

# FHWA Operations Benefit/Cost Analysis Desk Reference

## Real-World Examples of Application of the Guidance

### Project Purpose

The FHWA Office of Operations developed the *Benefit/Cost Analysis for Operations Planning Desk Reference* to provide practitioners with practical guidance, tools, and information for conducting benefit/cost analysis for a wide range of Transportation System Management and Operations (TSM&O) strategies.

### Project Need

Due to an increasingly competitive fiscal environment, state, regional, and local transportation planning organizations around the country are being asked more than ever to justify their programs and expenditures. Transportation System Management and Operations (TSM&O) programs have not escaped this scrutiny and are routinely asked to rank their projects against traditional expansion projects, as well as conduct other “value”-related exercises.

This requirement can put TSM&O projects at a disadvantage since many specialists in the operations arena have limited experience in performing benefit/cost analysis and many of the established tools available for conducting benefit/cost (B/C) analysis for more traditional infrastructure projects are poorly suited to analyzing the specific performance measures, project timelines, benefits, and life-cycle costs associated with operational improvements.

### The Operations Benefit/Cost Analysis Planning Desk Reference Project

The FHWA Office of Operations initiated this project in recognition that practitioners were in need of relevant and practical guidance in how to effectively conduct benefit/cost analysis of a wide spectrum of transportation system management and operations strategies. The *Operations Benefit/Cost Analysis Desk Reference* project provides practitioners with relevant guidance on how to effectively and reliably estimate the benefits and costs of operations strategies.

Two primary products were developed in the project: the *Operations Benefit/Cost Analysis Desk Reference* document (<http://www.ops.fhwa.dot.gov/publications/fhwahop12028/index.htm>), intended to provide practitioners with relevant guidance on how to effectively and reliably estimate the benefits and costs of operations strategies; and a supporting spreadsheet-based decision support tool named the *Tool for Operations Benefit/Cost* (TOPS-BC), designed to provide a framework and relevant information for the conduct of B/C analysis.

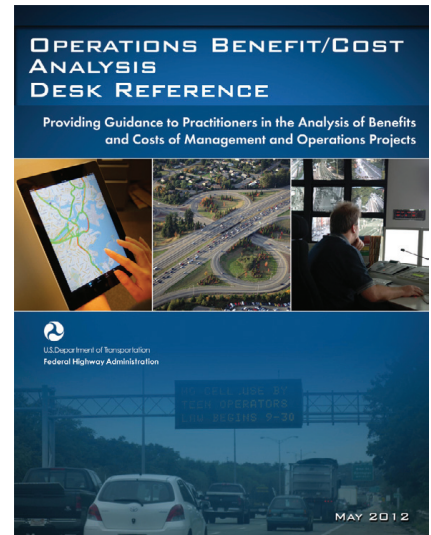
This effort has recently been supported by an ongoing outreach and workshop effort intended to both inform practitioners of the availability of developed guidance, but also gather feedback from participants regarding real-world applications of the guidance and tool to challenges being encountered by practitioners. Each workshop has explored locally relevant B/C challenges and discussed approaches to meeting these challenges. These discussions are being used to enhance the tool and guidance as the project moves forward. This brochure highlights some of the challenges discussed in various workshop locations as well as provides examples of some of the innovative approaches proposed to address these analysis needs.

### Philadelphia Workshop

Attendees at the Philadelphia workshop, hosted by the Delaware Valley Regional Planning Commission, reported challenges related to two widely varying B/C analyses intended to support two completely different phases of the objectives driven operations planning process. The first analysis involved the need to conduct a preliminary screening and prioritization of potential operations strategies being considered for future deployment on a segment of Highway 30 in Chester County which was formally a mostly rural roadway, but was rapidly experiencing increasing development pressure and growing congestion. Signal coordination strategies, along with supporting detection

and surveillance strategies are the primary operations deployments being considered. Through discussions, it was determined that a sketch-planning tool, such as TOPS-BC would be useful in estimating the benefits and costs, due to the preliminary nature of the screening activity and the limited nature of existing data and travel demand model detail in the corridor.

A second analysis discussion in the Philadelphia workshop was related to a widely different need. While the first analysis focused on the preliminary prioritization of potential strategies, the second benefit/cost need focused on evaluating an existing construction work zone strategy (being applied to a segment of New Jersey I-295) to provide greater understanding of the



Source: Federal Highway Administration.

strategy's benefits, as well as provide solid justification for expanding the use of these strategies in future work zone corridors. Whereas the first analysis also was limited by the amount of data available to support the analysis, the second analysis could be supported by a rich set of real-world archived data illustrating the conditions both "with" and "without" the mitigation strategies in place. Use of the TOPS-BC model to conduct this evaluation was illustrated; however, instead of utilizing the predictive ability of the tool to assess impacts on speeds and crashes and costs, the tool was used as a framework for monetizing benefits utilizing real-world impact and cost data in place of the default tool data to produce more locally relevant evaluation of the existing strategies. The attendees also investigated how multiple analyses might be performed to assess differing benefit levels during different implementation and construction phases of the project.



Source: iStockphoto®.

## Houston Workshop

Attendees at the Houston workshop, hosted by the Houston Galveston Area Council, brought a number of interesting benefit/cost analysis challenges to the discussion, mostly related in how to estimate the benefits of widely different operations projects for use in prioritizing the deployments for funding consideration. The first of the analysis needs explored was the challenge of estimating the benefits of a project intended to upgrade traffic-signal-coordination technologies and abilities across the entire City of Houston – a project involving numerous corridors and several thousand intersections. The specific challenge was how to estimate the planning-level benefits of this wide-geographically ranging project without having to individually model all of the corridors and intersections – an approach that would have exhausted a large proportion of the limited analysis resources. Guidance from the *Desk Reference* document was suggested that involved analyzing several representative corridors, each representing a common arterial corridor type, and then extrapolating the results to the regional scale according to the proportion of the arterial network comprised of the different corridor types.

A second analysis challenge was faced by a regional agency needing to justify funding for a redundant communications and power system designed to mitigate randomly occurring conditions when connections with signal and surveillance systems was knocked out by storms or other factors. Since the conditions in which the system would be used do not occur regularly, the frequency of these events needed to be estimated. Further, the traffic conditions representing what happens when the systems fail needed to be analyzed to establish a baseline to assess the incremental benefits that are accrued by avoiding these system failures. The final step in this approach is to multiply the incremental benefits that accrue by avoiding the failure conditions with the likelihood of their occurrence in order to annualize the benefit for comparison with the relative costs of the redundant systems.

## Richmond Workshop

The Virginia Department of Transportation hosted a combination webinar and in-person workshop in Richmond. One challenge presented by attendees was the need to estimate the potential impacts of a variable speed limit project being proposed on a freeway segment traversing a mountain pass section. Attendees experimented with entering available speed and volume data into the TOPS-BC tool to assess the crash and travel-time reliability benefits. One challenge to this analysis was that only the initial deployment costs for the variable speed limit strategies were available – no continuing operations and maintenance (O&M) costs or schedules for replacement of equipment were available. In conducting benefit/cost analysis of operations strategies, it is often critical to consider all life-cycle costs, including upfront capital, on-going O&M, and future equipment replacement costs. Attendees applied the guidance available in the *Desk Reference* and utilized a cost estimation template available in the TOPS-BC tool to assess the potential O&M costs and the anticipated useful life of deployed equipment to estimate these life-cycle costs for inclusion in the analysis.

## Project Contacts

If you have any questions regarding the Benefit/Cost Analysis for Operations Planning Desk Reference <http://www.ops.fhwa.dot.gov/publications/fhwahop12028/index.htm> or the supporting Tool for Operations Benefit/Cost (TOPS-BC), please contact one of the individuals below:

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