

TRANSPORTATION PERFORMANCE MANAGEMENT

TRAVEL TIME RELIABILITY PERFORMANCE MANAGEMENT

WHAT IS TRAVEL TIME RELIABILITY?

New federal rules require states to measure, monitor, and set goals based upon a composite index of travel time reliability metrics. Travel time reliability measures how consistent the travel time is from one point to another, from one day to the next. To determine reliability, data on travel time is examined to see how it varies over time. Travel time for each discrete segment of the National Highway System (NHS) is placed in order from the shortest time (fastest speed), which is the 1st percentile speed, to the longest time (slowest speed), which is the 100th percentile speed. Three performance measures are examined to compare the "normal" travel time, (which is defined as the 50th percentile travel time) on a segment, with either the 80th percentile or the 95th percentile travel time to determine the overall reliability. If the difference between the normal travel time and the longer travel time (80th or 95th percentile time) is greater than 50%, then the segment is unreliable.

To help understand this concept and how travel time reliability is applied, consider the following highly simplified hypothetical example. Suppose an individual person's normal travel time from home to work is 20 minutes. The 80th percentile is defined as one out of every five days, or approximately once a work week. If in a typical week, it takes this individual 30 minutes or longer to travel to work (one or more times), then his/her route would be designated as unreliable.

Comparatively, the truck travel time measure uses the 95th percentile which is one out of every twenty days.

Travel Time Reliability is not the same as Congestion. Reliability is important, because travelers prefer a consistent travel time to their destination over whether or not the route is congested. If people understand that a route is congested, they can plan accordingly, but if a route is unreliable, they really have no understanding of how long it will take to get to their destination, which creates greater frustration. In addition, segments of roads can be both congested, and reliable (e.g., reliably congested), whereas others can be congested, but unreliable.

Example of Unreliable Corridor

Day 1 – 50th Percentile (Average or Normal Travel Time)



Day 2 – 80th Percentile Longer Travel Time



TRAVEL TIME RELIABILITY MEASURES

Federal regulations require states and Metropolitan Planning Organizations (MPOs) to use three performance measures for assessing travel time reliability. Travel time data used to calculate each measure is purchased by the Federal Highway Administration (FHWA) and made available for use by states and MPOs. The vehicle probe data set used for the federally required measures is called the National Performance Management Research Data Set (NPMRDS). The data is processed through an analytical software tool known as Regional Integrated Transportation Information System (RITIS). The travel time reliability measures, as defined in the PM3 federal rule are:

- + Level of Travel Time Reliability (LOTRR) on the Interstate: % of person-miles traveled on Interstate that are reliable
- + LOTTR on the Non-Interstate NHS: % of person-miles traveled on the Non-Interstate NHS that are reliable
- + Freight Reliability Measure on the Interstate: Truck Travel Time Reliability (TTTR) Index

Performance Measure Description

Level of Travel Time Reliability (LOTRR)

Truck Travel Time Reliability (TTTR)

- 2- and 4-Year Targets**
- Interstate and Non-Interstate NHS
- Four (4) Time Periods
- Fifteen (15) Minute Travel Intervals
- Longer Travel Time: 80th Percentile
- Normal Travel Time: 50th Percentile
- Threshold: Reliability is <1.50
- Factors Applied: Vehicle volumes (HPMS) and Vehicle Occupancy Factor (provided by FHWA)

- 2- and 4-Year Targets
- Interstate
- Five (5) Time Periods
- Fifteen (15) Minute Travel Intervals
- Longer Travel Time: 95th Percentile
- Normal Travel Time: 50th Percentile
- Threshold: None
- Factors Applied: No additional factors are applied

** The Non-Interstate NHS Travel Time Reliability measure is being phased-in and does not require a 2-year target for the first performance period only.

Level of Travel Time Reliability (LOTRR) Example

Segment: Longer Travel Time (80th) ÷ Normal Travel Time (50th) = # seconds ÷ # seconds = LOTTR

Monday – Friday	6am - 10am	LOTRR = 44 sec ÷ 35 sec = 1.26
	10am - 4pm	LOTRR = 1.39
	4pm – 8pm	LOTRR = 1.54
Weekends	6am – 8pm	LOTRR = 1.31

Reliability: LOTTR below 1.50 during ALL of the time periods

Segment is NOT reliable

Measure: Percent of person-miles traveled on the [Interstate/Non-Interstate NHS] that are reliable

1. Length x Volume (AADTx365) x Occupancy = person miles
2. $\frac{\sum (\text{Reliable Person-Miles})}{\sum (\text{Total Person-Miles})} = \text{Reliability}$

Truck Travel Time Reliability (TTTR (This is an index, not a reliability threshold) Example

Segment: Longer Travel Time (95th) ÷ Normal Travel Time (50th) = # seconds ÷ # seconds = TTTR

Monday – Friday	6am - 10am	TTTR = 72 sec ÷ 50 sec = 1.44
	10am - 4pm	TTTR = 1.39
	4pm – 8pm	TTTR = 1.49
Weekends	6am – 8pm	TTTR = 1.31
Overnight	8pm – 6am	TTTR = 1.20
Maximum TTTR		1.49

Measure: Truck Travel Time Reliability (TTTR) Index

1. Length x MaxTTTR = Length-weighted TTTR
2. $\frac{\sum (\text{All segment length weighted TTTR})}{\sum (\text{All segment lengths})}$

TRAVEL TIME RELIABILITY TARGETS AND METHODOLOGY

PM3 Reliability Measures – Final State of Michigan Targets

Measure	Baseline from Jan 2017 to May 2018 (Source: NPMRDS – RITIS)	Recommended 2-Year Target(s) CYE 12/31/2019	Recommended 4-Year Target(s) CYE 12/31/2021
Interstate Travel Time Reliability	2017 - 85.2% 2018 - 85.8%	75%	75%
Non-Interstate NHS Travel Time Reliability	2017 - 86.1% 2018 - 85.8%	--	70%
Freight Reliability	2017 - 1.38 2018 - 1.49	1.75	1.75

Baseline Data: 2017 and 2018 data shows that the Michigan's interstate highways and non-interstate NHS highways have been between 85 and 86 percent reliable, meaning that greater than 85% of the person miles traveled on the NHS system are meeting the threshold, as defined in the federal rules (the ratio between the 50th percentile and the 80th percentile is below 1.5). For trucks, due to the higher threshold of comparing the 95th percentile to the 50th percentile, the overall truck travel time index on the interstates has remained near 1.5.

Target Methodology - Targets have been set conservatively for this first reporting cycle. There is only 17 months of data to establish a baseline, and month-to-month comparisons vary due to weather, construction, data coverage gaps and other factors. As more data is collected over the next 2 years, the detection of trends should become more observable and distinctive and MDOT will re-evaluate the targets for possible adjustments. In the interim, the trends and influencing factors reflect the best information available.

Application of these measures in MDOT's prioritization process: These three measures are monitored and considered as factors in the overall decision making process for transportation investments in Michigan. MDOT is currently evaluating the types of projects and funding templates that will have an impact on travel time reliability, and have developed an initial list of project types to be considered; however, due to the lack of historical data, it is not possible to truly quantify the level of impacts for each of these project types at this time. The initial list of project types includes: capacity improvements or widenings, ITS and operational improvements, safety projects that improve operational flow, and road and bridge reconstruction and rehabilitation projects that improve segments from poor condition to good/fair condition.

REPORTING ON TRAVEL TIME RELIABILITY

The Transportation Performance Management (TPM) System Performance Rule designates recurring four-year performance periods for which two and four-year targets are required to be established for travel time reliability on the NHS for person miles and freight. There are three sets of targets: 1) percent of person miles traveled on the Interstate System that are reliable, 2) percent of person miles traveled on the Non-Interstate NHS that are reliable, and 3) truck travel time reliability index on the Interstate. The first performance period takes place from January 1, 2018 to December 31, 2022, with state targets due on May 20, 2018. MDOT is required to submit biennial progress reports to FHWA. There are a total of three progress reports due for each performance period:

- + **Baseline Performance Report (due October 1, 2018)**
- + **Mid-Performance Period Progress Report (Oct. 1, 2020)**
- + **Full Performance Period Progress Report (Oct. 1, 2022)**

FHWA will determine significant progress using the Mid and Full Performance Period Progress Reports. Significant progress is defined as achieving a condition that is *equal to or better than the target, or better than the baseline condition*. If significant progress is not achieved, MDOT must document how it plans to achieve it by the next reporting cycle.

MPO Coordination

MPOs are required to establish four-year targets for these measures, and have two options for target selection: agree to plan and program projects that support state targets, or commit to their own targets for their Metropolitan Planning Area. MPO targets are due on November 16, 2018, 180 days after state targets are established. MPO targets are not reported to FHWA, but must be reported to MDOT using mutually agreed upon method. MPOs will include targets in their Transportation Improvement Programs and Long-Range Transportation Plans, and explain how their projects and programs support either MDOT's or the MPO's targets.