APPENDIX A

Selected Details of State-of-the-Practice Review

This appendix provides an overview of the state-of-the-practice by analysis type (i.e., “identifying bottlenecks,” “classifying bottlenecks,” “evaluating bottlenecks,” and “mitigating bottlenecks). The case studies identified under each bottleneck type in this appendix are described in short summaries in Appendix B.

Identifying Bottlenecks

Table B-1 in Appendix B lists a number of resources that are categorized as successfully incorporating the area of “identifying bottlenecks.” There are a few notable resources in the area of identifying bottlenecks, including the following (generally these resources have the word identifying in bold in Table B-1):

- Texas 100 Most Congested Roadways and Mobility Investment Priorities project;
- Freight Performance Measures Analysis of Freight-Significant Highway Locations and Impacts on Congestion on Trucking;
- Virginia Statewide Multimodal Freight Study, Phase I;
- Bottlenecks on Florida Strategic Intermodal System;
- Truck Modal Profile, Georgia Statewide Freight and Logistics Plan; and
- Existing and Future Truck Delay in Hampton Roads Preparation for Project Prioritization.
- Appendix B provides a short write-up of these and other “identifying bottlenecks” case studies.

A range of techniques are used in the case studies to identify bottleneck locations. The available data seems to dictate the type of approach used for conducting these studies. Roadway truck bottlenecks were frequently selected based on intensity of use (e.g., AADT) or state DOT or other freight stakeholder recommendations. When available, a common approach was to use GPS probe speed data (e.g., ATRI, INRIX) and augment the data with sensor data and/or modeled data as needed.

Volume data are often from local sources (state DOT roadway inventories) or from HPMS for the study of broader geographic scope. FHWA Freight Analysis Framework (FAF) volumes are another source.

Delay computed from combining speed and volume data is a common performance measure used to identify bottleneck locations. Various speed thresholds are used to define the start of delay (e.g., speeds less than free-flow or less than a fixed value such as 35 or 45 mph). Volume-to-capacity is also a relatively common approach for identifying bottleneck locations, particularly when speed data are not available or used.

Classifying Bottlenecks

Table B-1 in Appendix B lists a number of resources that are categorized as successfully incorporating the area of “classifying bottlenecks.” There are a few notable resources in the area of classifying bottlenecks, including the following (generally these resources have the word classifying in bold in Table B-1):

- Oregon State Highway Performance Data and Metrics Related to Freight;
- ODOT Region 1 Corridor Bottleneck Operations Study;
- Positioning Hampton Roads for Freight Infrastructure Funding MAP-21 and Beyond;
- Freight bottlenecks in the Upper Midwest: Identification, Collaboration, and Alleviation/Identifying and Characterizing Truck Bottlenecks in the U.S. Mississippi Valley Region;
- An Initial Assessment of Freight Bottlenecks on Highways; and
- Quantifying the Contributing Factors of Traffic Congestion Using Urban Congestion Report Data.

Appendix B provides a short write-up of these and other "classifying bottlenecks" case studies.

Truck bottleneck classification appears to have the least consistency in methods, in part because of the variability in the type of classification schemes used. Some studies classify geometric considerations only, while others classify beyond geometrics (e.g., work zones, weather, etc.). There is not much guidance on how to classify bottlenecks, and many reports refer to bottleneck types, but do not always explain why they were classified as such. Confounding the difficulty of classification is the fact that truck bottleneck causes are often not mutually exclusive.

Many classification efforts focus on identifying interchanges, lane drops, signalized intersections, and steep grades primarily due to data availability. Classification of these causes is often performed with HPMS data (or DOT inventory data). In addition to identifying typical congestion-related (high-delay) bottleneck locations, some studies also investigated other data sources to classify bottlenecks further (i.e., deficient bridge data, low vertical clearances, inadequate lane width, and poor pavement condition). Classification by cause at this level requires numerous data sources.

Another interesting question that arose related to classifying truck bottlenecks is the simple question – "what is the definition of a truck?" There is some question of what FHWA truck classifications should be used to define a truck, depending upon the purpose of the analysis. It appears there is also occasional confusion when the definition of a truck in an MPO model does not match FHWA classifications.

Evaluating Bottlenecks

Table B-1 in Appendix B lists a number of resources that are categorized as successfully incorporating the area of "evaluating bottlenecks." There are many notable resources in the area of evaluating bottlenecks, and some of them are as follows (generally these resources have the word evaluating in bold in Table B-1):

- Virginia's Statewide Multimodal Freight Study, Phase I;
- Washington Department of Transportation Freight Mobility Plan;
- Using GPS Truck Data to Identify and Rank Bottlenecks in Washington State;
- I-95 Corridor Coalition: Bottleneck Performance in the I-95 Corridor;
- Columbus-Phenix City MPO Congestion Management Process: 2007 Update; and
- Identifying, Anticipating and Mitigating Freight Bottlenecks on Alabama Intersections.

Appendix B provides a short write-up of these and other "evaluating bottlenecks" case studies.

Most resources that identified bottlenecks also evaluated the bottlenecks. As described in the "identifying" section previously, evaluations were often performed based on the available data. Data sources and typical measures were previously discussed in the "identifying" discussion as well.

The most common evaluation measures are average speed, delay (vehicle-hours or vehicle-hours per mile), duration of congestion and reliability. GPS probe data are a common data source for speed data, particularly in the more recent and thorough reporting efforts. It is clear that the ever-improving ubiquitous nature of GPS probe speed data is making their use the current state-of-the-practice in bottleneck analyses.

Mitigating Bottlenecks

Table B-1 in Appendix B lists a number of resources that are categorized as successfully incorporating the area of "mitigating bottlenecks." There are many notable resources in the area of mitigating bottlenecks, and some of them are as follows (generally these resources have the word evaluating in bold in Table B-1):

- Delaware Valley Regional Planning Commission (DVRPC) 2012 Congestion Management Process (CMP);
- Application of Congestion Management Process (CMP) Strategies in Miami-Dade County;
- Tampa Bay Regional Strategic Freight Plan;
- Southern California Council of Governments (SCAG) Regional Transportation Plan – Congestion Management, Goods Movement, and Truck Bottleneck Strategy;
- Mitigation of Recurring Congestion on Freeways;
- Improving Safety and Operation with Low-Cost Freeway Bottleneck Removal Projects; and
- Framework for Analysis of Recurring Freeway Bottlenecks.

Appendix B provides additional information of these and other "mitigating bottlenecks" case studies.

A number of studies provide mitigation strategies for truck bottlenecks. There are also a number of guidance documents that discuss lists of possible mitigation strategies. One gap in the literature is there seems to be limited analyses of actual projects that identify the truck bottleneck improvement as a result of the mitigation strategy. While there are certainly some before-and-after studies of this type, it is still a challenge to isolate the impact of a specific project to a specific positive impact (i.e., decreased truck delay, reduced crashes). Many studies use microsimulation or other modeling techniques to analyze potential impacts.

MPO CMPs were found to be another common place for truck bottleneck mitigation efforts. In these instances, improving goods movement is typically a part of the larger long-range plan and investigating freight improvements is another consideration added to the project screening when mitigation options are considered. Another observation is that CMP analyses typically focus on the most congested portions of the day (peak periods) and in many cases that is not when trucks are out on the road; therefore, some of the truck impact may not be captured in typical CMP analyses.