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## Regional Operations: One Approach to Improve Traffic Signal Timing

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In the 2014 Texas Transportation Poll, survey participants identified more effective traffic signal timing as the highest-rated strategy for resolving regional transportation issues (1). One way traffic engineers optimize traffic signal performance is through coordination. Traffic signal coordination involves timing the traffic signals so traffic can travel along a street without stopping at every light. This strategy involves adjusting the starting points of green lights so that when a group of vehicles arrives, it can traverse through the signals without stopping. Providing a good progression depends on a number of factors (many of which are out of the control of the traffic engineer), including:

- Vehicle and pedestrian traffic demands.
- The distance between intersections.
- The need to provide cross-street progression (like in a grid network).

The issue comes when a street crosses over into another jurisdiction. Often, these agencies will not or cannot coordinate their signal operations across agency boundaries for a number of reasons, including:

- Incompatible equipment/computer systems.
- Lack of communication links between signals (2).
- Maintenance requirements.
- Different operating philosophies.
- Institutional barriers, such as interagency agreements.

Solving these problems can be expensive and can often require a larger, more regional view than most communities have the resources to take.

Because of these issues, agencies are exploring regional traffic signal operations programs (RTSOPs). RTSOPs involve state, county, and city departments of transportation working collaboratively and cooperatively to address a region's mobility issues on the arterial street networks (3). RTSOPs have many different forms, depending on the goals and objectives of the region and the lead agencies in the region. Often, the central focus of these programs is to provide and improve the coordinated traffic signal operations on arterial roadways that cross jurisdictional boundaries. RTSOPs are also a cost-effective strategy for improving regional traffic signal operations.

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## What Are the Benefits of RTSOPs?

### *Agency Benefits*

Many evaluation studies have highlighted the benefits achieved through regional coordination of traffic signals, especially along major commuting corridors. Agencies using traffic signal coordination programs across regions have benefited by:

- Significant reductions in travel times, stops, delays, fuel consumption, and vehicle emissions.
- Increased access to funding set aside for regional improvements.
- Leveraging of agency resources and expertise.
- Shortening of implementation timeframes.
- Reduced operating and maintenance costs.
- Increased access to training and professional development opportunities.

### *Traveler Benefits*

Travelers also benefit from agencies adopting an RTSOP approach through (2, 4):

- Improved travel times and reliability.
- Consistency in signal timing practices across multiple jurisdictions.
- Reduced delays.
- Consistent multimodal traffic signal timing operations, such as transit priority and bicycle and pedestrian accommodations.
- Improved access to public agencies for reporting operational issues and obtaining traveler information.
- Better accountability from public agencies because of performance reporting to decision makers.
- Reduced fuel consumption and better air quality.

### *Regional Benefits*

RTSOPs are much more than conduits for coordinated traffic signal timings. Regionally throughout the United States, RTSOPs:

- Serve as a forum for discussing traffic signal operations from a regional perspective.
- Provide a mechanism for upgrading and maintaining reliable communication systems to field devices deployed at intersections.

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- Facilitate the replacement of antiquated or unreliable traffic signal controller equipment and infrastructure.
  - Allow local entities to collectively and collaboratively identify and prioritize arterial roadways of regional significance.
  - Provide a way to allocate funds to local agencies to address traffic signal operations issues of regional arterials.
  - Facilitate the use of consistent signal timing practices (such as yellow interval timing, transit signal priority, and pedestrian treatments) between multiple jurisdictions.
  - Provide a mechanism for conducting training and professional capacity building to promote a common signal operations philosophy in a region.
  - Facilitate communication to the general public and the political decision makers on the effects of coordinating operations between local jurisdictions.

## **Who Typically Leads RTSOPs, and How Is the Program Funded?**

Most RTSOPs are led by metropolitan planning organizations (MPOs), regional mobility authorities, or councils of governments (COGs) (serving as the MPO for the region). These agencies control how funding is allocated to various projects and tend to have a regional perspective on transportation issues. Examples of MPOs and COGS that are heavily involved in RTSOPs through direct operations include:

- The North Central Texas Council of Governments (NCTCOG).
- The Denver Regional Council of Governments (DRCOG).
- The Southwestern Pennsylvania Commission (SPC).
- The Mid-America Regional Council of Governments (MARC).
- The Orange County Transportation Authority (OCTA).

The Georgia Department of Transportation structured its RTSOP to actively monitor, manage, and maintain traffic signals throughout the region. Corridors are selected for the program based on their significance in moving traffic throughout the region and their current levels of congestion. Once a corridor is selected to participate in the program, a corridor manager makes regular (at least weekly) field visits to observe and fine-tune operations during the peak periods. Technology enhancements permit remote monitoring of all corridors from the transportation management center, improving response time to changing conditions. The corridor manager also responds to situations such as incidents or special events and provides oversight of traffic signal maintenance.

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Other MPOs may provide other forms of support including providing funding for projects, and assisting local agencies in developing coordination timing plans in corridors that cross jurisdictional boundaries. Examples of this assistance include NCTCOG, Maricopa County, the Regional Transportation Commission of Southern Nevada, and others.

Various sources fund RTSOPS, including:

- Surface transportation program funds.
- Congestion mitigation/air quality (CMAQ) program funds.
- Local capital improvement funds.
- Enforcement fines and revenue.
- Impact fees.
- Cost-sharing agreements.
- Regional tax revenue.

## **What Makes an RTSOP Different from a Normal Traffic Signal Operations Programs?**

RTSOPs can exist in many forms and perform various functions in different parts of the United States. One primary function of an RTSOP is to provide a collaborative environment among agencies so that regional funds to develop and implement coordinated timing plans can be appropriately allocated based on needs and performance.

In addition to establishing timing plans, some MPOs permit agencies to purchase equipment and deploy intersection infrastructure necessary for more efficient regional coordination between multiple jurisdictions through their regional programs. Examples of the types of improvements commonly eligible for funding under RTSOPs include:

- Installation of or improvements to communications systems and infrastructure that support regional coordination and monitoring.
- Installation of universal timing devices (such as global positioning system [GPS] clocks) that accurately synchronize controller time.
- Replacement of existing traffic signal controllers that are not compatible with or capable of providing coordinated operations.
- Addition of limited intersection signing and/or pavement markings needed to implement more efficient, progression-friendly intersections.
- Installation of other signal indications needed to improve intersection safety and coordination efficiency.

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- Replacement or modification of vehicle detection sensors and associated hardware.
  - Addition of pedestrian push buttons and signals to support coordinated operations in corridors.
  - Installation of equipment needed to provide priority treatment to transit vehicles.
  - Purchase and development of traffic signal synchronization optimization tools.
  - Provision of training and outreach activities to ensure highly qualified local agency staff that can support regional coordination and operations.
  - Removal of existing signal indications or entire traffic signals that are no longer warranted within the corridor.

Examples of the types of improvements *not* supported through RTSOPs include:

- Purchases of rights-of-way for planned or proposed intersection widening.
- Physical construction of added capacity (new travel lanes or turn lanes).
- Installation of new traffic signals where they previously did not exist.
- Relocation and replacement of traffic signal poles or mast structures.
- Addition of new sidewalks, pedestrian ramps, and other pedestrian features.

## **Funding Alternatives for RTSOPs**

Funding for regional traffic signal system operations comes from local sources. However, local transportation funding sources are typically very competitive, and traffic signal projects are subject to comparison and competition with other infrastructure and public services. Improvements for traffic signal operations, maintenance, and upgrades have not traditionally been funded unless stakeholders create a strong voice within the political and planning processes. The following provides a summary of common strategies used to fund RTSOPs (4).

### *Surface Transportation Program Funds*

State and federal funding for traffic signal operations is available, but in many cases, it is not used because of confusion or misperceptions about the process and how those funds are allocated and distributed. Although federal funding for traffic operations exists, the state and local funding allocation processes or formulas may make it difficult to allocate funds for traffic signal operations because there are separate categories of funds for capital expenses and maintenance expenses. Traffic signal operations are typically classified as a maintenance function.

Eligibility requirements for federal funds are presented in Title 23 of the U.S. Code of Federal Regulations. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users offers eligibility for federal funds to be used for traffic monitoring, management, and

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control systems using categorical funding from the National Highway System, Surface Transportation Planning, and Interstate Maintenance (for restoration and rehabilitation along interstate routes). Regions with air quality nonattainment status and regions classified as maintenance areas may use CMAQ program funds for operating costs if those pertinent systems can demonstrate measurable reductions in vehicle emissions.

### *Congestion Mitigation/Air Quality Program Funds*

One key for sustaining an RTSOP is to keep local operating agencies interested in participating in the program, and local agencies are more likely to participate if funding is available for improving their traffic signal system operations. The key to keeping money flowing into the program is to diversify the funding sources. A majority of RTSOPs in the United States use CMAQ funds. However, CMAQ funds are limited in that they can only be administered in regions that are currently not meeting National Ambient Air Quality Standards or in compliance as a maintenance area. Furthermore, uncertainty about the long-term future of the CMAQ program has caused many agencies to begin developing alternative funding sources.

Traffic signal operation improvement projects eligible for federal funds must be included in the Statewide Transportation Improvement Program and local Metropolitan Transportation Improvement Plans. Although it is unlikely that traffic signal operations projects from a single agency would rate well enough to be included in the Statewide Transportation Improvement Program, a regional collaboration might rate high enough to receive priority and garner federal funding. Agencies interested in participating in the federal funding process should be aware of the local match requirements and other stipulations (not covered here) related to use of federal funds.

### *Local Capital Improvement Funds*

One way that municipalities generate revenue for local capital improvement programs is through voter-approved sale of general obligation (GO) bonds. GO bonds raise funds for capital improvement projects that are otherwise not funded by city revenue, such as roads, bridges, bikeways, urban trails, and parks. As a result, GO bonds fund capital improvement projects that will serve the community. If voters approve a bond proposition, the city is authorized to sell bonds up to the amount indicated in the proposition language to fund capital improvement projects that meet the public purpose of that bond proposition (6).

GO bonds are backed by the credit and taxing power of the issuing jurisdiction rather than the potential revenue to be generated from the project. Because the bonds are issued in the belief that a municipality will be able to repay its debt obligation, no assets are used as collateral.

Municipalities do not issue all of the debt immediately. Instead, debt issuances are spread out over several years according to the annual spending needs of the bond program. By monitoring the annual spending needs and not issuing all the debt at one time, the city can keep the debt service tax rate stable from year to year (7).

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### *Enforcement Fines and Revenue*

Local agencies have also used revenue from red-light-running camera systems to make traffic signal operational improvements at intersections. These systems allow local authorities to collect fines from drivers that run red lights. Intersections are selected for a photographic traffic signal enforcement system based on their traffic volume, the history of accidents, the number or frequency of red light violations, and similar traffic engineering and safety criteria, without regard to the ethnic or socioeconomic characteristics of the area. In Texas, state law requires that local agencies send half of the revenue derived from civil or administrative penalties collected by a local authority to the state comptroller's office for deposit in regional trauma center accounts. The other half is to be used by local authorities to fund traffic safety programs, including pedestrian safety programs, public safety programs, intersection improvements, and traffic enforcement (8).

### *Impact Fees*

Impact fees are one way that many municipalities generate new revenue for financing transportation improvements. Local governments impose impact fees on new development in order to provide new or expanded public capital facilities required to serve that development (9). Impact fees shift some of the cost of financing public facilities from the general taxpayers to the beneficiaries of those new facilities. While the exact formulas used to assess the fee vary by municipality, the magnitude of the fee is derived from the cost, nature, and size of the development. Municipalities use impact fees to pay for intersection modifications, upgrades to traffic signal system infrastructure located at or near the development, pedestrian improvements, etc. These fees supplement state and federal funding. Agencies have also used impact fees to delay general property tax increases or as a substitute for these increases.

### *Cost-Sharing Agreements*

Cost sharing is an issue when the local agencies have created a regional entity that is responsible for the day-to-day operations and maintenance of the traffic signals on corridors of regional significance or of all signalized intersections (4). When the local decision is to operate the traffic signal system through a regional RTSOP entity, the local partners share the costs for the functions and services that the regional entity performs (e.g., developing timing plans, monitoring arterial performance, improving infrastructure, or performing maintenance). Many approaches exist for determining an equitable way of sharing costs, but the most common methods are based on the percentage of traffic signals within a single jurisdiction compared to the total number of traffic signals under the control of the regional entity. For example, if 25 of 100 intersections are within the jurisdiction of City A, then City A would be responsible for 25 percent of the total operating costs needed to operate the regional system.

### *Regional Tax Revenue*

Many agencies are turning to alternatives as sustainable sources of funding for signal operations become more difficult to find. Transportation improvement taxes, generated from sales tax revenue, support interjurisdictional traffic signal operations improvements. For example, in

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Los Angeles County, the Los Angeles County Metropolitan Transportation Authority funds many of the region's traffic signal system improvement projects. Measure R (approved by voters in 2008) authorizes an additional one-half of 1 percent sales tax to fund traffic relief and rail expansion according to an expenditure plan contained in the ordinance. The Measure R sales tax became effective July 1, 2009, and will remain in effect for 30 years (10). The portion of the sales tax revenue that is returned to the cities for transportation improvements is distributed to local agencies through a call for projects (11).

Orange County is another example where regional traffic signal operations are supported through sales tax revenue (12). Approved by Orange County voters in 1990, Measure M (M1) implemented a one-half-cent sales tax dedicated to transportation infrastructure improvements. The tax was sunset in 2011. In November 2006, voters approved a Renewed Measure M (M2) to begin in April 2011. This measure extended the one-half-cent sales tax through 2041. Of the net revenue from this tax, 32 percent is to be channeled to street and road programs in the county. Four percent of these funds are specifically allocated for OCTA's Regional Traffic Signal Synchronization Program (or Project P) improvements. In 2011, OCTA awarded \$8 million to local agencies to provide funding for traffic signal operations improvements for more than 520 traffic signals over 141 miles in 17 different corridors. Project funds require a 20 percent match by local agencies. All projects funded by this program must be corridor based and have a signal coordination component that:

- Develops and implements new signal synchronization timing and parameters based on current travel patterns.
- Monitors (at a minimum quarterly and at a maximum monthly) and regularly improves the signal synchronization timing and parameters after the project signal timing is implemented for the remainder of the project.
- Makes before-and-after comparisons of travel times, average speed, green lights to red lights, average stops per mile, and greenhouse gases.

Traffic signal operations in Las Vegas, Nevada, are also supported through a regional sales tax. The Regional Transportation Commission of Southern Nevada receives funding supported by a one-eighth-cent transportation tax (13,14). These funds finance major roadway capital improvements and other transportation improvements. A small portion of this tax revenue funds the arterial management portion of the Regional Transportation Commission's Freeway and Arterial System for Transportation (FAST) program. These funds primarily provide staffing support for the FAST center. They also support improving and upgrading the region's signal program, maintaining the communications network, and facilitating repairs to controller equipment. The Nevada Department of Transportation provides funding for the freeway management side of FAST.



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## What Are Some Examples of RTSOPs in the United States?

The following provides examples of U.S. RTSOPs.

### *North Central Texas Council of Governments*

In 2012, NCTCOG began its Regional Traffic Signal Retiming Program (RTSRP), which was an extension of its Thoroughfare Assessment Program/Traffic Signal Integration and Monitoring Program (5). The purpose of the RTSRP is to improve traffic flow and enhance the capacity of existing arterial systems by implementing new signal timing and low-cost operational improvements along selected corridors. Improved and coordinated traffic flow will improve the air quality standards in the Dallas-Fort Worth nonattainment area.

This project was implemented in two phases. Phase 1, completed in March 2014, included 26 corridors with 500 signalized intersections in the Dallas-Fort Worth metropolitan area. Before-and-after simulations estimated user benefit to be \$87,191 per weekday. Assuming 248 weekdays per year, this equates to an annual savings of approximately \$21.6 million.

Phase 2 began in April 2014, and 1,315 signalized intersections in the Dallas-Fort Worth metropolitan area are expected to be retimed. Selected corridors will be implemented under this phase by December 2017.

As part of this program, consultants were hired to identify and implement new traffic signal timings and low-cost operational improvements along selected corridors. For all corridors, new timing plans were developed for the AM and PM peaks plus the weekday midday peak in many cases. In some cases, separate versions of the AM and midday plans were required for times when school speed zones are in operation. Some corridors required timing plans for other periods such as the Saturday afternoon peak or the late evening off-peak. After the new timing plans were operational, extensive fine-tuning was performed to improve actual on-street performance.

In addition to developing new, up-to-date coordination timing plans, the local consultant also recommended implementing the following types of improvements to maximize the retiming efforts:

- Lane assignment changes.
- Vehicle detector upgrades.
- Addition of pedestrian push buttons.
- Upgrades to traffic signal heads, traffic signal controllers, and traffic signal controller cabinets.
- Communications infrastructure with central traffic management systems.

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- Installation of GPS clocks to provide time-based coordination.
  - Restriping of intersection approaches.

Funding for the projects was provided using CMAQ funds.<sup>1</sup> These funds were used to make operational improvements and minor upgrades to communication and control equipment (for example, purchasing GPS clocks to provide time-of-day coordination). Local agencies were responsible for providing a 20 percent local match that is associated with using CMAQ funds. No formal cost-sharing arrangements were used as part of the program. Maintenance of the traffic signal equipment and timings is the sole responsibility of the implementing agencies. Each local entity is responsible for maintaining the control and detection equipment and the signal timing plans when implemented.

### *Denver Regional Council of Governments*

DRCOG has had a Traffic Signal System Improvement Program (TSSIP) since 1989 (15). The program involves DRCOG, the Colorado Department of Transportation (CDOT), and local governments to coordinate traffic signals on major roadways in the region. One of the first MPOs to conduct this type of program, DRCOG remains the leader among the very few MPOs throughout the country involved in traffic signalization. The purpose of the TSSIP is to implement cost-effective traffic signal timing and coordination improvements that reduce travel time and harmful auto emissions within the DRCOG transportation management areas (17). The goal of the program is to make the region's traffic signal systems operate in a safe manner by making the most efficient use of arterial street capacity. The overarching goals of the program are:

- Minimizing arterial traveler stops.
- Minimizing traveler stop time at intersections.
- Maximizing traffic signal system equipment reliability.

In 2013, the program worked with local governments and CDOT to retime 328 signals on travel corridors in the metro area, reducing daily travel time by more than 9,000 hours and reducing fuel consumption by 4,700 gallons per day. In addition, pollutant emissions were reduced by 1,128 pounds per day, and greenhouse gas emissions were reduced by 97,932 pounds per day.

### *Mid-America Regional Council of Governments*

Operation Green Light (OGL) is a program developed by MARC, which serves as the MPO in the Kansas City area (18). OGL is a cooperative effort to improve coordination of traffic signals and incident responses on major routes throughout the Kansas City area on both sides of the state

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<sup>1</sup> RTSOPs are not eligible for Texas Emissions Reduction Plan (TERP) funding. This funding is intended to be used to replace or convert existing equipment and vehicles to clean-burning fuels to improve air quality. More information on the TERP program is available at <https://www.tceq.texas.gov/airquality/terp>.

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line. Depending on factors such as the length of the trip and the number of traffic lights on the trip, coordinated signals can save seconds or even minutes for drivers. Since thousands of vehicles travel along each road on a weekday, this adds up to noticeably improved traffic flow, especially during morning and afternoon rush-hour periods. OGL has reduced delays on coordinated routes by an average of 17 percent.

One unique feature about OGL is that staff are responsible for deploying regional traffic signal coordination plans during incident conditions. OGL staff establish these timing plans and submit them for approval by local entities. During incident conditions, OGL, operating from the Kansas City Scout Freeway Management Center, can manually force the traffic signal in impacted corridors to run special timing plans. Once the plans are implemented, OGL operators monitor travel conditions and modify traffic signal operations to optimize flow in the impacted corridors. After the incident has cleared, MARC operators return the signals back to normal operations.

In addition, MARC also develops and implements time-of-day coordination plans on significant routes in the region. MARC develops regional traffic signal timing plans using traffic counts and other relevant information provided by the local entities. MARC is also responsible for:

- Conducting an annual examination of the signal operations that are part of the regionally significant traffic corridors.
- Developing and implementing special timing plans for when incidents occur.
- Responding to citizen complaints and requests on operations of the traffic signals in the program.

#### *Orange County Transportation Authority*

With Orange County's population estimated to increase 11 percent by 2030, OCTA (which is the equivalent of an MPO in Texas), the California Department of Transportation, Orange County, and all 34 cities work together to coordinate traffic lights across the county in an effort to ease growing traffic demands (19). OCTA's goal is to improve the flow of traffic in the community by developing and implementing traffic light coordination across city boundaries. These projects include optimizing signal timing to provide drivers better travel experiences through reduced travel times, reduced stops, and reduced delays, and by making more green lights than reds. Most signal timing projects can result in a 5 to 15 percent improvement in travel time and speed.

Agencies have the option to use their own forces or OCTA to develop coordination timing plans. In the case where the agencies are leading the development process, their roles and responsibilities are to:

- Develop a local traffic signal synchronization program greater than or consistent with OCTA's master plan.
- Participate in regional traffic forums.

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- Provide local match or in-kind services to support the project development and implementation.
  - Collect intersection traffic counts needed to support the development of timing plans.
  - Develop new timing plans that optimize signal synchronization and provide updated timing plans and turning movement counts to OCTA in a particular format.
  - Complete a before-and-after study of the project improvements.
  - Take reasonable steps to keep signal control systems, interconnections, detection systems, and related equipment in proper working order.
  - Perform the changes required at central or field locations and/or intersection controller assemblies.
  - Authorize a representative from the agency to make changes or adjustments to the signal timing plans, when required.
  - Provide OCTA with a project final report that documents the effects the improvements had on corridor operations and the environment.

In those cases where the agency elects to have OCTA lead the project development effort, many of these timing plan development roles and responsibilities transfer to OCTA (or their designated consultants) for the duration of the project. Local agencies retain their responsibilities to maintain the traffic signal and communications infrastructure to local agency standards and policies. OCTA's responsibilities in the program are to:

- Provide funds up to a specified amount to reimburse agencies for expenses in establishing and implementing timing plan changes that provide interjurisdictional operations.
- Perform web-based public outreach activities for each individual project to disseminate major project deadlines and results.
- Provide project oversight in order to maintain interjurisdictional traffic signal operational integrity between existing legacy and new projects and operations.

Multiple traffic operations/management centers monitor traffic signal operations through data, audio, and video. Maintenance of central or supervisory control, data acquisitions systems, and interconnected communications is funded through the program. All other work is considered routine maintenance to be covered by each agency's normal policies and procedures.

### *Maricopa County Association of Governments*

The Traffic Signal Optimization Program (TSOP) began in 2003 when the Maricopa County Association of Governments (MAG), which is the MPO for the Phoenix area, developed a Regional Concept of Transportation Operations that serves as an overall plan for improving

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transportation operations in the region. This plan led to the establishment of the TSOP in 2004. Since then, the TSOP has successfully completed 112 projects that involved more than 1,100 signalized intersections all across the region (20). Through this program, MAG provides assistance to local agencies that own and operate traffic signal systems to ensure that they are operating efficiently. MAG provides assistance through an on-call consultant services. These consultants provide local agencies with the following technical services (20):

- Hands-on training in signal timing optimization and evaluation software such as SYNCHRO and HCS.
- Development and optimization of timing plans for traffic signals.
- Field adjustment deployment of offset and timing parameters following implementation of initial timing plan settings.
- Acquisition of turning movement counts for the AM, PM, and off-peak periods.

Signal optimization projects produce benefit-to-cost ratios as high as 40 to 1. The TSOP has been championed by the MAG Intelligent Transportation Systems Program to provide traffic engineering assistance for refining signal operations across the MAG region. Typical TSOP projects cost about \$30,000, with projects involving multiple agencies or coordination with freeways costing as much as \$50,000.

#### *Southwestern Pennsylvania Commission*

SPC, which is the regional planning agency for the greater Pittsburgh area, has developed a regional traffic signal program that includes technical assistance to municipalities and potential funding for upgrading signal systems in the region (21). This effort is identified as a high priority in both the 2035 Transportation and Development Plan for Southwestern Pennsylvania and the Southwestern Pennsylvania Regional Operations Plan. The goals of this program are to:

- Provide outreach, training, and education to local government agencies.
- Update and maintain a traffic signal management database.
- Manage regional signals in coordination (SINC) projects (i.e., retiming and coordination projects for signals that are adequately equipped).
- Manage regional SINC projects with equipment upgrades (i.e., projects that include both equipment upgrades, and retiming and coordination plan development).

Optimizing the operations of traffic signals will be accomplished through two types of projects within the program: regional SINC projects and regional signals in coordination with equipment upgrades (SINC-UP) projects (15). SINC projects involve improving traffic signal timings at intersections that already have the equipment needed to provide coordinated operations across jurisdictional boundaries and can be implemented in a quick timeframe (four to six months). SINC-UP projects typically involve implementing minor traffic signal equipment upgrades that

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are required to improve traffic signal coordination and optimization including upgrades to controllers, communications, and signal indications.

Primary funding for the Regional Traffic Signal Program is from the CMAQ program as part of the 2013–2016 Transportation Improvement Program that was adopted in June 2012. SPC anticipates that up to \$4 million in federal funds are available from the 2013–2016 Transportation Improvement Program to implement multiple traffic signal projects. The first cycle of projects provided \$90 of annual public benefits for each \$1 expended (15).

The second cycle of the project began in 2011. Twenty-one different projects were selected for funding through the program. SPC executed all of the required agreements with the Pennsylvania Department of Transportation and the involved municipalities, committing \$5 million in CMAQ funds for the program’s second cycle. Preliminary engineering and final design were completed on all projects in 2012. Projects were advertised for bids in late 2013/early 2014 and completed in 2014/early 2015. Of the completed projects, the average benefit-to-cost ratio has been approximately 37:1.

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## Publication Date

November 2016

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## References

1. Simek, C., and T. Geiselbrecht. *Texas Transportation Poll*. Report No. PRC-14-16-F. Transportation Policy Research Center, Texas A&M Transportation Institute, 2014. <http://tti.tamu.edu/documents/PRC-14-16-F.pdf>. Accessed August 29, 2015.
2. Balke, K., and A. Voigt. *NCHRP Synthesis 420: Operational and Institutional Agreements That Facilitate Regional Traffic Signal Operations*. National Academies of Science, Transportation Research Board, 2011. [http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_420.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_420.pdf). Accessed August 29, 2015.
3. Koonce, P., K. Lee, and T. Urbanik. *Regional Traffic Signal Operations Programs: An Overview*. Report No. FHWA-HOP-09-007. U.S. Department of Transportation, Federal Highway Administration, October 2009. <http://ops.fhwa.dot.gov/publications/fhwahop09007/fhwahop09007.pdf>. Accessed August 29, 2015.

- 
4. National Cooperative Highway Research Program. *Best Practices in Regional, Multiagency Traffic Signal Operations Management*. NCHRP Project 20-68A, Scan 07-04. National Academies of Science, Transportation Research Board, March 2013.  
[http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp20-68a\\_07-04.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp20-68a_07-04.pdf). Accessed August 23, 2015.
  5. North Central Texas Council of Governments. Transportation Systems Management (TSM).  
<http://www.nctcog.org/trans/tsm/>. Accessed August 23, 2015.
  6. City of Austin. Why and How Does the City Use Bonds to Fund Some Capital Improvement Projects? <https://www.austintexas.gov/faq/why-and-how-does-city-use-bonds-fund-some-capital-improvement-projects>. Accessed August 23, 2015.
  7. Municipal Securities Rulemaking Board. Glossary of Municipal Security Terms: General Obligation Bond or GO Bonds. <http://www.msrb.org/glossary/definition/general-obligation-bond-or-go-bond.aspx>. Accessed August 23, 2015.
  8. Texas Transportation Code. Title 7. Vehicle and Traffic. Subtitle I. Enforcement of Traffic Laws. Chapter 707. Photographic Traffic Enforcement Systems.  
<http://www.statutes.legis.state.tx.us/Docs/TN/htm/TN.707.htm#707.008>. Accessed August 23, 2015.
  9. American Planning Association. *APA Policy Guide on Impact Fees*.  
<https://www.planning.org/policy/guides/adopted/impactfees.htm>. Accessed August 23, 2015.
  10. Los Angeles County Metropolitan Transportation Authority. Measure R.  
<http://www.metro.net/projects/measurer/>. Accessed August 23, 2015.
  11. Los Angeles County Metropolitan Council of Governments. *Call for Projects*.  
[http://media.metro.net/projects\\_studies/call\\_projects/images/2011\\_call\\_for\\_projects\\_application.pdf](http://media.metro.net/projects_studies/call_projects/images/2011_call_for_projects_application.pdf). Accessed August 23, 2015.
  12. Orange County Transportation Authority. Measure M. <http://www.octa.net/Measure-M/>. Accessed August 23, 2015.
  13. Interview with Hoeft, B., Assistant Director, Regional Transportation Commission of Southern Nevada. Interview, November 2011.
  14. Regional Transportation Commission of Southern Nevada. Freeway and Arterial System of Transportation (FAST). <http://www.nvfast.org/>. Accessed August 23, 2015.

- 
15. Southwestern Pennsylvania Commission. *Southwestern Pennsylvania Commission (SPC) Regional Traffic Signal Program Guidelines and Application Instructions Program Guidelines*.  
<http://www.spcregion.org/pdf/signals/cycle3/3rd%20CALL%20Program%20Guidelines%20and%20Application%20Instructions%20final.pdf>. Accessed August 23, 2015.
  16. Denver Regional Council of Governments. Traffic Operations Program.  
<https://www.drcog.org/programs/transportation-planning/traffic-operations-program>. Accessed August 23, 2015.
  17. Denver Regional Council of Governments. *Traffic Signal System Improvement Program*.  
<https://drcog.org/programs/transportation-planning/traffic-operations-program>. Accessed August 23, 2015.
  18. Mid-America Regional Council of Governments. About OGL.  
<http://www.marc.org/Transportation/Commuting/Operation-Green-Light/About-OGL.aspx>. Accessed August 23, 2015.
  19. Orange County Transportation Authority. Signal Synchronization.  
<http://www.octa.net/Projects-and-Programs/All-Projects/Streets-Projects/Signal-Synchronization/>. Accessed August 23, 2015.
  20. Maricopa Association of Governments. Traffic Signal Optimization Program.  
<https://www.azmag.gov/Projects/Project.asp?CMSID=1050&CMSID2=1138>. Accessed August 23, 2015.
  21. Southwestern Pennsylvania Commission. Transportation Operations and Safety: Regional Traffic Signal Program. [http://www.spcregion.org/trans\\_ops\\_traff.shtml](http://www.spcregion.org/trans_ops_traff.shtml). Accessed August 23, 2015.