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Newsletter for MPOs

Marc's Operation Green Light Moves Traffic

The Mid-America Regional Council in Kansas City, Missouri is heading a metropolitan area-wide initiative called Operation Green Light to improve traffic flow and reduce vehicle emissions and travel time. Operation Green Light works with federal, state and local agencies to develop and implement a system that will coordinate traffic signal timing plans and communication between traffic signal equipment across jurisdictional boundaries. This will help reduce unnecessary "stop delay," improve traffic flow and reduce emissions that contribute to ozone pollution.

MARC, the region's MPO, serves as the project administrator and facilitator and coordinates the system's design and implementation. The Missouri and Kansas Departments of Transportation and 17 area cities in Kansas and Missouri are participating in the project.

The state and local governments that own traffic signals in the area will work together to make sure that the timing plans for the intersections on major routes are coordinated for more efficient flow of traffic. Although existing equipment will be used wherever possible, some new communications equipment and software – and some new signal controllers – will be installed so that the traffic signals on the system can communicate with each other and with a central operations center. This equipment and software will help keep the traffic signals in sync with the new timing plans.

The proposed system, estimated to cost $56.8 million, will be developed in phases. Phase one started in 2002 and will provide new communication equipment, replace some signal controllers, supply traffic signal coordination software, and develop and install new timing plans on a network of approximately 600 intersections in 17 jurisdictions.

Later phases will include a dedicated fiber-optic communications system and a traffic operations center, and will extend the system to approximately 1,500 intersections.

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This newsletter is sponsored by the U.S. Department of Transportation. AMPO is a member of U.S. DOT's National Associations Working Group for ITS (NAWG), which is composed of national associations of state and local officials with a common interest in being informed and educated about the concepts, practices and applications of ITS.

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Development of Operation Green Light

In 1998, the City of Kansas City began to develop a strategy to define and analyze alternative approaches to meeting the existing and future traffic signal needs in the city, with an aim towards providing optimum traffic movements and progressive flow patterns. After several other local agencies requested consideration of participation in the process, the project was reformulated to take on a regional flavor, headed by MARC.

The basis of this regional project was to focus on a number of corridors with regional significance from a traffic movement standpoint. The project began in March of 1999 and was given the name Operation Green Light shortly after that.

During the initial phases of the project, a steering committee was formed to undertake the task of determining the administrative and intergovernmental aspects of regional signal operations. The committee chose to pursue formation of a regional traffic signal operations authority to conduct day-to-day management and operation of the regional signal system.

During monthly project workshops, agency participants were briefed on a variety of technical issues regarding various operational strategies, necessary hardware to support such strategies and a wide range of communications alternatives and approaches.

Early on in the process, one workshop focused on establishing system goals and objectives, which served as guidelines for selection of system components and features. Subsequent workshops identified system elements, identified areas where signal control by a regional system would likely be beneficial, and developed an implementation plan to carry the concept to reality.

Consultants gathered information on existing signal control systems and communications infrastructure at more than 1,400 traffic signals in the Kansas City region and developed a geographic information system (GIS) based inventory map.

The selected approach will implement a temporary radio communications system in areas where no existing traffic signal communications is in place and replace controller units with a uniform type capable of communication to other such system controllers. These will be used to exchange data and coordinate the signals.

Priority signals in the MARC MPO area

Eventually, the radio system would be phased out and replaced with a fiber optic backbone, linked to a new freeway management system. That system would be capable of supporting the transmission of video and data from more than 250 proposed closed-circuit TV sites, anticipated to be developed at a cost of approximately $10 million.

Operation Green Light Benefits

Costs of the multi-phase project range from approximately $5.7 million for the first phase, with a buildout total cost of more than $30 million, plus an additional $26 million for the regional fiber optic communications system. MARC received a federal award of $1.5 million in 2002 to develop the first phase of the system. That work should take about a year and a half. Additional funds have been secured to deploy the first phase starting in 2004. The remaining system would be developed and deployed as funds become available.

Why is Operation Green Light important?

It will improve the flow of traffic on the most-used arterial roads in the region.

It will improve regional air quality.

It will provide a tool for state and local governments to be able to better manage changes in traffic patterns.

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Washington, DC MPO Uses Technology to Quantify Congestion Trends

The National Capital Region Transportation Planning Board (TPB) is the MPO for the Washington, DC metropolitan area, one of the nation's most congested transportation systems. To get a handle on this congestion and decide when and where to allocate transportation funds, TPB staff has used a variety of technical tools. Two in particular have provided useful information to planners and decision makers: aerial surveys of highways and use of satellite navigation for major arterials.

Aerial Surveys

Every three years TPB uses extensive aerial surveys to monitor traffic quality on the freeway system in the metro area. The surveys quantify traffic congestion over time and highlight trends and possible solutions to relieve congestion. The most recent survey and analysis was conducted in the spring of 2002.

TPB contracted with Skycomp, Inc. to conduct a series of aerial photo-surveys of highway traffic conditions in the planning area. Using the mobility and vantage point of fixed-wing aircraft, a photographic inventory of traffic conditions was made on the backbone of the transportation system. Approximately 300 miles of highways were surveyed during the peak morning and evening periods of commuter travel.

In 1993, the first survey of the freeway system was conducted during peak morning and evening periods of commuter travel. With some modifications, surveys were conducted in 1996, 1999 and 2002 in the same manner. In 1994, 1997 and 2001, aerial surveys documented freeway traffic quality during midday and weekend travel, together with the effects of construction-related lane closings and the effects of freeway crashes and breakdowns.

By repeating the survey program on a three-year cycle, long-term trends can be monitored, while the effects of changes on the system can be evaluated.

As in the past, the results of the 2002 survey have proven useful to the MPO. They reinforce the general perception that the metro area's freeways have gotten more congested in the latest three year period, as rapid population and employment growth have occurred. But they also point to some areas that have gotten better after improvements were made.

For example, one notorious corridor now experiences backups that stretch for 22 miles during the morning peak, about double the length recorded in 1999. Along another major corridor where HOV lanes were added prior to 1999, improvements were shown in the 1999 survey. During the 2002 analysis, however, congestion is worsening again.

"This is the part of the debate about widening highways – the 'If you build it, they will come' argument," said Gregory W. Jordan, president of Skycomp Inc.

But the analysis also showed the benefits of recent road improvements at locations where previous studies showed bottlenecks. At one location where I-95 meets the Capitol Beltway, traffic would routinely back up six miles. A merge lane was added in the years between the 1999 and 2002 surveys, which is shown by the 2002 analysis to have cleared the

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bottleneck. At a major bridge crossing, traffic used to back up across all three lanes due to a dangerous weave that motorists followed to get on the bridge. A merge lane was lengthened and now traffic flows much more smoothly. A similar improvement was seen at the entrance to a highly-used parkway when highway officials added one lane to enter the parkway.

'Planners can now tell where the specific trouble spots are and what time of day they occur.'

Ron Kirby, Transportation Director for the MPO said "those are situations where the roadway has an artificial limit on its capacity. If you remove that limit, you can improve traffic flow. There are choke points you can release with project-specific improvements."

Monitoring the Arterials

To get a handle on congestion on major arterials in the metro area, TPB uses a different type of technology. For a 2002 study, the MPO employed test vehicles to gather travel time information on 42 sections of major commuter routes. Using test cars, drivers traveled on weekdays between 1 p.m. and 8 p.m. in vehicles equipped with Global Positioning System (GPS) units that used satellites to record their speed, latitude and longitude on laptop computers every two seconds.

Using this data, each road section was assigned a letter grade of "A" to "F," based on how fast the vehicle traveled compared with the free-flow speed for that section. The letter grade related to Level of Service measures contained in the Highway Capacity Manual used by traffic engineers and planners.

The results show that some of the routes are severely congested all day, not just during the afternoon peak hours. Traffic in downtown Washington experienced the worst congestion, with 42 percent of major commuter routes congested during the evening rush. Problem areas abounded in the Virginia and Maryland suburbs as well, with 30 percent and 26 percent, respectively, of the major routes congested. On some major routes, heavier traffic traveling in the peak-hour direction moved faster than lighter traffic going the other way.

The results also showed that few roads were consistently jammed, with most becoming bad only at specific points during the peak travel hours. Data also showed that some major routes experienced very little congestion.

Measurable Proof

The results mark the first time MPO staff and the area's transportation departments have been able to methodically measure the major commuter routes and find not only the locations where congestion occurs, but also the severity.

"This allows you to focus on exactly where the hang-ups are with precision," said Kirby. The study gives much more specific information than was previously available. For example, instead of knowing that a particular corridor is congested during much of the day, planners can now tell where the specific trouble spots are and what time of day they occur. Kirby said that before satellite technology, test drivers used stopwatches to calculate average speeds over a large section of road, but that method does not identify the specific places where traffic suddenly becomes congested.

This information provides measurable proof of problem areas, which is useful when decision-makers are allocating transportation funds to improve a corridor or network. The ongoing program will continue to provide the MPO with feedback on the performance of past transportation investments and provide insight for future decisions.

This article is based on a report prepared by Skycomp for the TPB and two articles in the Washington Post, by Lyndsey Layton (October 16, 2002) and Katherine Shaver (September 18, 2002). For more information on the program at TPB, contact Daivamani Sivasailam at siva@mwcog.org

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Operation Green Light is estimated to reduce delays on the coordinated routes by an average of 17 percent. Depending on the length of the trip and the number of traffic lights on the trip, this could result in a time savings of up to two to three minutes for someone driving on one of these routes. When multiplied by the thousands of trips per day on these routes, this could noticeably improve traffic flow, especially during peak travel periods in the morning and afternoon.

Operation Green Light conducted a pilot study along a 2-mile traffic corridor with 8 signals. New timing plans were designed and implemented for the peak travel times as well as the off-peak travel times. A benefit study revealed that the travel times were reduced by 32%, travel speed increased by about 40%, fuel consumed was reduced by 22%, and vehicle emissions were reduced by about 22%. The project also reduced the number of vehicle stops along the corridor (a measure of effectiveness that most affects and is most perceived by the motorist) by a dramatic 68 percent.

Staff evaluated of the regional traffic signal management system's expected benefits to determine the air quality impact of improved traffic signal operations. The study concluded that the commutative effects of improved traffic flow will result in a reduction in hydrocarbons of 9% and a reduction in carbon monoxide of 14%.

To find out more about MARC's Operation Green Light, contact Reggie Chandra, MARC's Manager of Traffic Operations, at (816) 474-4240 or rchandra@marc.org. To learn more about ITS benefits and costs, see *USDOT's ITS Benefits and Costs 2003 Update,* available at www.its.dot.gov

Operational Performance Measures Synthesis Surveys State of Practice NCHRP Synthesis 311

The National Cooperative Highway Research Program produced Synthesis 311 - Performance Measures of Operational Effectiveness For Highway Segments And Systems. The synthesis authors surveyed MPOs and state transportation agencies and performed a literature search to address current practices across the nation regarding the use of performance measures for the monitoring and operational management of highway segments and systems.

Conclusions and Recommendations

The current state of the practice includes a wide and varied approach to performance measures, with more than 70 performance measures identified in the synthesis. The synthesis reports on the strengths and weaknesses of these measures. The performance measures that were most commonly identified were conditions experienced by the traveler, such as travel time, speed, and delay. Measures that are derived from these basic units, primarily indices, were found to be less relevant to the operational environment, but very valuable for transportation planning, policy, and prioritization analysis. The dimensions of operational performance that were the most relevant were the quantity of travel and the quality of travel.

Several research needs were identified to enhance and expand the state of the practice. These include developing common definitions for emerging performance measures such as travel reliability and other indices, as well as data quality and reporting guidelines that consider estimated standard errors. Guidelines for forecasting and considering alternate policy and development scenarios are also needed.

The synthesis authors concluded that the nation's emerging intelligent transportation systems would provide a strong operational platform for the more formal application, use, and study of the benefits of performance-based management. However, without strong leadership, diverse and more informal practices are likely to continue that make system evaluation, aggregation of statistics, and comparisons of operational scenarios more difficult.

The synthesis found a need for recommended practices for reporting of performance measures. These could include reporting standard errors or confidence intervals as a common practice. Few agencies have addressed the need to forecast performance measures and to address the sensitivity of policy or travel behavior changes.

Lastly, the report concludes that operational performance measures that address evacuations from man-made or natural disasters are needed in order to tailor strategies and improve their effectiveness.

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Of Note

HOT Lane Development Guide – USDOT released a comprehensive source of collective experience gained from the nation's current and implemented high occupancy toll (HOT) lane projects. See www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//13668.html

Technical Training by Telephone – USDOT's Professional Capacity Building (PCB) program is offering a free "Technical Training by Telephone," or 'T3," service that lets multiple practitioners participate in a targeted teleconference with experts in specific topics. See www.nawgits.com/icdn/t3.html

ITS/Operations Resource Guide 2003 – This comprehensive listing of more than 400 documents, videos, websites, training courses, software tools and points-of-contact related to ITS and transportation operations is now available. See www.its.dot.gov/guide.html

Operations Security Website – FHWA's new Operations Security website contains a wealth of information about the FHWA's role in surface transportation security, emergency preparedness for and the management of our nation's surface transportation system, and more. See http://www.ops.fhwa.dot.gov/OpsSecurity/index.htm