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Operations Data for Planning Applications

Identifying Needs, Opportunities, and Best Practices

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Operations Data for Planning Applications

Identifying Needs, Opportunities, and Best Practices

Transportation Research Board
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Introduction

On May 4, 2005, the Operations Data for Planning Applications: Identifying Needs, Opportunities, and Best Practices Peer Exchange was held in Washington, D.C. The goal of the peer exchange was to identify opportunities to improve the linkages between transportation planning and operations. Given recent technological advancements, operations data exist for the development of system performance measures, improvements to travel models, and a greater understanding of traffic condition dynamics (e.g., characteristics on nonrecurring congestion).

Invitations to the peer exchange were extended to state departments of transportation (DOT), metropolitan planning organizations (MPO), and the private sector. Participants were selected from across the county to discuss their utilization of operations data in the transportation planning process. Appendix A contains the list of peer exchange participants.

Before the meeting, participants were also asked to respond to a set of questions about the relationship between operations data and planning processes to create the foundation for the meeting and facilitate discussion. The section on peer exchange material contains a summary of these responses (complete responses are located in Appendix B). The section entitled Summary Concerns summarizes the meeting discussions including some ideas on linking operations data and transportation planning, additional observations from recent experiences, potential next steps, and existing resources.

Peer exchanges offer a unique opportunity to not only engage in discussion and share experiences and lessons learned but also to identify potential solutions and prioritize areas for additional advancement through research, technical assistance, and other activities. This report serves to document and further distribute the issues and insights raised during the meeting.

Peer Exchange Material

PEER EXCHANGE QUESTIONS ON OPERATIONS DATA FOR PLANNING APPLICATIONS

Each participant was asked to answer the following questions before attending the peer exchange:

1. How are you using operations data in the context of transportation planning?
2. What are your data needs from operations for use in the planning process?
3. What methods do you use to obtain data from operations for use in transportation planning?
4. What factors caused you to begin using operations data for transportation planning?
5. What benefits have you found in the use of operations data for transportation planning?
6. What challenges have you faced when using operations data (archiving, data quality, etc.)?
7. What advantages or new opportunities have you realized from the use of operations data?
8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?
9. What are the obstacles to the use of operations data across the planning profession?
10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a time frame (1 year, next 5 years, etc.).

SUMMARY OF PEER EXCHANGE MATERIAL

The participant responses are summarized in Table 1 (full responses are included in Appendix B).

TABLE 1 Participant Responses on Operations Data

Responding Agency	1. How are you using operations data in the context of transportation planning?
Center for Transportation Studies, University of Virginia (UVA)	The Archived Data Management System (ADMS) houses the Smart Travel Lab at UVA, where operations data are obtained, processed, archived, and made accessible via the Internet.
Federal Highway Administration (FHWA)	Traffic data are collected and compiled for use in policy and planning activities.
FHWA–New York Division	Data are used to promote coordinated Traffic Monitoring Program activities and intelligent transportation systems (ITS) detection systems.
FHWA–Office of Corridor and Border Planning	Data used to calibrate and validate regional-scale demand and network simulation models

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	1. How are you using operations data in the context of transportation planning?
FHWA–Office of Planning	Data used to forecast and evaluate the impacts of operational strategies and road pricing policies in travel demand models
Hampton Roads Planning District Commission (HRPDC)	• Congestion management system (CMS) • Intermodal management system • Long-range plan • ITS strategic plan and architecture • Incident management program • Regional travel time study • Regional safety study • Congestion Mitigation and Air Quality Improvement Program (CMAQ) and Regional Surface Transportation Program (STP) project selection • Special corridor/intersection studies
Maryland–National Capital Park and Planning Commission (MNCPPC)	• Archived data from state and county transportation management centers support – Travel forecasting model validation, – Travel monitoring, and – Growth management program. • Archived signal phasing plans used to validate turning movement count database. • Global Positioning Satellite (GPS) system-based travel time data used for signal retiming plans and coordination.
Metroplan Orlando	Data used for Florida project (FHWA initiative) for • System performance evaluation (e.g., travel) • Calibrating the regional demand model • Testing management and operations strategies during the long-range plan update
Metropolitan Washington Council of Governments (MWCOG)	Ad hoc
Minnesota DOT (Mn/DOT)	Traffic volume data from the traffic management center are used to produce annual average daily trips (AADT), which is used to project future traffic and pavement management.
Mitretek Systems	Data used to produce the Urban Congestion Reporting (assesses congestion) for FHWA
North Central Texas Council of Governments (NCTCOG)	The Thoroughfare Assessment Program collects traffic signal operations data to calculate mobility and air quality benefits of implementing traffic signal improvements; Synchro software is used for signal timing plans, and other data are used to validate the model.
Oak Ridge National Laboratory (ORNL)	Data used to integrate temporal and spatial detail with traditional planning data
Pennsylvania DOT (PennDOT)	Volume count data from Mobility Technologies (Traffic.com) supplement agency data.

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	1. How are you using operations data in the context of transportation planning?
Regional Transportation Commission of Southern Nevada (RTC)	• Travel demand model calibration and validation • Corridor studies • National Environmental Policy Act (NEPA) studies
Southwestern Pennsylvania Commission (SPC)	• Information used in analysis of CMS corridors • Count data used to update traffic forecasting

Responding Agency	2. What are your data needs from operations for use in the planning process?
UVA	• Volume • Incidents • Vehicle miles of travel (VMT) • Speed • Weather
FHWA	Supplement urban traffic data
FHWA–New York Division	Facilitate communication and coordination between traffic monitoring program activities and ITS
FHWA–Office of Corridor and Border Planning	• Data sources that are relatable to each other • Data that are better, faster, and cheaper than conventional planning data sources
FHWA–Office of Planning	• Traffic volume (means and variations) • Travel times • Delays (type of facility, time of day, nonrecurrent incidents)
HRPDC	• Travel time and speed • Delay (recurring and non-recurring) • Work zone • Arterial • Signal • Real-time traveler information
MNCPPC	• Travel monitoring data: travel time and speed, vehicle occupancy, lane occupancy vehicle classification, link and intersection volume • Transit operations data: vehicle, route, station, ridership, vehicle occupancy/loading factors, speeds, schedule adherence • Safety data: incidents/crashes • Asset management information: highway, intersection, bus stop inventories
Metroplan Orlando	• Travel time • Speed • Delay • Incident response time
MWCOG	24/7/365 speed and volume data at multiple locations
Mn/DOT	Total traffic volume data
Mitretek Systems	• Point-to-point travel times: – Every 5 min – On 50+ mi of urban freeway – At least 14 h per day – Meet data quality standards of 80% usability • Traffic count data in the same timeframe as above • Contributing factor data: weather, accident, work zones

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	2. What are your data needs from operations for use in the planning process?
NCTCOG	• Volume • Speed • Lane occupancy • Vehicle classification • Transit usage/ridership • Incident information
ORNL	To perform benchmarking and calibration
PennDOT	• Minimum data requirements: • Free-flowing mainline traffic • 24-h period • Hourly segments • Monday through Thursday • Excludes days near holidays
RTC	• Traffic data used to assess • Commute period performance • Ramp metering systems • Special events • Large-scale megaresort development • Incidents
SPC	• Traffic counts • Travel delay • Average speed

Responding Agency	3. What methods do you use to obtain data from operations for use in transportation planning?
UVA	The Smart Travel Lab has direct connection to operation centers throughout Virginia to transfer, archive, process, integrate sources, and clean data as well as maintain hardware and software.
FHWA	Through partnerships between traffic operators and data collectors at state and local agencies
FHWA–New York Division	Automated routines archive ITS data in traffic monitoring guidelines (TMG)-compatible data formats to provide continuous count and short counts.
FHWA–Office of Corridor and Boarder Planning	By requesting data directly from the operating agency
FHWA–Office of Planning	Potential methods: • Automated traffic monitors • Remote imagery • GPS equipped probes • Cell phone tracking strategies
HRPDC	• Virginia DOT via file transfer protocol (FTP) in Microsoft Access or Excel format • Smart Travel Lab website
MNCPPC	• Direct data requests from operating agencies • Coordination with agencies to create own agency archive • Data requests from other data archives • Data counted directly by agency
Metroplan Orlando	Data are provided by Florida DOT or local governments.
MWCOG	• Case-by-case requests to operations agencies • Regional Transportation Data Clearinghouse
MWCOG	• Case-by-case requests to operations agencies • Regional Transportation Data Clearinghouse

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	3. What methods do you use to obtain data from operations for use in transportation planning?
Mn/DOT	By downloading data from a server
Mitretek Systems	• Web mining • XML and other feeds from various advanced traveler information systems (ATIS) data providers
NCTCOG	Data are converted or imported from text format into a database format; some data are received via FTP or protected Internet site.
ORNL	New operation data sources are shared by word of mouth and transmitted via CDs or websites.
PennDOT	• Partnership with Mobility Technologies provides PennDOT with Philadelphia and Pittsburgh area data in exchange for use of right-of-way. • Data are available from a partner's page on the Mobility Technologies website.
RTC	• Limited automated collection via freeway loops and cameras • Paratransit buses equipped with automatic vehicle location (AVL) equipment (data not utilized)
SPC	• Highway Performance Monitoring System (HPMS) for traffic counts • Independent travel time runs for CMS corridors • Traffic.com (ISP) for sensor data

Responding Agency	4. What factors caused you to begin using operations data for transportation planning?
UVA	Changed data dissemination procedure to ADMS Virginia, which is a web system providing data in various formats and from different sources
FHWA	Ability to archive data and reuse it for multiple purposes
FHWA–New York Division	Agency promotion of Traffic Monitoring/ITS coordination to minimize data collection costs and increase safety
FHWA–Office of Corridor and Border Planning	Validation of large-scale simulation models
FHWA–Office of Planning	The need to use travel demand models to forecast and evaluate the impacts of operational strategies and road pricing policies
HRPDC	• Federal requirements and MPO certifications • Funding constraints • CMS • Regional ITS plans and architecture • Congestion (reoccurring and due to incidents) • ITS technologies • Performance measures that prioritize projects • Public pressure
MNCPPC	• Lack of traditional planning data • Technological advances in data archiving and exchange • Pressure from political officials • Demand for wider and deeper data (both temporally and spatially) • Awareness of data availability
Metroplan Orlando	MPO leadership focus on using a business approach in transportation planning with an emphasis on management and operations

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	4. What factors caused you to begin using operations data for transportation planning?
MWCOG	Need for information not traditionally associated with the four-step forecasting process [e.g., Transportation Emissions Reduction Measure (TERM) analysis]
Mn/DOT	Availability of previously collected volume data
Mitretek Systems	FHWA request
NCTCOG	Budget constraints led to looking at the capabilities of devices already deployed in the field
ORNL	Need for timely and frequent data
PennDOT	Some roads in Pittsburgh and Philadelphia have volumes that are too high or too dangerous to set up traditional traffic counts.
RTC	RTC will manage the new Freeway and Arterial System of Transportation (FAST) operations data system.
SPC	CMS requirements

Responding Agency	5. What benefits have you found in the use of operations data for transportation planning?
UVA	Facilitation of access to data and data quality screening
FHWA	Good data source at marginal cost
FHWA–New York Division	Safety and data sharing
FHWA–Office of Corridor and Border Planning	Model validation
FHWA–Office of Planning	Too early to tell
HRPDC	• Regional database for planning • Better understanding of system performance • Ability to identify critical locations • Funding prioritization • Improve forecasts • Freeway incident and response program evaluation • Faster public response time • Improved ability to address short-term needs
MNCPPC	• Quick data collection • Fosters relationship between planning and operating agencies • Current/up-to-date data • Provides detailed response to public officials based on real-world data
Metroplan Orlando	• Evaluate impact of projects • Identify problems • Propose alternatives • Test solutions • Inform stakeholders • Measure performance
MWCOG	Consideration of air quality credits for TERM programs
Mn/DOT	Supplements data collection needs
Mitretek Systems	Improved data quality

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	5. What benefits have you found in the use of operations data for transportation planning?
NCTCOG	Real-world data provide a better understanding of the inner workings of the transportation network and allow the agency to implement solutions.
ORNL	Data can be made available in a more timely manner and can be more spatially and temporally "dense."
PennDOT	Safety and ease of access to data
RTC	Improved ability to quantify performance during special events and incidents
SPC	Identifies problem areas and corridors needing attention

Responding Agency	6. What challenges have you faced when using operations data (archiving, data quality, etc.)?
UVA	• Communicating with operation centers • Metadata updates: equipment; data formats; understanding the data; standardization of data fields; data aggregation, data quality, and imputation
FHWA	• Data quality • Maintaining traffic detectors • Validating data • Communicating data quality to others
FHWA–New York Division	Not applicable
FHWA–Office of Corridor and Border Planning	• Problems relating data elements in time and space • Comparing between model results and ATIS information
FHWA–Office of Planning	• Lack of proven methodologies for summarizing vast amounts of data into meaningful measures • No standard practices for archiving operational data
HRPDC	• Data quality • Real-time information accuracy • Lack of arterial system data • Limited freeway system coverage
MNCPPC	• Data quality • Data availability • Difficulty filtering the volume of data • Inconsistencies in data aspects
Metroplan Orlando	Reaching consensus on a standard format for data collection
MWCOG	Not all member agencies have the same data: this creates a sampling issue.
Mn/DOT	Data storage and editing
Mitretek Systems	• Data quality • Data visualization • Automation • Consistency over time • Legal concerns
NCTCOG	• Data inconsistency • Data quality • Data completeness • Data coverage
ORNL	• Data quality • Data compatibility with other planning data • Interpretation of integrated data

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	6. What challenges have you faced when using operations data (archiving, data quality, etc.)?
PennDOT	Archiving is not an issue due to the mutually advantageous relationship with Mobility Technologies; data quality and location of sensors issues have also been satisfactorily addressed.
RTC	• Data mining • Balancing current job duties and data analysis
SPC	• Limited data sets • Difficulty interpreting data when there are unique local factors

Responding Agency	7. What advantages or new opportunities have you realized from the use of operations data?
FHWA	• New opportunities for timely performance measurement • Better coverage of urban traffic characteristics • Development of new approaches to planning and operations
FHWA–New York Division	Increased data collection and processing capabilities without additional staff resources
FHWA–Office of Corridor and Border Planning	Model validation
FHWA–Office of Planning	Great potential to address data needs but few success stories
HRPDC	• Quick access to a comprehensive dataset • Data availability for emergency and special event planning • Knowledge of operational problems and opportunities • Transportation system reliability improvements • Increased role for MPOs to facilitate regional ITS/operations programs
MNCPPC	• Better understanding of travel conditions outside peak periods • Theoretical 24/7/365 analysis • Provides good graphics
Metroplan Orlando	• Ability to measure performance and determine the effectiveness of capital and operation investments • Ability to use data in updated demand models to reflect M&O strategies • Tool to prioritize projects
MWCOG	Consideration of air quality credits for TERM programs
Mn/DOT	More complete and accurate volume data to produce AADT maps
NCTCOG	Vast amounts of available data help improve planning applications and project evaluation through • Development of new tools, • Time-of-day/seasonal variation, • Mobility, • Air quality, and • "Big picture" of transportation network.

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	7. What advantages or new opportunities have you realized from the use of operations data?
ORNL	More reflective and accurate planning
PennDOT	• Safety • Cost savings from partnering with Mobility Technologies
RTC	Improved ability to quantify performance during special events and incidents
SPC	Better opportunity to address problems (e.g., intersections)

Responding Agency	8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?	
UVA	Future opportunity • VII will provide direct travel time and improved origin–destination (O-D) data • Weather data • Electronic format of work zone data • New means of collecting travel time	
FHWA	Future opportunity • Use of incident data to understand nonrecurring congestion and crash characteristics	Obstacle • Fusion of disparate data sources • Lack of incident standard definitions • Not all incidents are recorded
FHWA–New York Division	• High-speed weigh-in-motion (WIM) data collection	
FHWA–Office of Corridor and Border Planning	• Travel time reliability estimates improvements • O-D flow estimates by time of day	
FHWA–Office of Planning	Future opportunity • Automated traffic monitors • Remote imagery • GPS • Cell phone tracking	Obstacle • Lack of methods to summarize data • No archiving standards
HRPDC	• Travel time and speed data for performance measures (e.g., travel time index) • Operations data for arterial system • Freight data • Transit data	
MNCPPC	Future opportunity • Emergency response time • Maintenance data • Facility data • Traffic accident/crash data	Obstacle • Confidentiality/privacy

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?	
Metroplan Orlando	Future opportunity • Real-time system performance data from GPS and cell phone data • GPS and cell phone data archiving for analysis and modeling	Obstacle • Proprietary and privacy issues
MWCOG	• Impact of near-term operations • Operations' relationship to planning and funding	• Lack of data
Mn/DOT	• Vehicle classifications based on length	
Mitretek Systems	Future opportunity • Ramp speeds/travel times • Arterial data • Alternative modal data • Accident/work zone data	Obstacle • Lack of data quality performance requirements
NCTCOG	Future opportunity • Vehicle classification counts • Weather • Work zones • Special events • Transit usage • Traffic signal phasing • Ramp meters	Obstacle • Data format consistency • Agency coordination and communication
ORNL	Travel behavior changes due to • ITS deployment • Incident data • Work zone data	
PennDOT	Future opportunity • Analyze traffic speed data • Classification counts by vehicle length	Obstacle • Lack of software to archive and analyze data • Lack of vehicle length standards
RTC	Future opportunity • Systemwide performance measures that relate travel time and volumes • Ability to assess impacts of incidents and provide countermeasures	
SPC	Future opportunity • Integrated truck counts into traffic models and forecasts • Collection of arterial traffic data through coordinated signal systems • Parking Management Systems	Obstacle • Data availability • Data quality • Cost of operations management

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	9. What are the obstacles to the use of operations data across the planning profession?
UVA	• Metadata • Data quality • Obtaining access • Reaching consensus on data issues
FHWA	Lack of planning models that take advantage of operations data
FHWA–New York Division	• Increasing awareness of data availability • Awareness of existing roadway data detection and monitoring investments
FHWA–Office of Corridor and Border Planning	• Data access • Knowing about existing data sources • Privacy and proprietary concerns
FHWA–Office of Planning	• Lack of methods to summarize data • No archiving standards • Absence of operation and planning staff coordination
HRPDC	• Data quality • Accuracy and timeliness of information • Limited coverage area • Institutional and technical problems with data integration among agencies • Integration of freight and transit data into a regional clearinghouse
MNCPPC	• Lack of consensus • Limited resources • Data sharing/confidentiality issues • Awareness of available data • Lack of engineering background to understand operations data
Metroplan Orlando	• Funding • Culture change • Privacy • Emerging technology
MWCOG	• Lack of common data across COG members
Mn/DOT	• Data and systems compatibility • Data sharing • Knowledge of data availability
Mitretek Systems	• Absence of data on critical sections of the network • Poor data perception • Funding constraints • Suspect data • Burden on user to clean data
NCTCOG	• Sharing data between agencies • Identifying time intervals • Data storage capacity • Data available • Inconsistent format • Data quality
ORNL	Identifying how to use data, check data quality, and integrate data with other planning data
PennDOT	• Cost • Lack of software at the planning level
RTC	• Mindset of planning profession • Limited resources (staff and funding)
SPC	• Expense of collecting accurate data • Lack of public and political support to address congestion problems

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).
UVA	• Improve data quality and metadata – Contracts specifying complete metadata before closing a project • Track metadata • Tiered maintenance standards for sensors

FHWA	• Showcase current use of operations data in planning
	  – Lead: federal
	  – Timeframe: now
	• Develop new applications for operations data in planning
	  – Lead: any organization with a research program
	  – Timeframe: 5 years
	• Develop courses on the use of operations data in planning
	  – Lead: any organization with a research program
	  – Timeframe: in a few years

FHWA–New York Division	Acquire input from state DOT and MPO representatives
FHWA–Office of Corridor and Border Planning	• Case studies • Peer exchanges • Applications research

FHWA–Office of Planning	• Develop data collection and archiving standards
	  – Lead: FHWA
	  – Timeframe: 1 to 2 years
	• Identify traffic congestion measures
	  – Lead: transportation planning profession
	  – Timeframe: 1 to 2 years
	• Develop methodologies for extracting and summarizing operations data for use in quantifying congestion measures
	  – Lead: FHWA and NCHRP
	  – Timeframe: 2 to 5 years
	• Document case studies of effective operations data in transportation planning applications
	  – Lead: FHWA and NCHRP
	  – Timeframe: 1 to 2 years

HRPDC	• Conduct training and capacity building
	  – Lead: FHWA
	  – Timeframe: 2 years
	• Educate staff on the use and benefit of operations data
	  – Lead: FHWA and MPOs
	  – Timeframe: now
	• Improve ITS procurement process
	  – Lead: state DOTs
	• Timeframe: now

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).
HRPDC	• Loops, detectors, and other field device maintenance – Lead: local agencies and state DOTs – Timeframe: now • Dedicated funding for software, hardware, and other related infrastructure – Lead: FHWA and state DOTs – Timeframe: now
MNCPPC	• Staff exchange – Lead: Transportation Research Board (TRB) and FHWA, carried out by state and local governments – Timeframe: 1 to 2 years • Publications in professional journals – Lead: ITE – Timeframe: 2 years • Encourage state transportation research centers and MPOs to become data clearinghouses and coordinate data exchange – Lead: FHWA – Timeframe: 5 years • Presentations at professional meetings
Metroplan Orlando	• Operation data application guidance – Lead: federal and state DOTs – Timeframe: 1 to 3 years • Data integration training – Lead: federal and state DOTs – Timeframe: 1 to 3 years • Development of standard for benchmarking and system performance measurement – Lead: National Transportation Operations Coalition – Timeframe: scheduled for completion in 1 to 3 years
MWCOG	Additional funding for operations data
	• Collection • Cleaning • Verification • Sharing
Mitretek Systems	• Use operations data to improve planning for conditions outside of "normal" • Write data quality performance requirements into contracts • Perform independent data quality monitoring and sampling

(continued)

TABLE 1 (*continued*) **Participant Responses on Operations Data**

Responding Agency	10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

NCTCOG	• Champion to archive operations data
	  – Lead: regional or state agencies
	  – Timeframe: 1 year
	• Educate agencies about performance measures and operations data
	  – Lead: federal agency
	  – Timeframe: 1 year
	• Develop center-to-center software for communicating in a similar format
	  – Lead: state DOTs and local cities
	  – Timeframe: 1 or more years
	• Educate agencies regarding the reliability of operations equipment
	  – Lead: local or regional agencies
	  – Timeframe: begin when field equipment reliability data available

ORNL	• Operations data clearinghouse • Metadata to describe operations data • Automated data quality checks • Transparent tool to integrate operations data with other sources
PennDOT	Develop standards to encode, transmit, and decode operations data

RTC	• Discuss planning–operation activities regularly at local meetings
	• Develop data use guidelines
	  – Lead: Unified Planning Work Program (UPWP)
	• Create presentations material for use at local meetings
	• Facilitate communication between planning and operations interest groups
	  – Lead: Association of Metropolitan Planning Organizations (AMPO) and operations interest groups
	• Develop and promote training courses and seminars
	• FHWA division offices should stress the above during an annual review with MPOs

SPC	• Report formats that measure system operational performance
	  – Lead: federal
	  – Timeframe: 1 year
	• Encourage standard and comparative reporting
	  – Lead: federal
	  – Timeframe: 5 years
	• Fund sensor demonstration
	  – Lead: federal and state
	  – Timeframe: 5 years

Summary

STEPS TO LINKING OPERATIONS DATA AND TRANSPORTATION PLANNING

The responses to the peer exchange questions indicated that although operations data are more widely available, the linkage between existing data and planning procedures is limited. Participants identified several steps that could improve the connection between operations data and transportation planning. Table 2 summarizes the steps discussed during the peer exchange, why these steps are important, and some initial ideas for implementing the steps.

TABLE 2 Steps to Linking Operations Data and Transportation Planning

Key Steps	Why Are These Steps Important?	Initial Ideas for Implementing the Steps
Make a case for the benefits of using operations data for planning applications.	• Collecting and analyzing operations data are resource intensive. • Many agencies are "getting by" with existing data so there is limited motivation to change.	• The benefits of using operations data in transportation planning should be shared with all potential partners. Peer exchange participants identified the following benefits: – Optimization of maintenance and operations activities; – Travel demand forecasting model validation; – Managing congestion on megaprojects; – Emergency preparedness; – Air quality nonattainment; – Performance measurement; – Congestion relief, solving the "insolvable" problems to capacity restrictions and high cost; – Traveler information; – Data collection safety; and – Expanding understanding of traffic conditions (e.g., nonrecurring congestion).
Develop the relationship between operations staff and planning staff.	• Operations and planning typically reside in separate agency silos. Therefore, the two groups are faced with different priorities and concerns (e.g., short-term versus long-term planning horizons). • Limited interaction between operations and planners typically occurs. • Cultural change will happen only through early and ongoing collaboration.	• Create a task force or project team composed of planners, operators, and data experts. These can evolve from existing committees or be formed from multistakeholder workshops. • Use available seed money to start building relationships and help form the task forces identified above. • Define each agency–office role. • Identify the varying needs and similarities between operations and planning offices.

(continued)

TABLE 2 (*continued*) **Steps to Linking Operations Data and Transportation Planning**

Key Steps	Why Are These Steps Important?	Initial Ideas for Implementing the Steps
Address data issues.	• Data quality, coverage, and compatibility issues still exist. • Data that are not perceived to be reliable will undermine efforts to use information in any planning decisions. • Software tools to handle large amounts of operations data are lacking.	• Continue to improve the quality, coverage, and compatibility of existing data collection efforts. • Explore new data partnerships: – Universities have performed data archiving, quality checks, and analysis for transportation agencies. To ensure success, university work must be carefully focused and directed at the needs of the agency. – Private sector has begun collecting and selling operations data. Similar to the universities, the relationship between the private and public sector must be clearly outlined. • Evaluate new data sources (e.g., remote imaging). • Develop new software tools to meet archiving, analysis, and data compatibility issues.
Identify a champion within the agency or within the decision-making body.	• Collecting and analyzing operations data are time-consuming and resource intensive so require longer-term management support.	• Identify a potential agency to facilitate and guide process.
Start small.	• Establishing an operations data program can be a long-term process, so don't wait for the ideal system to begin collecting data.	• Begin with traffic count and speed data.

ADDITIONAL OBSERVATIONS

The following were among the insights offered by peer exchange participants and discussed during the meeting:

- The available operations data vary widely between regions—the variations occur in the types of data, quantity, and quality. In addition, the planning issues, analysis tools, and projects vary between regions. Encouraging and facilitating the use of operations data in planning must recognize that this will not be a "one-size-fits-all" proposition.
- Because data collectors and data users may be in separate offices ownership of data quality and reliability may be unclear. Where ownership is clear, there may be resistance to sharing information.
- Ownership of operations hardware does not typically fall under planning offices potentially hindering infrastructure optimization. For example, one participating agency could not perform system signal optimization because the signals were owned by 200 separate entities.
- Operations data could also benefit transportation planning in rural areas through tourism promotion, mobility notification, traveler information systems, and economic development partnerships.
- Operations data provide agencies with a means of communicating the role of transportation agencies to the public and decision makers in a timely manner.
- Transit agencies have extensive experience with operations data and could provide guidance to state DOTs and MPOs. In addition, transit agencies have successfully developed partnerships with other departments for mutually beneficial operational strategies (e.g., dedicated transit traffic signal timing).
- A key barrier to using operations data in transportation planning is the lack of compatibility between different data sources.
- Given funding shortfalls, growing demand, and capacity project constraints, agencies are turning more to operational strategies to address mobility issues.
- A cultural change would be needed at some transportation agencies to accommodate consideration of operations data in transportation planning.

CONSIDERATIONS FOR FUTURE RESEARCH AND DEVELOPMENT

Peer exchange participants identified the following potential research ideas and opportunities to expand the linkage between operations data and planning processes:

- Document successful case studies of agencies using operations data in transportation planning. Not only will this help agencies learn from others, but also the benefits of using operations data will become better defined.
- Compile existing performance measures that rely on operations data and communication methods options (graphics, dashboards, periodic reports, etc.).
- Specifically identify planning data needs that can be filled with operations data and what operations data are necessary and available. For example, traffic data can be used in optimization tools for signal timing and in forecasting models for long-range planning purposes. However, the type of operations data may vary to meet different planning needs.

- Develop training mechanisms for both operations and planning staff.
- Develop solutions to data quality and compatibility issues (e.g., prototyping data exchange software, expand data archiving abilities).
- Conduct an assessment of new data sources including freight, remote imagery, signal system information, transit data, private data (cell phones), and emerging technologies (EZPass).

EXISTING RESOURCES

During the peer exchange, participants discussed the following resources, which provide useful guidance and examples of the application of operations data for a wide range of planning activities:

Cross-Cutting Studies and State-of-the-Practice Reviews: Archive and Use of ITS-Generated Data, http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/13697.html.

ITS as a Data Resource: Preliminary Requirements for a User Service, http://www.fhwa.dot.gov/ohim/its/itspage.htm.

ASTM Archived Data Standards Effort, dsmith@astm.org.

National Transportation Operations Coalition (NTOC) Performance Measurement Initiative Final Report, July 2005, http://www.ntoctalks.com/ntoc/ntoc_final_report.pdf.

Lessons Learned: Monitoring Highway Congestion and Reliability Using Archived Traffic Detector Data, report for the FHWA, October 2004, http://ops.fhwa.dot.gov/publications/lessons_learned/.

FHWA, Getting More by Working Together – Opportunities for Linking Planning and Operations, http://ops.fhwa.dot.gov/publications/lpo_ref_guide/prim0405.htm.

Margiotta and Turner, Planning for Operations, September 2004, http://webservices.camsys.com/trbcomm/preswdc2005margiotta.pdf.

APPENDIX A

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APPENDIX B

Peer Exchange Material Submitted by Participants

PEER EXCHANGE QUESTIONS ON OPERATIONS DATA FOR PLANNING APPLICATIONS

Each participant was asked to answer the following questions prior to attending the peer exchange:

1. How are you using operations data in the context of transportation planning?
2. What are your data needs from operations for use in the planning process?
3. What methods do you use to obtain data from operations for use in transportation planning?
4. What factors caused you to begin using operations data for transportation planning?
5. What benefits have you found in the use of operations data for transportation planning?
6. What challenges have you faced when using operations data (archiving, data quality, etc.)?
7. What advantages or new opportunities have you realized from the use of operations data?
8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?
9. What are the obstacles to the use of operations data across the planning profession?
10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

FEDERAL HIGHWAY ADMINISTRATION OFFICE OF CORRIDOR AND BORDER PLANNING

1. How are you using operations data in the context of transportation planning?
Primarily for regional-scale demand and network simulation model calibration and validation.

2. What are your data needs from operations for use in the planning process?
Primarily for modeling. However, my data needs are evolving. In the near term, I'm hoping that operations data sources are better, faster, and cheaper than conventional planning data sources.

- Better data with more predictable error terms and improved overall quality. Some of the self-describing formats, such as XML, may be beneficial in the near term. Primary examples of data I'm hopeful for are 15-min link and turning volumes, classification counts, 15-min and hourly average link speeds, and average and max queue lengths for 15-min and hourly intervals. Incident data are also a big deal, particularly location, type, duration. Link-specific weather data are becoming interesting.

- Shorter turnaround times between collection and applications will help with hot projects.
- Lower data collection and processing costs allow those resources to be used elsewhere.

Relative to other data sources, in past experiments with operations data from multiple sources, it was quite difficult to pull the various parts together.

3. What methods do you use to obtain data from operations for use in transportation planning? Ask the operating agency for specific data during a specific time period.

4. What factors caused you to begin using operations data for transportation planning? The need to validate large-scale simulation models.

5. What benefits have you found in the use of operations data for transportation planning? Model validation.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)?

- Problems relating data elements in time and space.
- Comparisons between model results and publicly available ATIS information.

7. What advantages or new opportunities have you realized from the use of operations data? Model validation.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?

- I don't know about a lot of operations data that are captured.
- ETC tags present some interesting opportunities to improve space mean travel time reliability estimates and OD flow estimates by time of day.

9. What are the obstacles to the use of operations data across the planning profession?

- Gaining access. Much of this is institutional.
- Knowledge of what data are potentially available.
- Consumer data privacy concerns and proprietary business interests will require a lot of work to access and innovative use schemes to protect, especially with sunshine laws.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Case studies,
- Peer exchanges, and
- Applications research.

FEDERAL HIGHWAY ADMINISTRATION TRAVEL MONITORING TEAM LEADER

1. How are you using operations data in the context of transportation planning? My team collects and compiles traffic data, which include some operations data, for others to use in policy, planning, etc.

2. What are your data needs from operations for use in the planning process? Operations data are most helpful for filling in gaps in urban traffic data.

3. What methods do you use to obtain data from operations for use in transportation planning? We try to promote partnering between traffic operators and data collectors at state and local agencies for the purpose of archiving and using operations data.

4. What factors caused you to begin using operations data for transportation planning? Operations data are a great resource that should be used not only once (in "real time") but saved and used for multiple purposes.

5. What benefits have you found in the use of operations data for transportation planning? Operations data are a very rich source of information available at marginal cost.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)? Data quality is the main challenge. Associated with that are maintenance of traffic detectors, validation of incoming data, and communication of data quality to others.

7. What advantages or new opportunities have you realized from the use of operations data? Operations data provide new opportunities for timely performance measurement, better coverage of urban traffic characteristics, and accordingly enable the development of new approaches to planning and operations.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? Incident data are a new resource that's just beginning to be tapped for better understanding of nonrecurring congestion and crash characteristics. Obstacles include fusion of disparate data sources, the lack of standard definitions of incidents, and the challenge of getting all incidents recorded.

9. What are the obstacles to the use of operations data across the planning profession? I think the main obstacle is the lack of planning models that take advantage of operations data.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Showcase what is being done with operations data in planning. Probably federal lead. Could start now.
- Develop new applications that take advantage of operations data in planning. Could be done by any organization with a research program. Continue for next 5 years.
- Develop courses that build on the use of operations data in planning in order to enable the professional capacity to make this a standard practice. Could be done by any organization with a research program. Start in a few years.

FEDERAL HIGHWAY ADMINISTRATION NEW YORK DIVISION OFFICE

1. **How are you using operations data in the context of transportation planning?** Role is to promote coordination between Traffic Monitoring Program activities and deployment of ITS detection systems.
2. **What are your data needs from operations for use in the planning process?** Again, role is to serve as facilitator for communication and coordination between ITS and Traffic Monitoring program areas.
3. **What methods do you use to obtain data from operations for use in transportation planning?** In the two instances in New York State where ITS detection data are used for traffic monitoring purposes, special automation routines have been crafted to archive ITS data in Traffic Monitoring Guidelines (TMG) compatible data formats. Both continuous count and short count (72 or 48 h) are produced in each instance.
4. **What factors caused you to begin using operations data for transportation planning?** FHWA-NY is promoting ITS–Traffic Monitoring coordination to minimize the expense of this important data collection activity and to minimize the cases where traffic count crews must enter the travel way to set out telemetry to capture traffic volume information.
5. **What benefits have you found in the use of operations data for transportation planning?** Each of the goals identified in Response 4 is served: safety and data sharing.
6. **What challenges have you faced when using operations data (archiving, data quality, etc.)?** Not applicable to the role served by the Division Office.
7. **What advantages or new opportunities have you realized from the use of operations data?** State Traffic Count Program staff have added to their capacity in the collection and processing of TMG compliant counts without requiring additional staff resources.
8. **In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?** High-speed weigh-in-motion data collection is of growing interest and value to the statewide freight management community. Information produced through collection and processing of vehicle weight-based data has implications in the pavement management, freight mobility, and air quality analysis areas.
9. **What are the obstacles to the use of operations data across the planning profession?** Here is where the role of the division is important. The greatest obstacle is in making all potential customers of the data aware of the data's availability and to have both the operations and traffic monitoring aware of the detection and monitoring investments that have been placed in the roadway network.
10. **What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).** I look forward to the discussion that the state DOT and MPO representatives bring to the table.

FEDERAL HIGHWAY ADMINISTRATION OFFICE OF PLANNING

1. How are you using operations data in the context of transportation planning? Travel demand models are increasingly being asked to forecast and evaluate the impacts of transportation alternatives involving operational strategies and road pricing policies. These strategies are typically implemented to mitigate congestion without major capital-intensive infrastructure investments. Operational data are needed to measure the variations in travel times by time of day and operational strategy to evaluate the effectiveness of these strategies in relieving congestion.

2. What are your data needs from operations for use in the planning process? Means and variations in traffic volumes, travel times, and delays by type of highway facility, by time of day, including nonrecurrent incidents (e.g., crashes, breakdowns, weather, work zones).

3. What methods do you use to obtain data from operations for use in transportation planning? Many of these methods are just now being explored. Potential data sources include automated traffic monitors (e.g., permanent counters), remote imagery (e.g., traffic video cameras, aerial imagery), GPS-equipped probes, cell phone tracking strategies.

4. What factors caused you to begin using operations data for transportation planning? See Question 1, above.

5. What benefits have you found in the use of operations data for transportation planning? Still too early to tell.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)? Lack of proven methodologies for summarizing vast amounts of operational data into meaningful measures suitable for planning purposes. No standard practices for archiving of operational data.

7. What advantages or new opportunities have you realized from the use of operations data? Tremendous potential to address data needs, but relatively few good examples of success stories.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? See Questions 3, 6, and 7.

9. What are the obstacles to the use of operations data across the planning profession? Lack of proven methodologies for extracting and summarizing operations data, lack of standards for data archiving, and relatively little coordination between transportation operations and planning staffs in all transportation agencies.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Development of standards for collecting and archiving traffic operations data (FHWA Operations – 1 to 2 years).
- Identification of useful measures of traffic congestion (Transportation planning profession—1 to 2 years).
- Development of methodologies for extracting and summarizing operations data for use in quantifying measures of traffic congestion (FHWA, NCHRP—2 to 5 years).
- Documentation of cases studies where operations data have been used effectively in transportation planning applications (FHWA, NCHRP—1 to 2 years).

HAMPTON ROADS PLANNING DISTRICT COMMISSION

1. How are you using operations data in the context of transportation planning?

Operations data are being used for the following transportation planning activities:

- Congestion management system,
- Intermodal management system,
- Long-range plan,
- ITS strategic plan and architecture,
- Incident management program,
- Regional travel time study,
- Regional safety study,
- Project selection process for CMAQ and regional STP funds, and
- Special corridor/intersection studies.

The 2005 CMS Report includes:

1. The state of transportation,
2. Bridges and tunnels,
3. Roadway congestion analysis, and
4. Mitigation strategies and evaluation.

Primary operations data used in the analysis were traffic volumes (average daily traffic and peak-hour volumes), vehicle classification, travel time–speed data for bridges and tunnels, freeway incident–accident data, and high-occupancy vehicle counts and occupancy data.

2. What are your data needs from operations for use in the planning process?

- Travel time and speed for the entire thoroughfare system,
- Delay due to recurring and nonrecurring congestion,
- Work zone–related data,
- Arterial traffic and signal data, and
- Real-time traveler information data.

3. What methods do you use to obtain data from operations for use in transportation planning?

- Traditional data are obtained from VDOT as they become available (i.e., yearly) via file transfer protocol (FTP) site in Access or Excel database format.
- Freeway operations data (collected from the Smart Traffic Center) and arterial signal data (city of Norfolk) are archived at the Smart Travel Lab (UVA). This information is contained in the Virginia ADMS, which can be accessed from the Smart Travel Lab website.

4. What factors caused you to begin using operations data for transportation planning?

- Federal requirements and MPO certifications,
- Funding constraints to build needed new capacity,
- Congestion management system,
- Regional ITS plans and architecture,

- Increasing recurring congestion (major bottlenecks at bridges and tunnels) and nonrecurring congestion due to incidents, bad weather, etc.;
- Deployment of ITS technologies to provide transportation solutions that can respond quickly to congestion and delay;
- Use of performance measures to evaluate and prioritize transportation projects; and
- Increased public expectations to operate the system more efficiently.

5. What benefits have you found in the use of operations data for transportation planning?

- Comprehensive regional database for short- and long-range planning purposes;
- Access to more data helped the staff to better characterize existing system performance, to identify critical locations, and prioritize limited transportation funding;
- Improved forecasts of future conditions;
- Evaluation of incident management and response program currently in place on the freeway system;
- Quicker response to demands from the public and decision makers; and
- Improved ability to address short-term transportation needs.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)?

- Data quality,
- Accuracy of real-time information dissemination,
- Lack of data for the arterial system, and
- Limited coverage of the freeway system.

7. What advantages or new opportunities have you realized from the use of operations data?

- Quick access to a more comprehensive dataset,
- Use of data for hurricane and other emergency–special events planning,
- Knowledge of current operational problems and opportunities to work with operations staff,
- Use of nontraditional strategies to improve reliability of the transportation system, and
- Increased role for MPOs to facilitate regional ITS–operations program.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?

- Travel time and speed (both freeways and arterials);
- Use of data in calculating travel time index, reliability and other performance measures as included in the TTI's annual congestion mobility reports;
- Operations data for the arterial system to expand the current system coverage;
- Freight data; and
- Transit data.

9. What are the obstacles to the use of operations data across the planning profession?

- Data quality,
- Accuracy and timeliness of traveler information dissemination to the public,

- Limited coverage area,
- Institutional and technical problems with data integration among various agencies, and
- Integration of freight and transit data into the regional clearinghouse.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Training and capacity building: FHWA should conduct more training sessions for both planners and operators at local levels—next 2 years;
- Encourage planners and MPOs to educate their staffs on the use and benefits of operations data—joint effort by FHWA/MPOs—needs to take place now;
- Improve ITS procurement process to accelerate the completion of ITS projects—state DOTs—needs to take place now;
- Maintain the loops, detectors and other field devices to improve data quality—state DOTs/locals—should take place now; and
- Encourage localities and state DOTs to dedicate appropriate funding to maintain and regularly upgrade software, hardware, and related infrastructures–facilities—FHWA/DOTs—should take place now.

MARYLAND–NATIONAL CAPITAL PARK AND PLANNING COMMISSION

1. **How are you using operations data in the context of transportation planning?**
   - We use archived operations data (traffic volumes, travel speeds, and travel times) from the state and county transportation management centers (TMCs) or their designated archives to support travel forecasting model validation and travel monitoring as part of our overall growth management program, called the annual growth policy (AGP).
   - We use archived signal phasing plans to validate information in our turning movement count database, which stores raw counts and calculated critical lane volumes (CLVs).
   - We use GPS-based travel time data collected for signal retiming plans and coordination as part of our travel monitoring efforts.
   - All of the above are active projects using or that have previously used operations data in planning context.
2. **What are your data needs from operations for use in the planning process?**
   - Any highway operations data that can be used for travel monitoring and forecasting, such as link and intersection traffic volumes (including turning movements), travel time and travel speed, vehicle occupancy, land occupancy, vehicle classification, etc.;
   - Rail and bus transit operations data—vehicle, route, and station ridership, vehicle occupancy–loading factors, speeds, schedule adherence;
   - Safety data—incidents–crashes; and
   - Asset management information—highway, intersection, bus stop inventories.

3. What methods do you use to obtain data from operations for use in transportation planning?

- Request data directly from operating agencies;
- Work with operating agencies to set up our own archive;
- Request data from other data archives; and
- Collect our own data.

4. What factors caused you to begin using operations data for transportation planning?

- Decrease in the availability of traditional planning data;
- Technological advances that made data archiving and exchange easier;
- Increased pressure from appointed and elected officials to produce analyses based on real-world data; and
- Increased demand for wider and deeper (both temporally and spatially) data to support planning activities.

5. What benefits have you found in the use of operations data for transportation planning?

- Can obtain large amounts of data quickly;
- Data are usually fairly current;
- Fosters staff-level relationship between planning and operating agencies; and
- Allows detailed response to public officials' questions about congestion and traffic patters based on real-world data.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)?

- Ongoing data quality issues (poor data quality, or unknown data quality);
- Availability of data (maintaining a functional archive);
- Sheer volume of data, which can be difficult to work with or filter for best use in planning activities (drowning in data); and
- Inconsistencies in data aspects and storage among archives.

7. What advantages or new opportunities have you realized from the use of operations data?

- Allows examination of travel conditions outside the traditional peak periods;
- Theoretical analysis of travel conditions 24/7/365; and
- Can provide good graphics showing variation of travel among days of week, and hours of day, helpful in understanding patterns.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?

- Emergency response time;
- Maintenance records–facility;
- Traffic accident–crash data in more easily accessible and usable format; and
- Obstacles in confidentiality issues.

9. What are the obstacles to the use of operations data across the planning profession?

- Planning agencies have had differing missions historically so no consensus on what is needed and how to use it.

- Limited resources for operating agencies to archive their data, so planning agencies have had to take the lead, often overcoming concerns.
- Concerns over data sharing/confidentiality issues.
- Planners are generally not aware of what kinds of data are potentially available and may not have the traffic engineering background to be able to have a productive dialogue with the operators about obtaining and archiving the data.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Staff exchange (1 to 2 weeks, planners work at operations center, operations staff at planning department) – program within 1 to 2 years, encouraged by TRB and FHWA but carried out by state and local governments.
- Articles in professional journals such as *ITE Journal* and *Planning Magazine* discussing possible uses of the operations data and going over success stories (ITE takes lead, over next 2 years).
- Presentations at professional society meetings where planners are present, also with theory and success stories (not sure who leads this because target is APA members, folks who are not touched by the ITE and TRB literature).
- Encouragement of state transportation research centers and MPOs to take the lead in becoming regional data clearinghouses, coordinating data exchange and even being the central archives so individual planning agencies can primarily be users only, without having to create own databases (FHWA leads and encourages, over next 5 years).

METROPLAN ORLANDO

Historically, Metroplan Orlando has limited use of operations data to the project prioritization process. The iFlorida Project, an FHWA initiative, will demonstrate the wide variety of operational functions that are enabled or enhanced with a surface transportation security and reliability information system. It will provide Metroplan Orlando with information on travel time. This information will be used to experiment and evaluate how comprehensive data available through a data warehouse can be used to improve regional planning and decision making.

1. **How are you using operations data in the context of transportation planning?**

Data from iFlorida will enable to us to measure system performance more accurately before and after a project is constructed or service deployed. It also can be used for calibrating the regional demand model and for testing management and operations (M&O) strategies during the update of the long-range transportation plan. In this regard, the data can be used to evaluate impact between a capital and M&O improvement. Historically, data on volume to capacity, level of service (LOS) and safety have been used in the project prioritization process for the Transportation Improvement Program (TIP).

2. **What are your data needs from operations for use in the planning process?** In addition to travel time, we expect to use travel speeds, delay, and incident response time. This will enable us to assess how well the system is performing; identify issues; project evaluation; measurement against goals and objectives.

3. What methods do you use to obtain data from operations for use in transportation planning? The organizational structure of the MPO does not enable us to be a primary source for data collection on operations. Data such as LOS, volume, and safety are currently provided only for portions of the limited access and arterial roadways. These data are provided by the Florida DOT and in some instances by a local government, i.e., county or city.

4. What factors caused you to begin using operations data for transportation planning? The most obvious factor was the proposal by our former chair that the MPO needed to take a more business approach to transportation planning. To meet this need, information and data are needed to understand the returns on investments. Typically, a benefit-to-cost analysis is completed to program a project, but rarely is an analysis completed after the project is implemented. Operations data provide the needed information to understand how our investments are doing. More emphasis is being put on M&O, which supports near-term improvements as opposed to the capital improvements that are typical of the MPO process. An observation in the recent survey on public opinions on transportation issues in Central Florida suggests more M&O strategies over capital projects to improve mobility.

5. What benefits have you found in the use of operations data for transportation planning? Operations data enable planners and engineers to evaluate the effect of projects, identify problems, propose alternatives, and test solutions. The knowledge discovery from data can be used to educate and inform stakeholders and decision makers. An important benefit to the MPO process is the use of data to measure performance against goals and objectives.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)? As a regional agency that includes more than 20 municipalities and other transportation agencies, it is always a challenge to reach agreement on a standard format for data collection. This was identified in a study on data collection in the region.

7. What advantages or new opportunities have you realized from the use of operations data? The most obvious opportunity is to be able to measure the performance of the transportation system and determine the effectiveness of the capital and operation investments. In this regard, transportation agencies have the information to report how well or poorly the transportation system is performing but provides the information for making the appropriate improvements. Operations data can be utilized in the updating of the demand model to reflect M&O strategies. They give the MPO another tool in prioritizing projects to meet goals and objectives.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? Data provided from in-vehicle GPS systems and cell phones can assist in evaluating system performance in real time. These data can be archived for analysis and modeling. The obstacles are proprietary and privacy.

9. What are the obstacles to the use of operations data across the planning profession? The obstacles to implementing operations data across the planning profession include funding, culture change, privacy, and emerging technology.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.). Guidance on the applications of operation data in the planning process is needed. In most urbanized areas, the state DOT maintains the data. The federal and state DOTs should lead this effort within the next 1 to 3 years.

Training on integrating the data into the planning process should be provided by federal and state DOTs within the next 1 to 3 years.

Agreement on standard measurements for benchmarking and system performance is needed. This effort is currently being led by the National Transportation Operations Coalition. It should be completed within the next 1 to 3 years.

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

1. **How are you using operations data in the context of transportation planning?** Have been used on an ad hoc basis, but no regular use.
2. **What are your data needs from operations for use in the planning process?** 24/7/365 speed and volume information for numerous locations would help us increase the accuracy of data available to us and be able to analyze information better on variation throughout the day (not just daily averages).
3. **What methods do you use to obtain data from operations for use in transportation planning?** We make case-by-case requests to operations agencies; we also have a regional transportation data clearinghouse with formats so that agencies can submit data on a regular basis if they want it.
4. **What factors caused you to begin using operations data for transportation planning?** Need for information not traditionally associated with the four-step travel forecasting process, such as for air quality–related Transportation Emissions Reduction Measure (TERM) analysis.
5. **What benefits have you found in the use of operations data for transportation planning?** We have been able to consider taking air quality credits for new and different types of TERMs.
6. **What challenges have you faced when using operations data (archiving, data quality, etc.)?** Not all of our member agencies have the same data, or they do not have them throughout their systems. This makes it more an issue of sampling than coverage.
7. **What advantages or new opportunities have you realized from the use of operations data?** To date, same answer as Question 5.
8. **In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?** Our board is very interested in near-term operations and operations' relationship to planning and funding. Additional data will help inform the board's considerations.
9. **What are the obstacles to the use of operations data across the planning profession?** There will need to be similar data available in a wide variety of our locations for them to be useful. It is of limited help when County X has certain data but County Y does not.
10. **What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).** Additional funding developed to operations data collection, verification, cleaning, and sharing would be the most significant aid.

MINNESOTA DEPARTMENT OF TRANSPORTATION

1. **How are you using operations data in the context of transportation planning?** We use volume data from the traffic management center to assist in the production of AADT. The historical AADT can be used to project traffic into the future and for pavement design.
2. **What are your data needs from operations for use in the planning process?** We need total traffic volume data to assist in the production of AADT.
3. **What methods do you use to obtain data from operations for use in transportation planning?** We download the data from a server.
4. **What factors caused you to begin using operations data for transportation planning?** The availability of volume data that were already being collected.
5. **What benefits have you found in the use of operations data for transportation planning?** It supplements our data collection needs.
6. **What challenges have you faced when using operations data (archiving, data quality, etc.)?** Storage and editing of the data is always an issue. We have a research consultant from the University of Minnesota who stores and edits the data for us.
7. **What advantages or new opportunities have you realized from the use of operations data?** With the volume data from the RTMC, we have a more complete and accurate count of volume in the Metro area from which to produce our AADT maps.
8. **In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?** Additional data such as vehicle classifications based on length may be useful.
9. **What are the obstacles to the use of operations data across the planning profession?** Data and systems compatibility. Data sharing and knowledge of what is available.
10. **What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).** (No response provided.)

MITRETEK SYSTEMS

1. **How are you using operations data in the context of transportation planning?** Urban Congestion Reporting (for FHWA), a rapid-response, nationwide assessment of urban congestion conditions delivered in less than 10 working days each month.
2. **What are your data needs from operations for use in the planning process?**
   - Point-to-point travel times every 5 min over 50+ mi of urban freeway, up at least 14 h per day, meets data quality standards at 80% usability.
   - Traffic count data (sum of all lanes), same timeframe as (a).
   - Contributing factor data: weather, accidents, and work zones.
3. **What methods do you use to obtain data from operations for use in transportation planning?**
   - Web mining (some travel time data, all contributing factor data) and
   - XML (and other) feeds from various ATIS data providers.

4. What factors caused you to begin using operations data for transportation planning? FHWA tasking.

5. What benefits have you found in the use of operations data for transportation planning? Improved data quality over time because many data providers don't monitor their accuracy and reliability—but we do.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)?

- Data quality,
- Automation,
- Data visualization,
- Consistency over time (networks change, sensors go bad, etc.), and
- Legal—Who owns the data? Who can use the data?

7. What advantages or new opportunities have you realized from the use of operations data? (No response provided.)

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data?

- Ramp speeds—travel times in addition to mainline freeways;
- Arterial data are generally either missing or low quality;
- Alternative modal data (e.g., bus/rail) that are reliable and user oriented;
- More consistent and accurate accident–work zone reporting; and
- Obstacles: very few contracts are written with data quality performance requirements that are meaningful.

9. What are the obstacles to the use of operations data across the planning profession?

- No data on critical sections of the network;
- The sometimes accurate perception that "operations data" really means mammoth, unpleasant gobs of unprocessed freeway point sensor data;
- Lack of motivation, lack of capability–funding to make sense of the data; and
- Potentially suspect data in many cases; burden is often on the user to clean them up.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Planners typically plan for so-called normal conditions: average demand, clear weather, and no accidents. In real life, however, these normal conditions occur only a tiny fraction of the time (less than 1%). Suitable ops archives that include congestion contributing factor data can be manipulated to identify the true range of conditions in which the transportation network operates. This will help hasten the demise of unhelpful and outdated notions such as "recurrent" and "nonrecurrent" congestion. Planners should be "planning" for the complete range of operational conditions—a hard thing to do given the entire planning process is predicated on this notion of normal conditions.
- Don't deploy sensors or sign contracts with ops data providers unless you have measurable and enforceable data quality performance requirements built into your contracts. Perform independent data quality monitoring and sampling.

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

NCTCOG currently collects traffic operations data in two areas: the arterial street system, specifically traffic signal–related data, and the freeway system. In terms of the arterial street system, NCTCOG collects traffic count data from 16 traffic signal devices within the city of Fort Worth. NCTCOG also receives traffic operations data in the format of traffic signal timing plans through the Thoroughfare Assessment Program. Regarding freeway system data, NCTCOG collects freeway operations data from the Texas Department of Transportation–Dallas District.

1. **How are you using operations data in the context of transportation planning?** NCTCOG is currently using traffic signal operations data collected through the Thoroughfare Assessment Program to calculate mobility and air quality benefits of implementing traffic signal improvements. Actual signal timing plans are implemented with Synchro software to provide outputs (link speed, volume, stops, delay, and queue) that allow us to calculate these benefits. Also, at the 16 locations within the city of Fort Worth, along with other tube count data, NCTCOG uses the count data to help validate the model.
2. **What are your data needs from operations for use in the planning process?** NCTCOG has gone through the process to identify high-priority operations-related data needs for planning applications. To date, NCTCOG has identified volume, speed, lane occupancy, vehicle classification, transit usage and ridership, and incident information as high-priority data items. These data are useful for validating the regional travel models, determining time-of-day demands, monitoring and identifying congested corridors, understanding regional traffic and truck flow patterns, and transit route planning and scheduling.
3. **What methods do you use to obtain data from operations for use in transportation planning?** Currently, NCTCOG receives data in text format that have to be converted or imported into a database format. Some data are received through a FTP site and other data are received via a protected Internet site. Currently, all the data that NCTCOG receives require extensive time to clean and import into a usable format.
4. **What factors caused you to begin using operations data for transportation planning?** NCTCOG began to look into the use of operations data for transportation planning once we learned the capabilities of the deployed field devices. The Dallas–Fort Worth region has more than 640 freeway centerline miles and more than 1,600 arterial centerline miles. Our data collection budget does not cover the data needed to perform all of our planning activities. Plus, these deployed devices have a dual purpose and usefulness. They help traffic operations personnel manage real-time traffic conditions and allow us to archive the data to help improve our planning tools.
5. **What benefits have you found in the use of operations data for transportation planning?** The benefits that NCTCOG has experienced include the ability to receive real-world data to improve our tools and gain a better understanding of how the transportation system works. For example, it allows us to identify bottleneck locations versus overcapacity corridors. In turn, the region can quickly implement low-cost solutions that will relieve congestion.
6. **What challenges have you faced when using operations data (archiving, data quality, etc.)?** The challenges NCTCOG has faced include data format inconsistency (naming of intersections or locations and structure), data quality, data completeness, and data coverage.

Of the 640 freeway centerline miles mentioned above, only 430 centerline miles have ITS coverage.

7. What advantages or new opportunities have you realized from the use of operations data? The advantages include the vast amount of data available to help improve our planning applications and evaluation of project implementation. These data will help us with development of new tools, for example, to possibly include nonrecurring congestion in our model. These data will also allow us to determine time-of-day or seasonal variations and to gain a better understanding of the mobility and air quality benefits of transportation project implementation. For example, the Dallas–Fort Worth region offers freeway incident management training to first responders. These data would allow us to track how effective this program is based on incident clearance times and how quickly the queue clears after an incident has been removed from the roadway. Overall, these data allow us to have a better picture of how our system is performing and to identify the most congested corridors in order to focus our resources.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? Data that NCTCOG would find useful but currently is not receiving include vehicle classification counts, weather, work zones, special events, transit usage, traffic signal phasing, and ramp meters. Currently, these data are not being collected or are not in an easily transferable format. Some of the obstacles include getting the agencies to collect and share the data as well as receive the data in a consistent format.

9. What are the obstacles to the use of operations data across the planning profession? Encouraging operations data to be saved by operating agencies and to send the information to planning agencies is another common type of obstacle that NCTCOG has experienced. In the Dallas–Fort Worth region, some agencies receive the real-time operations data but do not save any of these data. The data write over the material at the next collection interval. Another obstacle is identifying what time intervals are needed and at what point do you aggregate the data. Currently, NCTCOG doesn't have a problem with storage space, but this may become a concern.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Have a champion lead a regional or state effort to save operations data. There is a benefit to the operation agencies to have the planning agency check data quality. This may help identify field equipment that is not calibrated correctly or is not working correctly. A regional or state agency may take the lead regarding this initiative, which could fall into a 1-year timeframe.
- Educating agencies on performance measures that can be developed from these data to help build support from decision makers. This can help sell future funding for operation-type projects. This would be most useful and best publicized if a federal agency took this role. I would suggest a 1-year timeframe, if there are enough data available.
- Develop center-to-center software that allows an agency to have a unique system but can communicate with other agencies in the same format through a center-to-center plug-in. In Texas, the state is taking the lead on this initiative, and it has worked well. In the Dallas–Fort Worth region, the state has involved local cities and transit agencies in

the center-to-center software development. I would recommend beginning this work within a year, but it will take multiple years to complete.

- Help operations and planning agencies gain a better understanding of the reliability of operations equipment. As these data are collected and archived, agencies will analyze data completeness and determine how often the system is offline. In turn, this could lead to more funding allocated to operate and maintain field devices. This would need to be implemented at more of a local or regional level. This activity could begin when there are enough data available to track field equipment reliability.

OAK RIDGE NATIONAL LABORATORY

1. How are you using operations data in the context of transportation planning? Operations data could be used to provide more temporal and spatial detail and be integrated with traditional planning data to give more comprehensive information.

2. What are your data needs from operations for use in the planning process? Benchmarking and calibration.

3. What methods do you use to obtain data from operations for use in transportation planning? The existence of available (and archived) operations data are frequently made known through the word of mouth. Data are transmitted via CDs or websites.

4. What factors caused you to begin using operations data for transportation planning? Need to have more timely and frequent data.

5. What benefits have you found in the use of operations data for transportation planning?

- Data can be made available in a more timely manner and
- Data can be more spatially and temporally "dense."

6. What challenges have you faced when using operations data (archiving, data quality, etc.)?

- Data quality,
- Data compatibility with other planning data, and
- Interpretation of the integrated–fused data.

7. What advantages or new opportunities have you realized from the use of operations data? Planning can more accurately reflect the actual situation for which planning process is intended.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? Data on travel behavior changes due to ITS deployments, incident data, work zone data.

9. What are the obstacles to the use of operations data across the planning profession?

- How to use the data,
- How to check for the quality of the data, and
- How to integrate and fuse with other planning data.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- A clearinghouse for operations data,
- Metadata to describe operations data,
- Automated data quality checks, and
- Transparent tool to integrate operations data with other data sources.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

1. **How are you using operations data in the context of transportation planning?** We obtain traffic counts from Mobility Technologies (traffic.com) nonintrusive sensors in Philadelphia and Pittsburgh. We use these data to supplement our own traffic data. On some roads these are the only traffic data we receive, because either the volume of traffic is too high or the location is too dangerous to setup a traffic count. Currently we receive only volume counts from the Mobility Technologies sensor locations.
2. **What are your data needs from operations for use in the planning process?** Our minimum requirements for traffic data are a 24-h count broken down into hourly segments, taken between Monday and Thursday, and the count must not be taken near a holiday. The traffic counting device must not be set up to measure traffic on ramps, and not be set up near intersections. What we like to see is the measurement of free-flowing mainline traffic.
3. **What methods do you use to obtain data from operations for use in transportation planning?** We have a partnership with Mobility Technologies (traffic.com) to provide us with traffic data from their sensors in Philadelphia and Pittsburgh. In exchange for the data, we have given them permission to set up their nonintrusive sensors in our right-of-way. We can access and download their data from a partner's page on their website.
4. **What factors caused you to begin using operations data for transportation planning?** In Philadelphia and Pittsburgh, there are roads that have too high a volume of traffic or are too dangerous for other reasons to set up a traditional traffic count. Mobility Technologies approached us about setting up their sensors in our right-of-way, so we started the partnership as outlined in the previous section.
5. **What benefits have you found in the use of operations data for transportation planning?** We can get counts from Mobility Technologies for any day of the year from their sensor network. We typically analyze data from their sensors twice a year. We also do not have to risk the lives of our staff or contractors to set up traffic counts on dangerous or high-volume roads.
6. **What challenges have you faced when using operations data (archiving, data quality, etc.)?** Archiving data has not been an issue with Mobility Technologies. They archive the data for us: advantageous to both of us. They get to use the data for research purposes or to sell them commercially, and we get to access the data free of charge for our purposes.

Data quality, in contrast, has been a slight issue, but Mobility Technologies has worked with us every step of the way. The data are high quality and 100% useful for their purposes. However, they are more interested in looking at how the traffic is flowing by using the sensors to measure vehicle speed and taking short-term 5-min volume counts. Some of the sensors are also set up to pick up traffic on ramps. We are interested in them only to adjust the location of

some of the problem sensors so that we can both benefit from the data collected. They have been very receptive to our requests and have worked with us to maintain their high quality of data. When we analyze their traffic data, we typically sit down with them at the end of our analysis and take a look at the sites that did not meet our requirements or might have data quality issues.

7. What advantages or new opportunities have you realized from the use of operations data? The biggest advantage is safety. We don't have to place our personnel or contractors in dangerous situations to collect traffic data. We also have the ability to collect traffic data 24/7/365 at these locations if we desired, and it's as easy as a couple of clicks of the mouse to download these data. The partnership with Mobility Technologies also saves us money because they have absorbed the cost of installing and maintaining their network of sensors.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? We have not utilized traffic speed data yet, but these could be used to measure the congestion of the roadway during peak hours. It would also allow us to see where bottlenecks occur consistently. Our obstacle to using speed data is that we do not have software to archive and analyze the available data.

Another possible use of the sensors already in place is taking classification counts by vehicle length. We currently do not have standards developed to classify vehicles by length.

9. What are the obstacles to the use of operations data across the planning profession? The number one obstacle is cost. The sensors, support equipment, and personnel required to set up your own operations center costs a lot of money. This also limits the possibility of partnering with a private company. It needs to make financial sense for the private firm to install the equipment in the locations you desire. If it doesn't make financial sense for the company, then you're back to square one, which is to install the equipment yourself.

The other obstacle is the lack of software at the planning level to archive and analyze the operations data. Using traffic data from operations is easy to do, because most MPOs and all states have traffic divisions that can import these data into their system. The other data available from the operations centers, like incident management and video feeds, don't have an equivalent to a traffic division or systems in place to import the data for planning purposes.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.). Developing standards to encode, transmit, and decode operations data would be the most helpful and cost-saving activity at this point. If there were one agreed on standard for transmitting the data, money would be saved by reducing the number of data formats that need to be supported by the software and hardware involved in operations and planning. I believe that either TRB or AASHTO is working on an XML document standard to transmit transportation data. This could be a natural extension to their standard and could probably be implemented in the next few years. It's also better to set the standard early before large investments in the technology are widespread.

REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA

1. How are you using operations data in the context of transportation planning? Operations data are used in association with the travel demand model calibration and validation activities including vehicle travel time, traffic volume, and transit travel time.

They are also used for various corridor studies and data for NEPA-related studies.

2. What are your data needs from operations for use in the planning process? Performance data are needed during typical commute periods and needed to support new ramp metering system. Also, due to the high number of special events in Las Vegas, performance data are needed during evenings and weekends. It is also important to assess congestion due to incidents.

Each time a new megaresort opens, such as Wynn Las Vegas on April 28 ($2.7 billion resort), spatial and temporal characteristics of travel demand change significantly. Operational data can provide a better understanding of these patterns.

3. What methods do you use to obtain data from operations for use in transportation planning? Automated methods are currently limited; however, with the opening of the TMC this summer, Las Vegas will begin using automated collection procedures with loops and cameras on the freeways. Paratransit buses are equipped with AVL equipment and data are generated on a 24/7 basis; however, this resource has yet to be used.

4. What factors caused you to begin using operations data for transportation planning? See Question 3 above for a summary of current status. RTC is in an excellent position to kick off use of operational data for planning because the Freeway and Arterial System of Transportation (FAST) has been assigned to RTC. FAST will be housed in the Las Vegas TMC beginning this summer and is responsible for freeway and arterial operations. The FAST system manager reports to the same RTC manager who oversees the Las Vegas MPO. An RTC staff member who currently works in an MPO planning position will be relocating to a new engineering position in FAST this summer.

5. What benefits have you found in the use of operations data for transportation planning? The ability to quantify performance better during special events and incidents.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)? Data mining, relieving staff of currently assigned duties so they can spend more time with the data.

7. What advantages or new opportunities have you realized from the use of operations data? See Question 5—the ability to quantify performance better during special events and incidents.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? Systemwide performance measures that relate travel time and volumes so that RTC can report the status to its board and the public. Also, the ability to assess impacts related to incidents and provide proactive countermeasures to minimize the impacts.

9. What are the obstacles to the use of operations data across the planning profession? Existing mindset of planning profession. RTC planning is understaffed and does not have resources to devote to new procedures.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Locally, planning and operation activities need to be discussed in regularly schedule meetings such as Operations Management Committee, Operations Subcommittee, Metropolitan Planning Subcommittee, Executive Advisory Committee, and RTC Board Meeting.
- UPWP projects can develop guidelines for use of operations data.
- Develop presentation material that can be used at local ITE, ITS, APA, ASCE, and APWA meetings.
- Nationally, continue interaction between planning interest groups such as AMPO and Operations interest groups.
- Develop and promote training course and seminars on the topic.
- FHWA division offices should stress these activities during annual review of MPOs.

SOUTHWESTERN PENNSYLVANIA COMMISSION

1. How are you using operations data in the context of transportation planning? Using information to look at CMS corridors. Using count data for updating traffic forecasting models in support of project MIS studies.

2. What are your data needs from operations for use in the planning process? Collecting traffic counts and travel delay information. Some use of average speed information.

3. What methods do you use to obtain data from operations for use in transportation planning? Collecting traffic counts for Pennsylvania's Highway Performance Monitoring System.

Collecting independent travel time runs for CMS corridors.

Internet search of traffic.com (ISP) sensor data resulting from a federal demo project installing 100+ radar traffic detectors.

4. What factors caused you to begin using operations data for transportation planning? The federal planning requirement for congestion management systems.

5. What benefits have you found in the use of operations data for transportation planning? Helps to identify problem areas and corridors that need attention.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)? Limited data sets (1 or 2 days' sample once every few years makes it hard to know if the data reflect "normal" operating conditions).

The MPO covers a 10-county area. Personal experience with any particular area or corridor is limited, so it becomes harder to interpret the data accurately especially where unique local factors are causing the delay.

7. What advantages or new opportunities have you realized from the use of operations data? Highlights opportunities to address problems at many intersections.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? Integrate truck counts into traffic models and forecasts. Availability and quality of the data can be uneven.

Collecting arterial traffic info through coordinated signal systems and using the info to update computer models and signal plans would be helpful. Jurisdictions have little interest in operations management, particularly considering its costs.

Parking management systems could be used to mitigate a common area problem: driving around trying to locate a parking space.

9. What are the obstacles to the use of operations data across the planning profession? People are willing to put up with congestion rather than take on extra trouble and expense to address it. Political leaders don't want to hear about problems, particularly if the public is quiet or inattentive. Even more so, considering that collection of accurate data can be very costly.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.).

- Useful report formats that measure the system's operational performance (federal—1 year);
- Encourage standard and comparative reporting (federal and state—5 years); and
- Provide demonstration money for installation of sensors (federal and state—5 years).

UNIVERSITY OF VIRGINIA CENTER FOR TRANSPORTATION STUDIES

1. How are you using operations data in the context of transportation planning? Through the project ADMS Virginia, the Smart Travel Lab at the University of Virginia has played the role of facilitator, bridging the gap between operations data and planners' needs. As part of this process, we obtain, process, and archive the data from the operations. We have worked with the planners to understand their requirements. Formatting the data and making them accessible easily through the Internet has been our role.

2. What are your data needs from operations for use in the planning process? From the project we did, mainly volumes at all locations, at different granularities, VMTs, speeds (possibly travel times), weather, and incidents.

3. What methods do you use to obtain data from operations for use in transportation planning? The Smart Travel Lab has direct connections to the operations centers (Smart Traffic Centers) in the commonwealth of Virginia. There is an ongoing coordination with the people at these centers for timely transfer of information regarding data changes, equipment hardware, software, communication, format changes, etc. The STL also reaches out to new data sources whenever possible. As explained in the other answers, gathering the data from the operations centers, cleaning them, archiving them, processing for aggregation–imputation–data quality summaries, keeping in constant touch for any changes, maintaining the hardware–software in running condition, integrating data from different sources—these make up a nearly full-time job for several people, when working for the entire state. And all these are important necessary steps for using operations data in planning. The STL plays the central role in bridging these gaps, in an almost seamless manner.

4. What factors caused you to begin using operations data for transportation planning? The STL is an existing facility, started in 1998. It is the official archive of ITS data in the commonwealth of Virginia. Formerly we provided data manually to the users on an as-needed basis and in an easy format—tapes, CDs, FTP, etc. FHWA and VDOT cosponsored the TMC Applications of Archived Data Field Operational Test starting in late 2002. This project, called ADMS Virginia, helped create an easily accessible, web-based system that caters to the

individual needs of many stakeholders—provides data in various formats, from different sources.

5. What benefits have you found in the use of operations data for transportation planning? We have played the role of facilitators. From our surveys, mainly, the easy 24/7 access to data, data quality screening, in a wide variety of formats.

6. What challenges have you faced when using operations data (archiving, data quality, etc.)? Communications with the operations centers is difficult sometimes (given that we are not their top priority); metadata updates regarding equipment, data formats, understanding the data; standardization of the data fields; aggregation; data quality; imputation (all these have resurfaced with the ubiquitous and continuous format of the ITS data).

7. What advantages or new opportunities have you realized from the use of operations data? N/A.

8. In the future, what other operations data do you think could be used in planning and how could they be used? What are the obstacles to the use of these additional operations data? VII promises to be a great source, with direct travel time availability and possibly improved O-D data; other means of collecting travel times; improved weather data; electronic format of work zone data could also be useful.

9. What are the obstacles to the use of operations data across the planning profession? Metadata and data quality are two big challenges, after obtaining the access itself. In our experience, getting everyone to the table and sorting out data issues takes time. Fast prototyping allowed us to provide data in an incremental manner, instead of one final product at the end of the project.

10. What activities would help encourage the use of operations data in the planning profession? For each idea, please suggest who should take the lead and a timeframe (1 year, next 5 years, etc.). Improved data quality and metadata are the two most important activities to help encourage the use of operations data for planning. Both these activities rest in the hands of the operations centers. Contracts should specify the need to provide complete metadata before closing the project. And these should be updated by the operations people and the maintenance crews, as changes arise. Maintaining high data quality for the thousands of sensors has been an issue for the operations centers. A few locations could be selected with the help of the planners, and these could be maintained in high standards. Other sensors could be maintained at some lower standards. The facilitators (data archives) could work with the operations center to identify bad-quality sensors by providing regular feedback and providing data quality features in their ADMS.

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

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The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, on its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. William A. Wulf are chair and vice chair, respectively, of the National Research Council.

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