Peak Spreading Procedure

Metro is continually updating and refining modeling tools and resources. The material below is intended for general reference purposes only and may be outdated. Coordinate with Metro Transportation Research and Modeling Services staff for guidance on application and consistency with the latest methods and tools.

How will the peak spreading algorithm impact trips on the network at a local level?

The peak spreading algorithm is meant to work with the regional network, and the methodology has the most impact on 'regional-level' trips -- or, those trips with longer rather than shorter trip lengths. Even in super saturated conditions, many O-D pairs will not experience a Travel Time Index (TTI) exceeding the threshold (TTI > 1.6), especially shorter 'local' trips.

Additionally, since the TTI is based on overall trip length, and not on specific network locations or features, it is possible that many locations will still show relatively high V/C ratios, especially if the volume across links in those locations is made of longer trips which have low TTIs, despite locally high V/C ratios across small portions of their paths.

The peak spreading algorithm impacts primarily those O-D pairs with paths through very congested corridors (e.g., Oregon to Washington via I-5 / I-205, Downtown PDX to Washington County via US-26, etc.).

Can the peak spread trip tables and a static assignment be considered a substitute for micro- or meso-level (DTA) assignments?

Using the peak spread trips tables with a static assignment cannot be considered a substitute for micro- or meso-simulations Dynamic Traffic Assignment (DTA). Both of these simulations restrict volume through links and intersections to saturated flow rates, and reflect congested conditions through queuing, while static assignments cannot accurately reflect this particular result of congested networks.

Using the static assignment with the peak spread trip tables will provide *more* realistic assignment results on a very saturated network compared to a static assignment with non-peak spread tables. However, even with the peak spread trip tables, the path results are still subject to the nuances of the static assignment, resulting in V/C ratios on links and intersections that can still exceed 1.0 in many locations.

If making changes to the network or O-D tables, is it necessary to rerun the peak spreading algorithm?

The original peak spread trip tables and resulting assignments on the base network are considered to represent ambient demand. Small changes in the network or small changes in O-D demand should not impact the modeling results enough to warrant rerunning the peak spread algorithm.

Any change to the network or O-D trip tables substantial enough to impact peak spreading characteristics would probably have regional impacts, and should therefore be run through the entire travel demand model process to reflect changes in distribution and mode choice, as well as time of day characteristics.

How should adjustments to the peak spread O-D trip tables be handled?

One key difference with the new trip tables is that demand is now divided among several hours, rather than contained in a single 4pm-6pm trip table. This allows the practitioner greater flexibility in determining the temporal distribution of any additional demand.

For example, if adjusting O-D demand to represent new employment center, the practitioner can exercise her discretion as to what percentage of the additional demand will occur between 3pm-4pm, 4pm-5pm, 5pm-6pm, etc. Distributing the demand among more hours reduces the overall impact of the O-D change to any given time period.

If the hourly trip tables provide too much fidelity [such as individual data increment periods that provide detail at a shorter duration than what is needed] , one can always sum the 4pm-5pm and 5pm-6pm trip tables and run a single 4pm-6pm assignment [using an aggregated period] if they choose.

Is there information on the TTI threshold that can be derived from the travel survey?

The peak spreading algorithm was developed separate from the travel survey. Unfortunately, the travel survey does not contain information that can guide the peak spreading methodologies. Development of a full peak spreading model would likely require a separate and extensive stated preference travel survey.

The methodology behind the peak spreading algorithm is based purely on reasonable assumptions and present day observations for our region. The identification of the TTI threshold is based on the observation that the I-5 corridor between downtown Portland and Vancouver, WA represents one of the most congested corridors in the region. Additionally, it can be observed that congestion in this corridor lasts for an extended period of time, often much longer than the typical one or two hour long congestion seen in many other parts of the region.

Based on these observations, the TTI threshold for the 5pm-6pm (peak of the peak) time period on I-5 NB is approximately 1.6. This value is assumed to be the limit of acceptable congestion, beyond which travelers might begin look at temporal changes in their trip patterns (i.e., peak spreading).

By using this threshold and the peak spreading methodology explained in this document for adjusting future year trip tables, it is observed that modeled static assignment volumes are less likely to greatly exceed network capacity along key regional cutlines.

Cutlines showing volumes in excess of capacity prior to the peak spreading show the most temporal adjustment of demand. Cutlines with ample capacity relative to demand show very little temporal adjustment of demand. This suggests that O-D pairs that have paths through the most congested corridors are adjusted by the peak spread algorithm, while O-D pairs with paths through relatively low congestion corridors are not adjusted.

Should the original non-peak spread trip tables be used to analyze latent demand rather than the peak spread trip tables?

The peak spread trip tables should be used to analyze all demand on the network. Essentially, the trip tables produced for final assignment -- whether peak spread or non-peak spread -- represent an assumption about the daily distribution of trips in the region. In Existing Year conditions, this profile is based on a combination of travel survey results and measured count profiles along key corridors. By 2035, the region is so congested that it is not realistic to assume that the Existing Year peaking profiles would remain the same--there just isn't the capacity in some corridors to accommodate all of the demand produced by peaking factors used in the less congested Existing Year.

The peak spreading algorithm attempts to 'readjust' some of these peaking profiles by moving trips in very congested corridors to time periods that are a bit less congested. This seems to be a reasonable assumption, given that there is not much data on how traveler behavior is impacted by the degree of network saturation that is demonstrated in the future year transportation scenarios.