APM Appendix 3E

Traffic Volume Development During Disruptive Events

This document is intended to provide guidance on volume development for facility level analysis of Oregon Department of Transportation (ODOT) plans and projects under disruptive conditions such as the current COVID-19 pandemic. This guidance may be updated periodically as new information becomes available. Please check the APM website for current information.

As of this writing, the 2020 COVID-19 pandemic has resulted in drastic reductions and alterations in traffic volumes and patterns in Oregon. This is due to a variety of causes including stay at home orders, school and business closures, and economic downturn. Traffic characteristics affected include travel demand, traffic patterns, modes, mix of vehicles, trip purposes, turn movements, time periods, congestion and peak spreading.

Disruptive events may also include economic recessions, natural disasters (e.g. earthquakes, tsunamis), long-term roadway construction, and other major occurrences that significantly alter traffic patterns for extended periods of time. Under these conditions taking new traffic counts for the project will often not be advised and state and local traffic count programs will likely have been suspended.

This guidance supplements the procedures for traffic counts and volume development in APM Chapters 3, 5 and 6, which should be referred to for more details. Disruptive events may justify some exceptions or variations to these APM procedures. Under these circumstances it is even more critical to coordinate with ODOT staff in order to agree on a data collection methodology prior to proceeding with traffic counts and volume development. The following are potential resources and approaches (not necessarily in order of preference) that may be considered along with engineering judgement in order to move traffic studies forward despite a disruptive event that results in atypical traffic volumes.

This guidance assumes that travel patterns will eventually return to conditions that existed prior to the disruptive event, and provides some alternative methods that may be used to estimate what traffic volumes would be if the disruptive event had not occurred. Depending on the event, returning to “normal” conditions could take up to five years or more. Estimated traffic counts introduce an additional degree of uncertainty, so a sensitivity analysis should be considered for short term forecasts.

Taking New Traffic Counts

Caution should be exercised in taking new traffic counts during disruptive events. New traffic counts should only be taken during disruptive events when it is determined that the data already available is not sufficient for decision making. The use of new traffic counts may be a possibility depending on a number of factors. Considerations include:

- Only one or two sites needed (e.g., not a large list of many new counts)

- Project importance and need to adhere to schedule (e.g., construction project versus a TSP)
- Extent of deviation from normal link volumes, as determined from continuous count sites
- Availability of bracketing counts
- Extent of deviation of turn movement percentages based on an older count or travel demand model if available
- Availability, project budget for, and familiarity with use of third party O-D data such as from StreetLight for adjustment of turn movement percentages if needed

A methodology for traffic count adjustment is available from the Ohio DOT[1]. The next section of this paper outlines data sources that can be used in combination with new data to implement the Ohio DOT methodology. If taking new counts is being considered it is recommended to contact TPAU or Region Traffic for further guidance.

Resumption of Project Counting

Project traffic counting can generally be resumed when the difference between current year and prior year volumes is less than 10 to 20 percent, which is within the range of normal volume variations. The difference may be determined by comparing current volumes to volumes prior to the disruptive event. Continuous count locations within the study area can be used. It may be necessary to supplement the continuous count locations with check counts at other sites. Volumes being compared should be seasonally adjusted so the time periods are equivalent.

Alternatives and/or Supplemental Data to New Traffic Counts

Historical Traffic Counts

Historical traffic counts are commonly used in traffic studies where new counts are not possible or necessary. They can be factored up to the current year using Future Volume Tables or other data. The TCM traffic count tool (soon to be replaced by the Oregon Traffic Monitoring System (OTMS)) may be used to identify historical counts in the study area. The Transportation System Monitoring (TSM) Unit should be contacted to identify any other historical counts that may have been missed. Some counties and larger cities also have regular traffic counting programs in place. The TSM Unit provides links to many of these traffic data websites on the Traffic Counting Program webpage. Tube counts should be checked to see if they are only axle counts – if so the axle factors need to be applied to them before use.

Other databases or archived data should be searched. These may be available from traffic data collection companies such as Quality Counts https://data.qualitycounts.net/. PORTAL is a centralized repository of transportation related data in the Portland metropolitan area, hosted and maintained by Portland State University. This is an example of using data archived from ITS

[1] Traffic Counts for Traffic Forecasts - COVID19 Supplement, Ohio DOT, 4/17/2020

deployments such as ramp meters or other sensors. PORTAL data should be quality checked before using.

The APM standard is for traffic counts to generally be no older than 3 years, although up to 5 years old may be appropriate in areas with little growth or change. Traffic counts older than 5 years might be justified in disruptive event conditions if no significant land use or network changes have occurred in the study area since the count was taken. For example, there may be no available counts on a lower volume local intersection. The older count should be factored to the current year using historic growth rates such as from the Future Volume Tables. In some instances one or more parameters from an older count may be used rather than the volumes themselves. For example, if found to be representative of the study location, a count from a nearby roadway or intersection may be used for the K factor, D factor, peak hour factors (PHF), and/or classification percentages.

ODOT Transportation Volume Tables (TVT)

ODOT Transportation Volume Tables (TVT) counts and HPMS sample counts are short-term portable tube counts taken every three years. These can be used for segment volumes on state highways. The AADTs at these locations are published in the TVTs. (Note: Volumes listed in the TVT are for a single point, not the entire segment). For planning level analysis, AADTs can be converted to 30th highest hour volumes using K and D factors. Hourly volumes may also be available from the TVT counts. Contact the TSM Unit directly if the actual count is needed.

Ramp Interchange Volume Diagrams in the TVT and on the TSM Unit webpage are based on 48-hour tube counts taken on a 3-year schedule. The actual ramp count should be used rather than the published volumes. Contact the TSM Unit directly for the actual ramp count.

Many of the TVT and HPMS sample counts are classification counts. State Highway vehicle classification percentages are assigned to all sites including those with volume-only counts, on the TSM Unit's Traffic Volumes and Vehicle Classification webpage. Contact the TSM Unit if an actual classification count is needed.

Published Transportation Studies

Traffic counts and other data may be available from other published transportation studies in the project area, including planning studies, project development, and TIAs. The Transportation Planning On-line Database (TPOD), a map-based, graphical tool for locating planning studies, may be helpful to locate these studies. Other studies may be found by contacting local jurisdictions, the Region Traffic Manager, the Region Traffic Engineer, the Region Access Management Engineer (RAME) and the Region Planning Manager.

Permanent Count Stations

Continuous directional hourly link volumes can be obtained from Automatic Traffic Recorder (ATR) stations. A summary of data for each ATR is available at Permanent ATR Station Trends. ATR/AVC "Critical Hour" listings are also available which break down a year's worth of data

down to the hour level so a 30 HV can be obtained at that location (contact the TSM Unit). These data may also be useful for monitoring trends over time, as is being done as part of the ongoing Weekly COVID-19 Traffic Reports. Permanent traffic recorder sites are also available on non-state roadways. Contact local jurisdiction traffic engineering staff for locations.

Automatic Vehicle Classifier (AVC) stations continually classify data so vehicle classification data will be available throughout a given year at these locations (contact the TSM Unit). Another source of truck classification data are Weigh-in-Motion stations.

Bracketing

It may be possible to estimate intersection approach volumes by bracketing the site with counts taken at nearby intersections. The counted intersections should not be too distant from the site and there should not be any major intervening intersections. Bracket counts should be minimum of 16 hours in duration, preferably with 15-minute intervals

Turn Movement Volumes

Methods are available to estimate turn movement volumes from approach volumes. Turning movements at T-intersections can be developed readily from intersection leg or directional volumes. Four-leg intersections generally require an iterative procedure. See Analytical Travel Forecasting Approaches for Project-Level Planning and Design (NCHRP Report 765) for detailed methodologies. Procedures for estimating weaving volumes are also available, see APM Appendix 11C.

Travel demand models may also be used as a starting point to estimate turn movements at intersections, using select-link analysis. These O-D percentages can be used as initial seed turn movement percentages in a matrix tool such as Turns W32, which is used to create balanced intersection volumes.

Travel Demand Models

Raw travel demand model volumes may be used for planning or preliminary analysis if relatively good validation to observed data was achieved in the base year within the study area. The model volume assignments may be further improved by using windowing or focusing scenarios to add detail such as by subdividing zones, adding centroid connectors and refining the road network within the project study area.

Select-zone data from travel demand models can be used for trip distribution estimates. These can be used as part of a TIA or cumulative volume development process. The Statewide Integrated Model (SWIM) can provide volume estimates for state highways and for the county arterial system. Contact the Transportation Planning Analysis Unit (TPAU) for more information.

Third Party and Probe Vehicle Data

In addition to speed and travel time related data, volume estimates are now being offered by many probe data/big data third party vendors such as INRIX or StreetLight. Third party data may have limited availability, accuracy, and can be expensive. Caution should also be exercised in using these volume estimates as they are data aggregators which combine data from various sources including smart phones and GPS devices or connected vehicles. They are based in large part on sample data which has been expanded into a full estimate using scaling factors, based on permanent count data. Such volume estimates should be validated within the study area by comparing to measured volumes to determine if the level of accuracy is sufficient. A 2019 ODOT research study evaluated StreetLight AADT estimates and showed that the error depends on overall expected volume or functional classification and ranges from 7% error on interstates to 55% error on lower functional classification roads. Error has been measured to be as much as 197% however. This is an area of ongoing research.

These data potentially could be considered for monitoring trends over time as the data are available continuously for an entire year or more. However, caution should be used since these firms do not always disclose when and how their underlying processes change, which might impact the output metrics.

In addition, some vendors such as StreetLight provide origin-destination (O-D) and select-link data which potentially could be used to help estimate turn movements at intersections, in particular where travel demand models are not available. Caution should be exercised when considering use of these measures/products as well, as we have not seen any validation of them. There could be a significant risk of undercounting communities of concern where mobile device adoption is lower.

Traffic Signal Controller Data

Although not as reliable as actual traffic counts, archived traffic signal detection counts/data may be available for some signalized intersections. Contact the Region Traffic Manager for availability. These data may be used to determine trends between weekday and weekend traffic, or in establishing relationships for side streets (i.e. seasonal adjustments). These frequently undercount, so these are best for trends/relationships unless other counts were also taken at the intersection or nearby. The most recent loop detector diagram for the intersection is needed in order to decipher the controller count data. ITS cameras may be another potential data source. Detector diagrams can be obtained from the various Region Tech Centers. Signal controller counts may not include turn movement volumes depending on specific detector placement. Depending on how long the data have been stored, it may also be used for monitoring trends over time. Pedestrian pushbutton activations may also be used to estimate pedestrian volumes. This requires an estimate of the number of pedestrians crossing per activation.

Pedestrian and Bicycle Volumes

Many local jurisdictions maintain pedestrian and bicycle traffic count programs. Volumes and factors from these sources should be checked for availability.

Traffic signal pedestrian pushbutton activations may be available for some traffic signals. Pedestrian volumes crossing intersection legs may be estimated if the number of pedestrian crossings per activation is known. Advance bicycle loop detectors counts may be available at intersections equipped with bike signals.

Pedestrian and bicycle volume-related estimates based on sample probe data may be available from third party vendors such as StreetLight or Strava. Caution should be used with these data, as they are known to contain biased samples of users and trips types with more strong and fearless riders logging more recreational trips than utilitarian trips. These data should be used in conjunction with observed traffic counts to understand the sample rates which can vary across the network and facility type.

Bicycle and/or walk trip estimates may be available in areas with focused activity based models or tour-based travel demand models.

A data archive of pedestrian and bicycle counts in Oregon (and other states) is maintained by the Transportation Research and Education Center (TREC) at Portland State University. http://bikeped.trec.pdx.edu/

ITE Trip Generation Data

The latest edition of the ITE Trip Generation Manual may be used to estimate trips generated by land uses approved but not yet built, or from facilities that have been temporarily closed (e.g., a movie theater), or for land uses with only one access point such as a dead-end residential street. Turning movements may be estimated using trip distribution methods. Refer to procedures in APM Chapter 6 for more information.

Default Values

Volume-related default values such as for truck percentages, peak hour factors, or K and D factors, or turn movement percentages may be used as estimates in planning or preliminary level analysis such as for TSPs or facility plans if measured values are not available. Default values for analysis of final alternatives is discouraged. Default values used in freeway facility analysis can be found in APM Appendix 11C. Others sources include the latest edition of the Highway Capacity Manual and the Planning and Preliminary Engineering Application Guide.

Sensitivity Analysis

A sensitivity analysis should be considered to test the effects of potential changes in volumes, especially if count substitutes are used or if it is expected to be a long period before volumes return to “normal”. This can be done by applying volume scaling factors on the order of 10 to 50 percent, depending on the level of uncertainty. Such scenarios can be used to identify how sensitive the analysis results are to demand projections and how close volumes are to triggering thresholds.