

# Analysis Procedure Manual

2019 Change Sheets

September 2019

APM Version 2

## Chapter 2, Subsection 2.5.1

### Changed:

- Traffic analysis must follow the Highway Capacity Manual (HCM) 6 procedures and comply with ODOT's Analysis Procedures Manual available at <https://www.oregon.gov/ODOT/Planning/Pages/APM.aspx>. Signalized intersections shall use HCM 6 methods in order to produce intersection v/c ratios.

### To:

- Traffic analysis must follow the Highway Capacity Manual (HCM) 6 procedures and comply with ODOT's Analysis Procedures Manual available at <https://www.oregon.gov/ODOT/Planning/Pages/APM.aspx>. HCM 6 signalized intersection v/c shall be computed manually unless software-calculated.

### Changed:

- Note: Three (3) to five (5) years of crash data shall be obtained from ODOT's Crash Analysis & Reporting Unit for state highways and any local roadways desired in the study area. Use five years for projects, detailed plans (i.e. IAMP's), or roadway/study areas with low number of crashes.

### To:

- Note: Five (5) years of crash data shall be obtained from ODOT's Crash Analysis & Reporting Unit for state highways and any local roadways desired in the study area.

### Changed:

- Traffic analysis must follow methods in the Highway Capacity Manual (HCM) 6 published by the Transportation Research Board (TRB) or as agreed to by ODOT. All traffic analysis software programs used must follow Highway Capacity Manual 60

procedures. Signalized intersection v/c shall use HCM 6 methods in order to produce intersection v/c ratios. Synchro/ SimTraffic is the ODOT standard software program and is the preferred format.

**To:**

- Traffic analysis must follow methods in the Highway Capacity Manual (HCM) 6 published by the Transportation Research Board (TRB) or as agreed to by ODOT. All traffic analysis software programs used must follow Highway Capacity Manual 60 procedures. HCM 6 Signalized intersection v/c shall be computed manually unless software-calculated.

**Changed:**

- [Note: for existing conditions] Contractor shall obtain the past five years of crash data from Agency's Crash Data & Reporting Unit for both state and non-state roadways and perform crash analysis. Contractor's data for state highways shall include locations of Safety Priority Index System (SPIS). If the local agency or region has established a critical crash rate for intersections or if each intersection type within the study area includes a minimum of 5 study intersections, Contractor shall use the Highway Safety Manual Part B Network Screening Critical Crash Rate for intersections. to compare intersection crash rates to a critical rate. Each reference population used in the critical crash rate method must have at least 5 (five) sites. If this is not met, intersection crash rates need to be compared with the published 90th percentile rates (See ODOT Analysis Procedure Manual Chapter 4).

**To:**

- [Note: for existing conditions] Contractor shall obtain the past five years of crash data from Agency's Crash Data & Reporting Unit for both state and non-state roadways and perform crash analysis. Contractor's data for state highways shall include locations of Safety Priority Index System (SPIS). Contractor shall use the Highway Safety Manual Part B Network Screening Critical Crash Rate and Excess Proportions of Specific Crash Types methods for intersections. Each reference population used in either method must have at least 5 (five) sites. In addition, at least two sites must have at least 2 (two) crashes of the target crash type to be applicable for the excess proportion method. If this is not met, intersection crash rates need to be compared with the published 90<sup>th</sup> percentile rates (See ODOT Analysis Procedure Manual Chapter 4).

**Changed:**

- For intersections that exceed the identified critical crash rate, and/or the published 90<sup>th</sup> percentile rate, crash patterns, evaluation of causes and potential countermeasures must be identified for each site. Consultant shall map locations of these safety issue areas and the Safety Priority Index System sites. Consultant shall utilize the Crash Data and MMLOS/LTS to identify potential countermeasures and safety improvement alternatives.

**To:**

- For intersections that exceed the identified critical crash rate, **the excess proportion of specific crash types**, and/or the published 90<sup>th</sup> percentile rate, crash patterns, evaluation of causes and potential countermeasures must be identified for each site. Consultant shall map locations of these safety issue areas and the Safety Priority Index System sites. Consultant shall utilize the Crash Data and MMLOS/LTS to identify potential countermeasures and safety improvement alternatives.

**Changed:**

- [Note: Future safety for TSP's, similar detail level plan, and project development screening] For each alternative developed to specifically address a safety concern, Contractor shall summarize safety impacts of each design. Contractor shall use the Crash Modification Factors (CMF) in the HSM Part D and/or the FHWA CMF Clearinghouse to indicate the potential crash reduction for each safety alternative or countermeasure. The ODOT CMF standard is to only use CMF's with a quality rating of 3 stars or better.

**To:**

- [Note: Future safety for TSP's, similar detail level plan, and project development screening] For each alternative developed to specifically address a safety concern, Contractor shall summarize safety impacts of each design. **Contractor shall use the All-Roads Transportation Safety (ARTS) Crash Reduction Factor Appendix as the initial source of countermeasures. If the ARTS Appendix/List is not sufficient, then** Contractor shall use the Crash Modification Factors (CMF) in the HSM Part D and/or the FHWA CMF Clearinghouse to indicate the potential crash reduction for each safety alternative or countermeasure. The ODOT CMF standard is to only use CMF's with a quality rating of 3 stars or better.

**Changed:**

- Consultant shall conduct Level of Traffic Stress (LTS) analysis for all roadways in the Project Area as per APM Chapter 14. As much as possible, data should be obtained from current aerial photography and (TSP) roadway inventories before field data collection. Bicycle LTS will be evaluated and results graphically displayed for the existing conditions.

**To:**

- Consultant shall conduct Level of Traffic Stress (LTS) analysis for all roadways in the Project Area as per APM Chapter 14. As much as possible, data should be obtained from current aerial photography and (TSP) roadway inventories before field data collection. Bicycle & Pedestrian LTS will be evaluated and results graphically displayed for the existing conditions.

**Added:**

- Traffic Data for Noise Analysis (Contingency)
  - Consultant shall prepare traffic data needed for noise analysis and noise technical report. This analysis shall include:
    - Existing, future build (design year), and future no-build traffic data for each roadway link in the project area, including collector and higher functionally classified cross streets, for the peak hour and the peak truck hour and in an MS Office-compatible spreadsheet in the form of:
      - Link volumes for each traffic direction
      - Percentages of the following vehicles on each link:
        - Automobiles (FHWA vehicle classes 1-3)
        - Medium trucks (FHWA vehicle classes 4-5)
        - Heavy trucks (FHWA vehicle classes 6-13)
    - Existing and future posted speeds
    - Existing 85th percentile speeds (if available)
    - For each traffic signal in the project area, the percentage of vehicles affected (expected to come to a stop).
    - Land use zoning information for properties within the project area in the form of:
      - Existing zoning
      - Future zoning or predicted changes in land use from existing use
    - Please note that the peak truck hour is typically not in the same period of the day as the peak hour, so longer duration vehicle classification counts

(ideally 16+ hr) are necessary. Please refer to ODOT's Analysis Procedures Manual Version 1 Chapter 11 for details on roadway link creation, vehicle classification, and required factors and their calculation.

- If peak hour or the peak truck hour link volumes exceed the maximum LOS C volumes (LOS C/D threshold) then the link volumes shall be capped at the maximum LOS C volume. LOS C comparative volumes for can be obtained from current Highway Capacity Manual 6<sup>th</sup> Edition methods. LOS C volumes for intersection approaches also require an iterative process to obtain the target LOS C value.
- The methodology for creating the noise traffic data shall be documented in a methods and assumptions memorandum to be reviewed and approved by Agency Transportation Planning Analysis Unit and Region Traffic Engineer before work on creating the noise traffic data starts.
- The completed draft noise traffic data and related documentation (calculations, notes, etc.) shall be reviewed and reviewed and approved by the Agency Transportation Planning Analysis Unit and Region Traffic Engineer. The noise traffic data shall be provided as appendix material in the draft and final Noise Technical Report.

#### Chapter 4, Subsection 4.4.4

##### Changed:

Enhanced Interchange Safety Analysis Tool (ISATe) **is not currently calibrated for Oregon conditions and** must be reported uncalibrated, as described below.

##### To:

**An attempt was made to calibrate the freeway and interchange Part C models but was unsuccessful. Results from the** Enhanced Interchange Safety Analysis Tool (ISATe) must be reported uncalibrated, as described below.

#### Appendix 11C

##### Changed:

Figure 1, Ramp free-flow speed, Suggested Default Value: **35** mph

To:

25 mph

Chapter 12, Example 12-1
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Changed:

- **Northbound:** The northbound advancing volume is  $40 + 200 + 300 + 15 = 555$ , and the southbound opposing volume is 515 vehicles (the opposing left turns are not counted as opposing volumes). The volume for the y-axis on Exhibit 12-1 is determined using the equation:

$$\begin{aligned} \text{y-axis volume} &= ((\text{Advancing Volume}/\text{Number of Advancing Lanes}) + \\ & \quad (\text{Opposing Volume}/\text{Number of Opposing Lanes})) \text{ y-axis} \\ &= (555/2 + 515/2) = 535 \end{aligned}$$

To determine if the northbound left turn volume criterion is met, use the 45 mph curve in Exhibit 12-1, 535 for the y-axis and 15 left-turns for the x-axis. The volume criterion is not met in the northbound direction.

- **Southbound:** The southbound advancing volume is  $90 + 250 + 200 + 15 = 555$ , and the northbound opposing volume is 540 vehicles (the opposing left turns are not counted as opposing volumes). The volume for the y-axis on Exhibit 12-1 is  $(555/2 + 540/2) = 548$ . To determine if the southbound left turn volume criterion is met, use the 45 mph curve in Exhibit 12-1, 548 for the y-axis and 40 left-turns for the x-axis. The volume criterion is met in the southbound direction.

To:

- **Southbound Left:** The southbound advancing volume is  $90 + 200 + 250 + 15 = 555$ , and the northbound opposing volume is 515 vehicles (the opposing left turns are not counted as opposing volumes). The volume for the y-axis on Exhibit 12-1 is determined using the equation:

$$\begin{aligned} \text{y-axis volume} &= ((\text{Advancing Volume}/\text{Number of Advancing Lanes}) + \\ & \quad (\text{Opposing Volume}/\text{Number of Opposing Lanes})) \text{ y-axis} \\ &= (555/2 + 515/2) = 535 \end{aligned}$$

To determine if the southbound left turn volume criterion is met, use the 45 mph

curve in Exhibit 12-1, 535 for the y-axis and 15 left-turns for the x-axis. The volume criterion is not met in the southbound direction.

- **Northbound Left:** The northbound advancing volume is  $40 + 300 + 200 + 15 = 555$ , and the southbound opposing volume is 540 vehicles (the opposing left turns are not counted as opposing volumes). The volume for the y-axis on Exhibit 12-1 is  $(555/2 + 540/2) = 548$ . To determine if the northbound left turn volume criterion is met, use the 45 mph curve in Exhibit 12-1, 548 for the y-axis and 40 left-turns for the x-axis. The volume criterion is met in the northbound direction.

### Chapter 13, Subsection 13.4.4

#### Replaced Example 13-4

### Appendix 12/13A

#### Added:

New section on SIDRA software and settings for intersection analysis.

### Addendum 15A, Subsection 2.2

#### Changed:

The seeding period should be the longest of the following four criteria:

1. A minimum of 10 minutes

#### To:

The seeding period should be the longest of the following four criteria:

1. A minimum of 15 minutes

### Chapter 18, Subsection 18.3.2

#### Changed:

Chapter 9 (not yet written) includes more information about performance measures.

**To:**

Chapter 9 includes more information about performance measures.

<b>APM Webpage</b>
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**Changed:**

A major update of the manual is currently in progress. APM version 2 will incorporate methodologies from sources such as the 2010 Highway Capacity Manual and the Highway Safety Manual. As new chapters or sections of APM version 2 are completed, they will be published on this webpage, and APM version 1 will be modified to refer to the version 2 procedures.

**To:**

A major update of the manual is currently in progress. APM version 2 will incorporate methodologies from sources such as the current version of the Highway Capacity Manual and the Highway Safety Manual. As new chapters or sections of APM version 2 are completed, they will be published on this webpage, and APM version 1 will be modified to refer to the version 2 procedures.

<b>Technical Tools Webpage</b>
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**Added:**

Year 2017 ATR data from approximately mid-August through mid-September should be used with caution. Traffic patterns in many areas of the state were disrupted in this period due to the 2017 solar eclipse, followed by major fires in the Columbia River Gorge. The 2017 TVT ATR section identifies affected ATRs.



*APM Version 2*

**Chapter 2, Subsection 2.5.1**

**Added:**

[Suggested scoping statement]

Following procedures in the APM, traffic data shall be prepared to support HB 2017 Benefit Cost Analysis (BCA). The analysis shall be coordinated with and prepared using assumptions and parameters provided by the Region and the economists in the ODOT Program Implementation and Analysis Unit (PIAU). Traffic data shall be provided for the No Build and Build Alternative for both the Base Year and Horizon Year.

**Chapter 10, Subsection 10.6.8**

**Added:**

New section on Benefit-Cost Analysis, replacing existing section on Economic Analysis.

**December 2019**

*APM Version 2*

**Chapter 6, Various**

**Added:**

References to new Chapter 17 on travel demand modeling.

**Chapter 9, Subsection 9.3**

**Added:**

New section replacing current section on Travel Time Reliability.

**Chapter 11, Subsection 11.5**

**Added:**

New section on Travel Time Reliability.

**Appendix 11B**

**Added:**

Updated section on Reliability Method Calibration.

**Appendix 11C**

**Added:**

New section on Reliability Default Values.

## **Appendix 11E**

### **Added:**

New section on ODOT Default Values for Reliability.

## **Appendix 11F**

### **Added:**

New appendix Reliability Data Guidance.

## **Technical Tools Webpage**

### **Added:**

Updated FREEVAL-OR tool.

## **Chapter 17**

### **Added:**

New chapter on travel demand modeling.

## **Appendix 17B**

### **Added:**

New Appendix 17B – Sample Model Request.