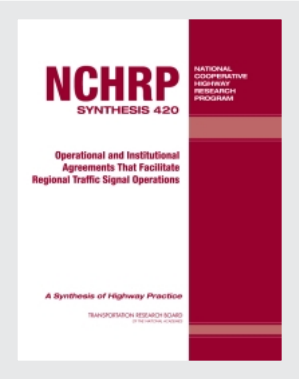

Operational and Institutional Agreements That Facilitate Regional Traffic Signal Operations

DETAILS

103 pages | | PAPERBACK

ISBN 978-0-309-14339-4 | DOI 10.17226/22846

AUTHORS

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP SYNTHESIS 420

Operational and Institutional Agreements That Facilitate Regional Traffic Signal Operations

A Synthesis of Highway Practice

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SUBSCRIBER CATEGORIES
Administration and Management • Highways • Operations and Traffic Management

Research Sponsored by the American Association of State Highway and Transportation Officials
in Cooperation with the Federal Highway Administration

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WASHINGTON, D.C.
2011
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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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NCHRP SYNTHESIS 420

Project 20-05, Topic 41-07
ISSN 0547-5570
ISBN 978-0-309-14339-4
Library of Congress Control No. 2011925671

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

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FOREWORD

Highway administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to highway administrators and engineers. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire highway community, the American Association of State Highway and Transportation Officials—through the mechanism of the National Cooperative Highway Research Program—authorized the Transportation Research Board to undertake a continuing study. This study, NCHRP Project 20-05, "Synthesis of Information Related to Highways Problem," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an NCHRP report series, *Synthesis of Highway Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measure found to be the most successful in resolving specific problems.

PREFACE

By Jon M. Williams
Program Director
Transportation Research Board

Regional Traffic Signal Operations Programs (RTSOPs) are a tool that regions can use to improve traffic flow as it crosses from one jurisdiction to another. One central focus of these programs is coordination of signal timing on multi-jurisdictional arterials. Another benefit is the creation of a central forum for consideration of other traffic operations measures to improve regional mobility. Although many RTSOPs have been established through regional metropolitan planning organizations, successful RTSOPs have been established by other organizations, including state and local departments of transportation, and government corporations.

Information for this study was gathered through a literature review, a survey of RTSOPs, and selected interviews.

Kevin N. Balke and Anthony Voigt, Texas Transportation Institute, College Station, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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Appendix D is web-only and can be found at www.TRB.org, search on “NCHRP Synthesis 420.”

OPERATIONAL AND INSTITUTIONAL AGREEMENTS THAT FACILITATE REGIONAL TRAFFIC SIGNAL OPERATIONS

SUMMARY

Traffic signal operations and management can be defined as the process of planning, designing, operating, integrating, and the proactive maintenance and administration of a traffic signal system so that the efficiency, safety, and reliability of the arterial roadway network are optimized. Often these systems extend across jurisdictional boundaries, requiring cooperation among two (or more) agencies. As a result, there is often a need to form cooperative and collaborative efforts to provide for more efficient planning, operations, and maintenance, and to leverage the talents of staff members for the benefit of the region.

Regional Traffic Signal Operations Programs (RTSOPs) represent one tool that regions can use to improve traffic flow as it crosses jurisdictional lines. RTSOPs are programs whereby state, county, and city departments of transportation work collaboratively and cooperatively to address a region's mobility issues on the arterial street networks. Often, the central focus of these programs is on providing and improving the coordinated operations of traffic signals on arterial roadways that cross jurisdictional boundaries. However, today's RTSOPs are much more than conduits for the development of coordinated traffic signal timings. In addition to developing coordinated timing plans, RTSOPs in the United States perform a number of value-added functions and services, including the following:

- Serving as a forum for discussing traffic signal operations from a regional perspective,
- Providing a mechanism for upgrading and maintaining reliable communication systems to field devices deployed at intersections,
- Facilitating the replacement of antiquated or unreliable traffic signal controller equipment and infrastructure,
- Allowing local entities a way to collectively and collaboratively identify and prioritize arterial roadways of regional significance,
- Providing a fair and equitable way for agencies that have been allocated limited funds to address operational issues of regional arterials,
- Facilitating the deployment of advanced traffic management concepts and control strategies designed to promote smooth traffic flow across jurisdictional boundaries,
- Facilitating the implementation of consistent signal timing parameters (such as clearance intervals, transit signal priority, and pedestrian treatments) between multiple jurisdictions,
- Providing a mechanism for conducting training and professional capacity building to promote a common signal operations philosophy in a region,
- Facilitating outreach to the general public and the political decision makers on the benefits of coordinating operations between local jurisdictions, and
- Generating significant reductions in vehicle emissions and fuel consumption through reductions in travel times, stops, and delays.

As part of this synthesis, a combination of surveys and site interviews were used to identify and highlight critical attributes of successful RTSOPs across the United States. Important findings from the survey and the interviews include:

- Creating a successful RTSOP requires agencies to take a regional perspective on operating traffic signals. To operate the traffic signals from a regional perspective often requires

old agencies to take on new roles or for new agencies to be formed to serve with more regional perspective. Although many RTSOPs have been established through regional metropolitan planning organizations, successful RTSOPs have been established by all levels of organizations, including state, county, and local departments of transportation and governmental corporations. Successful RTSOPS depend on an organization or a group of individuals that have a regional perspective about operating the traffic signal system, and it is important that programs and projects meet the needs and have the consent of local agencies.

- Many RTSOPs did not have formal agreements establishing an administrative structure. In many cases, local jurisdictions retain the responsibility to operate and maintain the traffic signals in their jurisdiction. Inter-jurisdictional signal timings are developed and implemented collaboratively between agencies. Formal agreements are generally used when an entity, such as a metropolitan planning organization or county, assumes responsibility for day-to-day operations and/or maintenance of traffic signals outside its normal jurisdiction. The structure of the program depends on the missions, goals, objectives, and priorities of the community. The needs and the consent of the local agencies are important for creating successful programs.
- Linking performance measures with operational goals is important in showing the benefits of these programs. These goals and measures often reflect local priorities and needs. Providing effective performance measurement is critical for making a case for maintaining and extending funding programs.
- Having a consistent funding stream is critical for the long-term success of the program. Those agencies that are able to provide a consistent funding stream (such as through designated tax revenue or through the use of Congestion Mitigation and Air Quality funds) are more likely to sustain programs than programs that constantly struggle to obtain funding.
- The organizational structures of some RTSOPs have evolved over time as operational goals have been reached, new systems have been deployed, and new funding opportunities become available. In some cases, changing organizational structures and institutional arrangements may be necessary and desirable to meet future opportunities and address pressing issues.

RTSOPs have proven to be a cost-effective strategy for improving regional traffic signal operations. Evaluation study after evaluation study has highlighted the benefits that can be achieved through regional coordination of traffic signals, especially along major commuting corridors. All of these studies have found that these programs have produced significant reductions in travel times, stops, delays, fuel consumption, and vehicle emissions. Other benefits that can be achieved through regional collaboration include increased access to funding set aside for regional improvements, leveraging of agency resources and expertise, shortening of implementation time frames, reduced operating and maintenance costs, and increased access to training and professional development opportunities. There are a number of different operating concepts that agencies can use to develop their RTSOPs. The first is where the regional entity is responsible for providing only funding to local entities to develop coordinated operation. Generally, this operating concept is used where strong working relationships already exist between the local agencies and/or where the local agencies already have a highly qualified technical staff. This operating concept is common in relatively small geographic areas, with only a few local agencies across which coordination is needed.

A second common operating concept is one in which the regional entity is responsible for developing recommended timing plans for coordinating traffic signals across jurisdictional boundaries, but implementation of the timing plans rests solely with local entities. Under this operating concept, local and regional entities work closely with one another to ensure that the timing plans will be implemented by the local agencies. As in the previous operating concept, the local entity retains all the responsibility for operating and maintaining the traffic signals in its individual jurisdictions.

A third operating concept involves programs where the regional entity coordinates development of regional signal timing plans and may implement timings in the field. Generally, at this level, local agencies are required to enter into a project-level agreement, indicating the local agencies' willingness to accept the timing plans' changes developed by the regional entity. Through the project agreement, local entities are sometimes restricted from changing the timing plans for a fixed time period without the consent of the adjacent local entities and/or the regional entity.

A fourth common operating concept is one where the local entities jointly monitor operations in the region through independent but connected control centers. With this operating concept, the regional entity may deploy equipment that provides real-time monitoring of regional traffic signal assets and may even implement timing plans that have been agreed on by the individual agencies. In this operating concept, standard operating procedures are often developed that define the situation and circumstances where the regional entity can alter timing places from standard treatments.

The final operating concept is one in which the local entities consolidate the day-to-day operations of their traffic signal systems under the direction of the regional entity. With this concept, the local entities generally retain the responsibility of emergency and preventative maintenance of the traffic signal hardware and control software, but the regional entity assumes responsibility for all other operational aspects of the region's traffic signals. These responsibilities may include the development and implementation of new timing plans, day-to-day monitoring of system performance, and real-time adjustments to signal timing parameters. Memoranda of understanding and cooperative agreements are often used to develop formal reporting structures, articulate roles and responsibilities for participating agencies, define the authority of the regional entity, and develop cost-sharing arrangements to support day-to-day operations. Several examples of the different types of formal agreements and institutional arrangements used by RTSOPs in different regions of the United States are included in this synthesis.

Regardless of the type of operating concept and organizational structure used, performance measurements are an essential component of most RTSOP programs. RTSOPs have consistently shown the benefits of operating the traffic signal systems from a regional perspective. Evaluations have shown that RTSOPs not only contribute to significantly improved overall travel times and reductions in individual intersection delays, but can also have a significant impact on reducing vehicle emissions and fuel consumption. Many agencies correlated reductions in travel times, stops, and delays to reductions in vehicle emissions and improvements in air quality. Sustaining these benefits over time depends on the region's ability to develop and sustain sources of funding to continue to promote regional coordination, an ability to demonstrate and articulate the benefits captured through their programs, and the ability to provide training and outreach to the local partners in the region.

CHAPTER ONE

INTRODUCTION

Traffic signal operations and management is the process of planning, design, operation, integration, and proactive maintenance and administration of a traffic signal system that optimizes the efficiency, safety, and reliability of the arterial roadway network. Successful traffic signal system operation relies on smart design and deployment, and effective response maintenance, as well as preventive equipment maintenance and ongoing optimization of signal timing parameters to adjust to changing conditions over time. The deployment and operation of modern traffic signal systems require collaboration of multiple disciplines [traffic engineering, human factors, communications, intelligent transportation systems (ITS), and information technology, among others] and consist of a conglomeration of technical subsystems, including physical infrastructure, process controllers, surveillance and detection systems, displays and signs, communications, and data collection. Often these systems extend across jurisdictional boundaries, requiring cooperation among two (or more) agencies. As a result, there is often a need to form cooperative and collaborative efforts to provide for more efficient planning, operations, and maintenance, and to leverage the talents of staff members for the benefit of the region.

Regional cooperation in traffic signal operations offers significant potential benefits, and this synthesis report examines some of the institutional techniques used by various regions in the United States to establish more effective and efficient Regional Traffic Signal Operations Programs (RTSOPs). In many cases, the barriers to improved traffic signal operations are not a result of the misapplication of fast-moving technology, but are tied to the long-standing institutional, bureaucratic, and budgetary issues that frequently appear to plague the delivery of public services, including transportation-related services. However, operating in an era of limited resources further necessitates realizing an economy of scale through which agencies increase their chances of acquiring funding by partaking in joint efforts, leveraging the expertise of sister agency staff to deploy more technologically advanced projects at lower cost, and collectively sharing resources and assets in operations and maintenance activities.

RTSOPs are one tool that many regions have deployed to facilitate the safe and effective movement of people and goods and address the challenges of operating signal systems with a more holistic view of traffic operations (*1*). RTSOPs represent the collaborative efforts of regional state, county, and city departments of transportation (DOTs); transit agencies; metropolitan planning organizations (MPOs); and other stakeholders to address regional mobility issues, typically with a particular focus on the operations of arterial networks between multiple jurisdictions. In many areas, RTSOPs might facilitate the interconnection of traffic signals or the use of common system cycle lengths to aid progression across jurisdictional boundaries. In some cases, RTSOPs are used to establish a common operating strategy for certain conditions or events (such as an incident or an emergency response) and, in other regions, RTSOPs are used to provide common training to facilitate the development of consistent operating philosophies among agencies. Finally, RTSOPs are used to facilitate technical training of agency staff and to provide public outreach resources. Regardless of the need for initiating an RTSOP, some level of operational and/or institutional agreement is typically desired to facilitate coordinated activities and clearly define the roles and responsibilities of the participating agencies.

BACKGROUND

The regional concept for transportation operations is a relatively new paradigm in managing the transportation system. Regional transportation operations involve refocusing resources, processes, and procedures away from an agency-centric perspective to managing transportation facilities and systems with a multi-agency regional perspective, regardless of jurisdictional boundaries. From a traveler's perspective, agency jurisdictional boundaries should not impede traffic flow and mobility. The traveling public is typically unaware of who has jurisdictional authority on any portion of a given trip. It is only noticed when the transportation system fails to meet its expectations in terms of travel performance and congestion levels. By thinking regionally when making decisions that impact operations, transportation agencies can help travelers better achieve their expectations. Occasionally, this may mean that individual operating agencies may be giving up something in order to achieve a higher goal or benefit. However, in an era of shrinking budgets and limited resources, agencies have to recognize opportunities to make improvements by leveraging institutional strengths, resources, talents, equipment, and facilities to address operational issues that extend beyond their jurisdictions.

Regional concepts for transportation operations are derived through sustained collaboration among stakeholders, all

committed to addressing common operational issues and goals (*1*). Creating a successful regional concept of transportation operations requires party agencies to accomplish the following:

- Establish desired operational outcomes for one or more activities or services through regional collaborations consistent with regional goals expressed in regional planning documents.
- Implement equipment, technology, facilities, people, and/or systems needed to achieve these operational objectives.
- Use tools such as working agreements, institutional arrangements, and performance measurement and monitoring to develop relationships and procedures that permit agencies to work collaboratively to achieve a common objective and to gauge their effectiveness.
- Develop mechanisms for securing and allocating funding and other resources (such as staffing and equipment) that are consistent and sustainable over time.

RTSOPs are one of several concepts for transportation operations that agencies can use to address operational issues at the regional level. RTSOPs represent the collaborative efforts of what may be a combination of state, county, and city DOTs; transit agencies; MPOs; and other stakeholders to address regional mobility issues, particularly on arterial networks that span multiple jurisdictions. By working collaboratively, participating stakeholders can achieve significant benefits by addressing traffic signal operational issues from a regional perspective. Some of these benefits include:

- Through joint collaborations, operating agencies can achieve increased access to limited funds in today's more highly competitive project selection processes.
- Agencies can implement larger, more technologically advanced projects by leveraging the technical expertise, resources, and institutional arrangements within the region.
- Participating agencies can implement real solutions that have tangible impacts on regional congestion reduction and environmental goals.
- Agencies are able to reduce deployment and implementation costs by sharing communications and infrastructure assets.
- By leveraging and sharing personnel and deployment costs, agencies can reduce the long-term operating and maintenance costs of regional transportation assets and infrastructure.
- Agencies can develop and maintain a highly skilled technical workforce through the leveraging of limited training and professional development funds.

RTSOPs can exist in many different forms and perform many different types of functions in different parts of the United States. Recently, the FHWA published an overview report on RTSOPs. In this report, the FHWA provides a framework for establishing an RTSOP for a region. Figure 1 shows this framework.

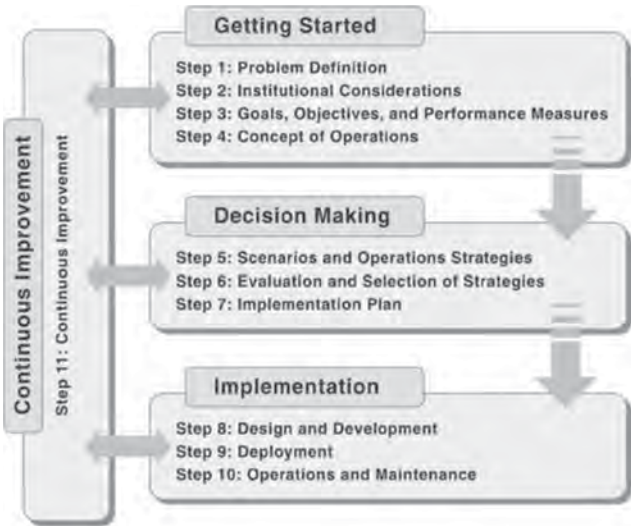


FIGURE 1 Regional Traffic Signal Management and Operations Program framework (*1*).

This synthesis project was intended to capture the state of the practice by documenting current agency experiences, risks, and lessons learned associated with establishing, operating, and sustaining regional RTSOPs in the United States.

STUDY GOALS AND OBJECTIVES

The goal of this project is to produce a synthesis report that agencies can use to assist them in developing and sustaining RTSOPs in their own regions. The synthesis is intended to inform local agencies, MPOs, and state DOTs about the current practices, institutional arrangements and agreements, and organizational frameworks associated with successful RTSOPs in North America. The synthesis highlights:

- Common practices used by agencies in forming and sustaining RTSOPs,
- Common obstacles and issues encountered during the formation process and how these issues were overcome,
- Activities and functions performed by RTSOPs,
- Tangible benefits derived from deploying sustainable RTSOPs, and
- Examples of institutional arrangements and interagency agreements related to funding and operating RTSOPs.

STUDY METHODOLOGY

Three primary tasks were used to develop the synthesis document. The first was to conduct a comprehensive review of the available literature associated with regional transportation operations and RTSOPs. The second task involved conducting a survey of MPOs to gauge the current status and level of

maturity of use of RTSOPs in the United States. The third task involved conducting in-depth interviews with representatives from a select number of RTSOPs to identify key factors of success, experiences, and lessons learned from operating and sustaining these programs over time. Each of the tasks is summarized here.

Literature Review

A comprehensive review of U.S. and North American literature sources related to regional transportation operations and RTSOP was conducted. The purpose of this review was to determine the attributes and characteristics associated with RTSOPs. Searches of standard library databases and journals, such as the Transportation Research Information Services, Center of Transportation Research, *Transportation Research Records*, and numerous professional journals, such as the *Institute of Transportation Engineers* journal, public works journals, and others were conducted. In addition, Internet and web searches were conducted of those agencies known to have regional transportation signal operations programs. The review of published papers and journal articles was used to gain background knowledge related to the operational characteristics and organizational attributes of RTSOPs. Although the synthesis itself does not reference all the documents gathered, the task was critical in establishing a solid foundation upon which to develop the survey instrument and the interview questions.

Survey of Potential RTSOP Sites

Using an online survey system, a survey was conducted of the identified MPOs with respect to their experiences in developing, operating, and sustaining RTSOPs. The purpose of the survey was threefold: (1) determine the number of MPOs that either lead or participate in RTSOPs; (2) obtain basic information about the experiences of these agencies with establishing, operating, and sustaining RTSOPs; and (3) identify sites for follow-up interviews where agency experiences would be discussed in greater detail. The survey was used to assess the current status and maturity level of various RTSOPs in the United States, as well as to collect basic information on the following:

- Common experiences and practices for forming and organizing RTSOPs,
- Common activities and functions performed by existing RTSOPs,
- Tangible benefits and performance measures used to assess the effectiveness of RTSOPs,
- A mechanisms for funding and sustaining RTSOPs,
- Roles and responsibilities of participating agencies, and
- Institutional and operational agreements used in the formation of these programs.

To the extent possible, the survey was designed to have multiple-choice questions from which survey participants could select appropriate answers. Open-ended questions were avoided. In some situations, an "other" response was provided and, if selected, the participant was prompted to provide a reason for that response.

The survey instrument was reviewed and approved by the Human Subject's Protection Program and the Institutional Review Board of Texas A&M University. The Board found that participants were placed at minimal risk by participating in the survey. Appendix A is a copy of the survey.

In-Depth Interviews with Select RTSOPs

The results of the survey were used to identify RTSOPs for in-depth interviews. The purpose of these interviews was to collect additional insight on the history, purpose, organizational structure, activities and functions, and roles and responsibilities of participating agencies; institutional agreements; and operating procedures of different RTSOPs. In-depth interviews were conducted with the following agencies (see Figure 2):

- Los Angeles Metropolitan Transportation Authority (Los Angeles, California)
- Puget Sound Regional Council (Seattle, Washington)
- Regional Transportation Commission of Southern Nevada (Las Vegas, Nevada)
- Oregon Department of Transportation (Region 4)
- Regional Transportation Commission of Washoe County (Reno, Nevada)
- North Carolina Department of Transportation
- Fargo–Moorhead Council of Governments (Fargo, North Dakota)
- Southeast Michigan Council of Governments/Oakland County Road Commission (Detroit, Michigan)
- Southwestern Pennsylvania Commission (Pittsburgh, Pennsylvania)
- Denver Regional Council of Governments (Denver, Colorado)
- Pima Association of Governments (Tucson, Arizona)
- Bay Area Metropolitan Transportation Commission (San Francisco, California)
- Maricopa Association of Governments (Phoenix, Arizona)
- Niagara International Transportation Technology Coalition (Niagara/Buffalo, New York)
- Mid-America Regional Council (Kansas City, Missouri)
- North Central Texas Council of Governments (Dallas–Ft. Worth, Texas)
- Orange County Transportation Authority (Orange, California).

Where appropriate, these agencies were asked to provide copies of any institutional and/or project agreements used in the development, governance, and operation of their RTSOPs.

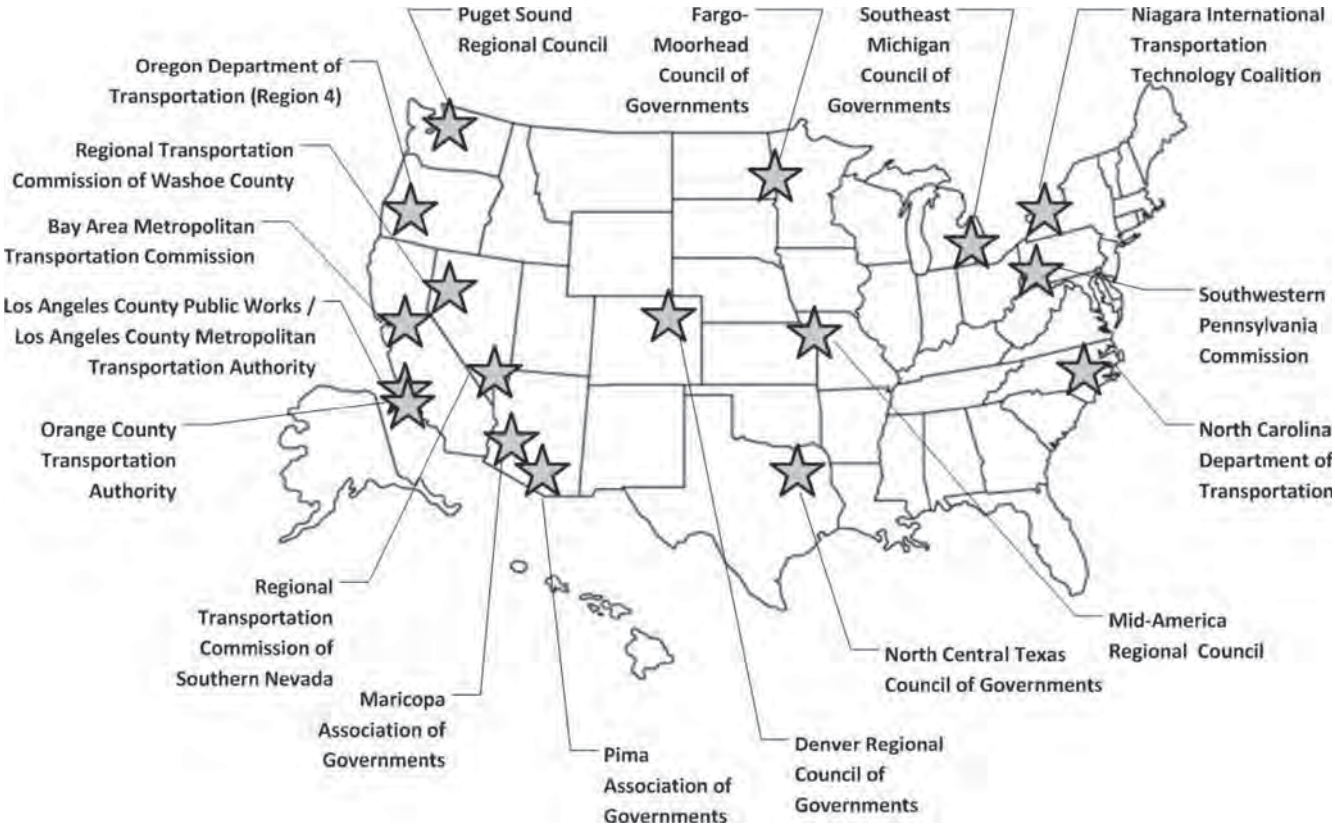


FIGURE 2 Location of RTSOPs interviewed.

SYNTHESIS ORGANIZATION

This synthesis is intended to capture the state of the practice and agencies' experiences with establishing, operating, and sustaining RTSOPs. Chapter two of this report provides a summary of the state of the practice of RTSOPs in the United States and presents the results from the online survey. Chapter three of this synthesis focuses on building and formulating RTSOPs and contains information on common organizational structures of RTSOPs, activities and functions facilitated through cooperative relationships, common roles and responsibilities of participating agencies, and concepts of operations for RTSOPs. Chapter three also summarizes the documented benefits associated with RTSOPs. Chapter four discusses the different types of operational and institutional arrangements used in the formation and operation of many existing RTSOPs. Chapter five discusses the challenges and issues associated with sustaining RTSOPs over time. Items discussed in this chapter include the evolution of partner roles and responsibilities, keys to surviving a change in program champion, program performance measurement and monitoring, keys to managing program risks, and effective promotion and marketing. Chapter six is a summary of the key findings associated with this review. Survey and interview responses, as well as sample institutional agreements, are provided in the appendices at the end of this synthesis.

CHAPTER TWO

STATE OF THE PRACTICE OF REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAMS

RTSOPs represent a relatively new paradigm for operating traffic signal systems, especially those systems that cross jurisdictional boundaries. The development of RTSOPs began in the late 1990s as deployment of advanced communications and ITS became more prevalent and agencies began to see the potential (and real) benefits of regional traffic operations. However, although many of the early ITS deployments were focused on the freeway system, agencies realized that ITS deployments on arterials could deliver performance improvements on the street network. Another catalyst for the formation of an RTSOP was the enactment of federal legislation that provided a dedicated source of funding to implementing surface transportation improvements (and other related projects) that contribute to air quality and congestion-reduction improvements.

The primary goal of this synthesis project was to document the current state of the practice of RTSOPs from around the United States. Specifically, the focus of the project was to identify the operational and institutional agreements and practices that allow agencies to work together on a regional scope to collaboratively and cooperatively develop and sustain programs dedicated to improving traffic signal operations. To fulfill these requirements, a combination of (1) surveys of MPOs and regional transportation agencies, and (2) interviews with practitioners to assess the current state of the practice of regional traffic signal operations programs was used. This chapter describes the results of those efforts.

SURVEY

A survey was developed to gauge the state of the practice of U.S. RTSOPs. The purpose of the survey was to (1) obtain basic information about the current practices and activities performed in support of regional traffic signal operations throughout the United States, and (2) identify locations that currently have formal RTSOPs. It's an online survey using a commercially available survey tool. A copy of the survey is in Appendix A.

Using the results of the survey, 15 sites were identified to conduct more detailed interviews to collect more in-depth information about the organizational structure, activities, functions performed, and roles and responsibilities of various RTSOPs. Another aspect of the interview process was to collect existing agreements that show the variety of arrangements used to structure, fund, and operate these programs. These existing agreements can be used as samples for other regions to emulate in developing their own programs. The criteria used to select locations for follow-up interviews included survey responses, geographic location, program size, existing (or potential) RTSOP organizational structure, lead agency type, and level of maturity. A copy of the interview script is provided in Appendix B. The findings from the surveys are synthesized in this and the following chapters.

SURVEY RESULTS

A cover letter with a link to the survey instrument was mailed electronically to more than 320 MPOs and regional transportation authorities throughout the United States. A total of 70 agencies responded, either partially or in whole, to the survey. Fifty-six agencies completed the survey document. As shown in Figure 3, 55% of the respondents indicated that they have some type of RTSOP for their region.

If agencies indicated that they had an operational RTSOP in their region or locale, they were asked to self-identify the level of development of their program. A total of 16 agencies indicated that they had formal RTSOPs, 6 that they were in the early stages of developing a formal program, and 9 indicated that although they had an informal program, they expected to transition to a more formal program in the next 3 to 5 years. The following is a list the locations of each of the programs responding in each level of development.

Formal Program Active in Region

- Orange County, CA
- Detroit, MI
- Fargo, ND/ Moorhead, MN
- Los Angeles County, CA
- Tucson, AZ
- Reno, NV
- Pittsburgh, PA
- Harris County, TX
- Macon, GA
- Kansas City, KS/MO
- North Carolina
- Buffalo/Niagara Falls, NY
- Bend, OR
- Portland, OR
- Las Vegas, NV
- San Francisco Bay Area, CA

Program in Early Stages of Development

- Auburn, ME
- St. Louis, MO
- Johnson City, TN
- Huntington, WV
- Seattle, WA
- Richmond, VA

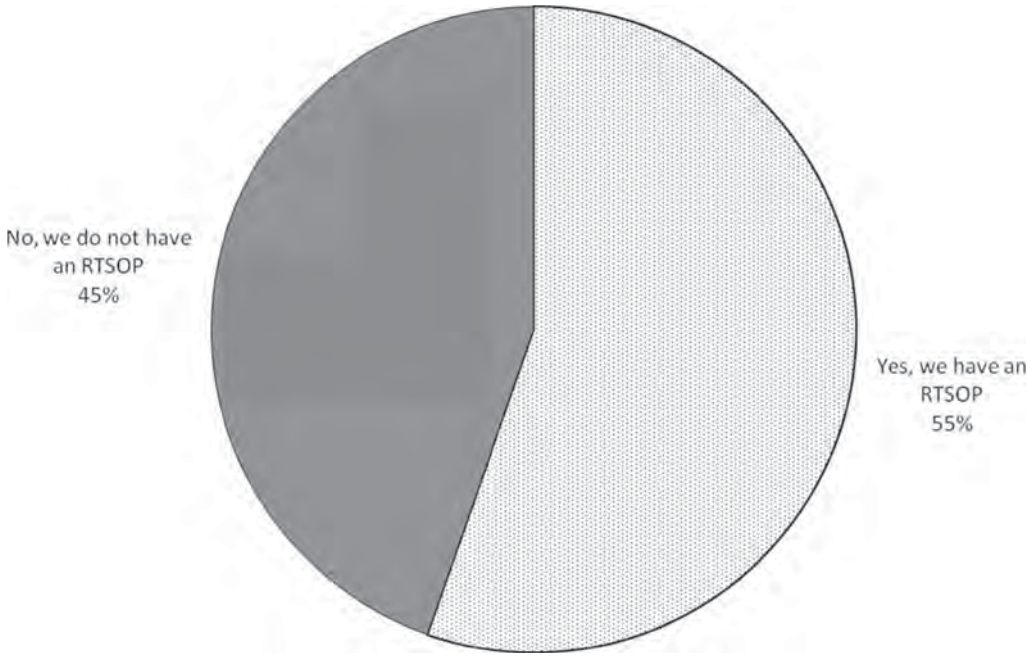


FIGURE 3 Percentage of respondents indicating the presence of an RTSOP in their region ($n = 56$).

Expect to Have Formal Program in 3 to 5 Years

- Baltimore, MD
- Chicago, IL
- Columbus, IN
- Philadelphia, PA
- Newark, NJ
- Lancaster, PA
- Columbus, OH
- Omaha, NE
- West Lafayette, IN

Relative Size of RTSOPs

Respondents were asked to provide an indication of both the number of traffic signals within their region and an estimate of the percentage of traffic signals included in their RTSOPs. Figure 4 shows how respondents answered the question about how many traffic signals are included in their region. Sixty-four percent of the respondents noted that their region contains more than 500 traffic signals. Only 13% of the respondents indicated that they have fewer than 100 signals in their region. Clearly, this demonstrates that RTSOPs are more often used in regions that have a relatively large number of traffic signals.

Figure 5 shows how agencies responded when asked what percentage of the total number of traffic signals included are operated and maintained under an RTSOP. A total of 70% of those agencies reporting that they have an RTSOP also operate and/or maintain their traffic signals through their programs. Almost 21% of the agencies reporting that they have an RTSOP also indicated that all (100%) of their traffic signals were included in the program. Thirty-one percent of the agencies reporting that they have an RTSOP also estimate that between one-half and three-quarters of their traffic signals were included in the program. This suggests that once agencies begin to regionalize operations through their RTSOPs, the tendency is for the programs to grow to include the vast majority of the traffic signals in the region.

Figure 6 shows how agencies responded to the question pertaining to the number of years their RTSOP has been operational. Approximately one-third of the respondents indicated that they have been operating their program for more than 5 years, whereas 26% of the respondents indicated that they have been operating their systems between 1 and 5 years. Thirty-three percent of the respondents with RTSOPs indicated that their programs were still under development.

Almost two-thirds of the agencies that reported using RTSOPs did not report using formal criteria to select roadway facilities for operational improvements through inclusion in their RTSOP. This implies that agencies have other factors that they consider when determining which roadways to include in their program. Roadway functional classification and regional importance were often cited as reasons for including roadways in their programs. Figure 7 shows the factors that agencies consider important when selecting roadways to be included in their RTSOP; agencies were permitted to select multiple factors influencing their decisions. The results show that RTSOPs tend to focus on roadways with high traffic volumes that also function as major commuting corridors, but may also be roadways that connect major trip generators. These characteristics tend to point to roadways of significant importance to regional mobility. Furthermore, the finding that "excessive delays" was lower rated as an important factor suggests that agencies may have higher intrinsic goals (such as regional mobility) other than strictly operational performance as a goal for their programs.

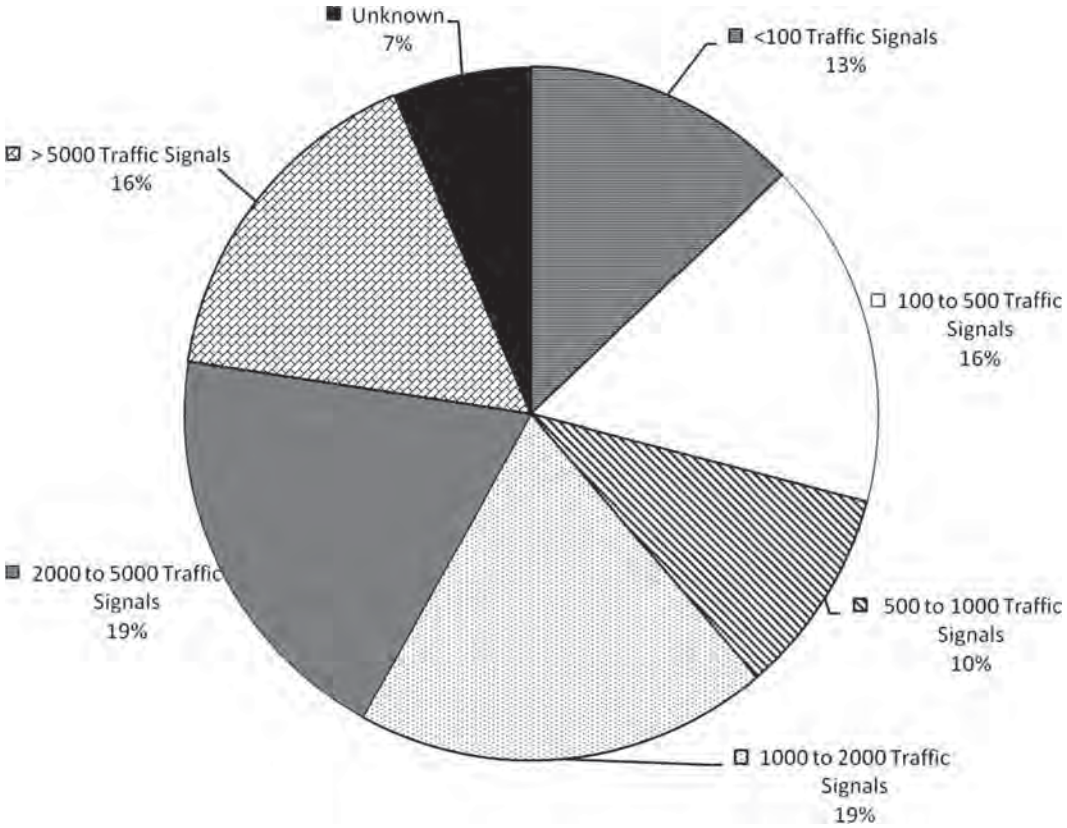


FIGURE 4 Distribution of agency responses as to the number of traffic signals included in region where RTSOPs are deployed ($n = 31$).

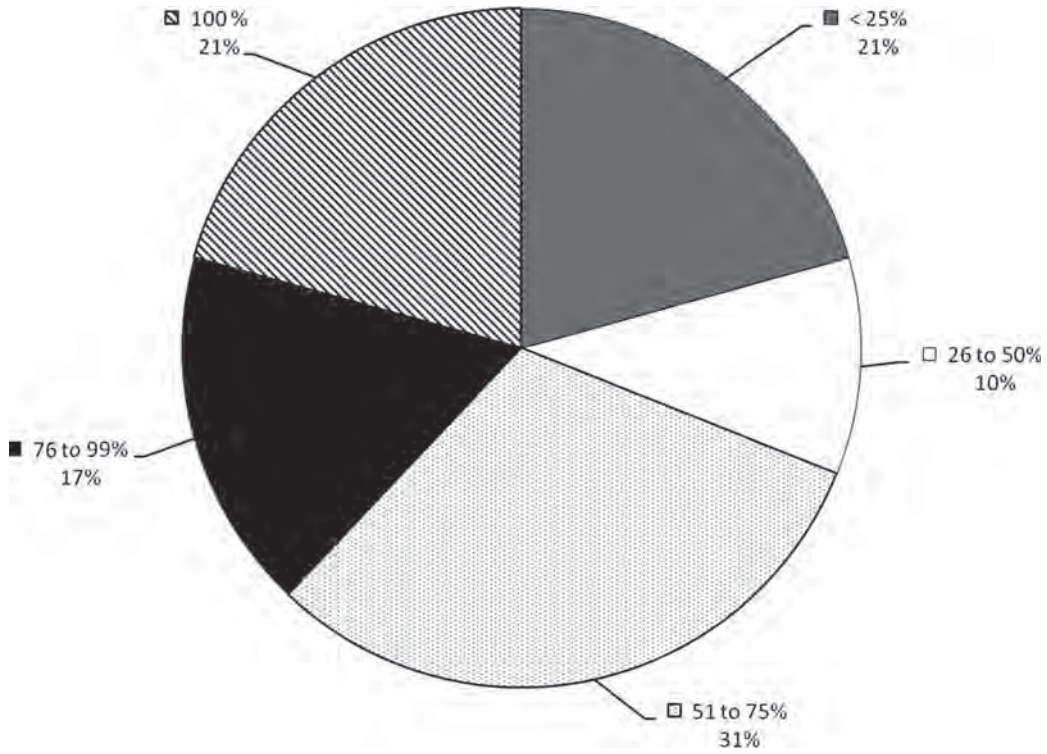


FIGURE 5 Distribution of agency responses indicating the percentage of regional signals included in their RTSOPs ($n = 29$).

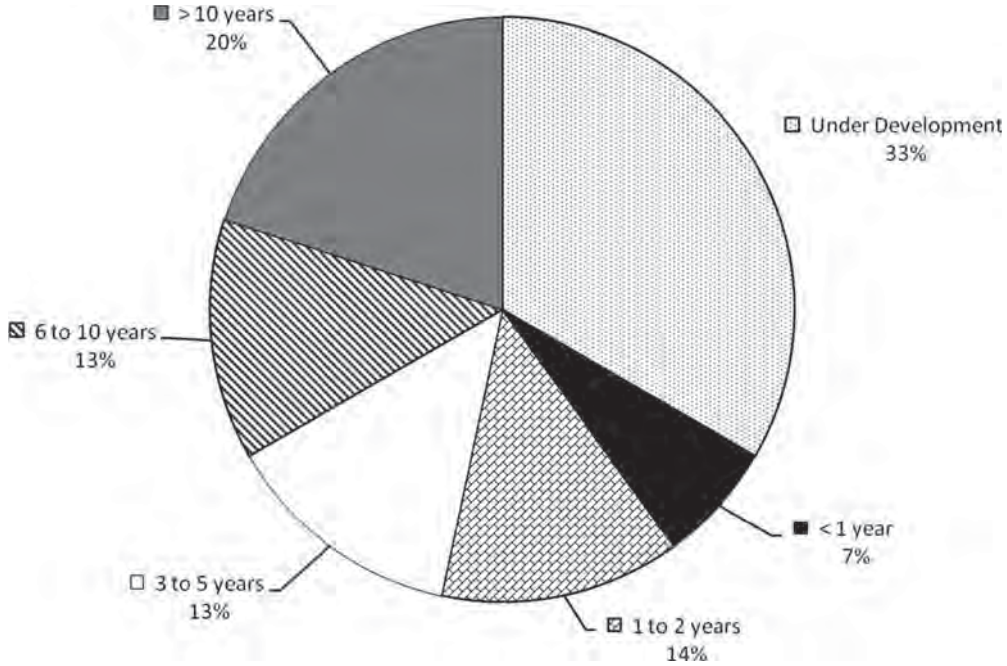


FIGURE 6 Distribution of agency responses indicating the number of years their RTSOPs have been operational ($n = 30$).

Other contributing factors cited as influencing the decision process for selecting roadways to include in their RTSOPs were:

- Signalized intersections at freeway interchanges,
- Primary evacuation routes or diversion routes for freeway incidents,
- Part of a regional network of high-priority roadways,
- Truck percentages,
- Accident rates,
- Air quality,
- Potential for integration with regional traffic management center,
- Need for transit priority, and
- Potential of local match.

Organizational Structure and Decision Making

Respondents were asked to select from several options the organizational structure that best described their system. Table 1 summarizes these responses.

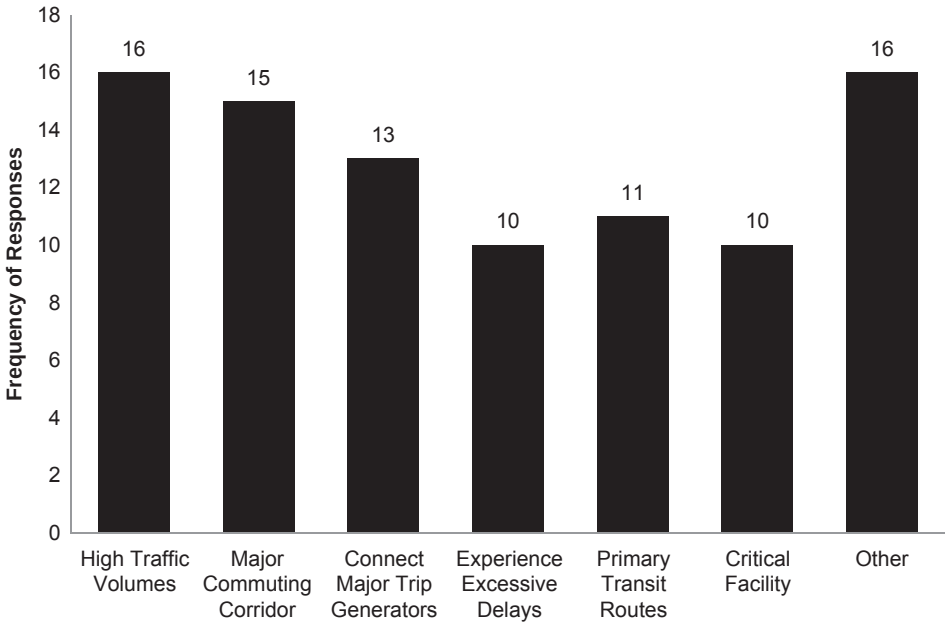


FIGURE 7 Factors important in selecting roadways for inclusion in an RTSOP.

TABLE 1
SUMMARY OF RESPONSES INDICATING THE TYPES OF ORGANIZATIONAL STRUCTURE EMPLOYED BY RTSOPs

Potential Organizational Structures	Frequency	Percentage
We formed a separate, stand-alone committee comprised of traffic signal engineers and decision makers from the public entities that make technical decisions for our RTSOP.	8	27
Our RTSOP is run through an independent agency, such as a MPO, a council of governments, or a governmental corporation. The program is managed by an executive director or program director with an independent technical staff. Technical assistance and oversight might be provided by a committee of agency representatives.	5	17
We have an executive committee of senior decision makers from each agency (e.g., district engineers, director of public works, etc.) that sets the policy for our RTSOP. Each member entity is responsible for implementing the policy set by the executive committee.	1	3
We have an executive committee of senior decision makers from each agency (e.g., district engineers, director of public works) that sets the policy for our RTSOP. The executive committee is supported by a technical committee of traffic signal engineers and decision makers that make implementation decisions for the RTSOP. Each member entity is responsible for implementing the decision of the technical committee.	1	3
Other (see below)	15	50
• Our RTSOP is run through an independent agency, such as a MPO, a council of government, or a governmental corporation. Within the MPO committee structure we have a steering committee of senior decision makers from each agency (e.g., district engineers, director of public works, etc.) that sets the policy for our RTSOP. The executive committee is supported by a technical committee of traffic signal engineers and decision makers that make implementation decisions for the RTSOP. The program is managed by an executive director or program director with an independent technical staff. • The county, as lead agency, provides the technical expertise and recommends routes to be included in the program. When the program was established, we worked with committees from each of the councils of governments. Now we work directly with each involved agency to obtain approvals as necessary. • The DOT technical staff takes the lead on program goals and priorities and works with the local agency staff on an ad hoc basis. • It is a combination of an independent governmental agency with technical staff and executive/technical committees in a tiered structure that make and implement decisions for the RTSOP. These decision makers are also agency policy makers and engineers responsible for implementation of the policy and systems. • Currently, our Traffic Operations Working Group is a subcommittee of the MPO Policy Board. However, our program is still emerging, so we are likely to advance to a more ÞpoliticallyÞ defined MOU of sorts in the next 8 to 24 months. The structure of the MOU will likely point toward a stand-alone governing body, made up of senior technical staff, which will report to elected public bodies (cities, DOTs, etc.). • A stand-alone committee organized by the MPO. The RTSOP is run through the MPO, but the MPO is comprised of the members of the stand-alone committee. Technical decisions are made through the stand-alone committee. The MPO provides contracted technical staff assistance to the MPO and the RTSOP for the program, including the current development of a systematic approach to the selection of signalized locations for analysis and time plan adjustment consideration. • In summary, we are an MPO. A technical working group consisting of operations staff from each partner agency assists the MPO staff in the development and update of the capital improvement program. MPO staff also provides assistance in the development of inter-jurisdictional signal timing and coordination plans. The MPO Board, consisting of elected officials, must approve the program each time it is updated.		

MOU = memorandum of understanding.

Responding agencies were also asked to indicate how key decisions are made within their programs. Figure 8 shows how agencies responded. Approximately one-half of the respondents (48%) indicated that decisions are made by consensus (100% agreement), whereas 11% indicated that decisions are made by an executive director or program director with input and oversight from a committee of member agencies.

Several respondents indicated that the traffic signal timing plans developed as part of their program are merely suggestions and that each agency is ultimately responsible for making decisions regarding the operation and timing of the signals that it owns. Other respondents noted that agency approval is needed before new operational settings can be implemented in field devices. Several respondents also indicated that because of good working relationships and trust that exist between partners operational decisions are often reached by mutual agreement.

Agreements and Institutional Arrangements

Agencies were asked to indicate the reasons (or motivating factors) for establishing their RTSOPs. Table 2 summarizes these responses. Three of the top four reasons (to improve progression, create operational efficiencies, and facilitate advanced traffic management strategies) all suggest that agencies are creating RTSOPs as mechanisms for improving traffic flows and providing operational efficiencies, and all four of the top-cited reasons suggest that agencies are self-motivated in developing these programs. Issues associated with optimizing funding (i.e., to identify or prioritize locations to expend limited funds and to leverage or pool funds and/or resources and leverage staff expertise with a fellow operating agency) all rated in the middle of the frequency of responses, whereas externally motivated factors (such as responding to external public pressure; responding to political pressures; and adhering to local, state, or federal regulations) all rated low as

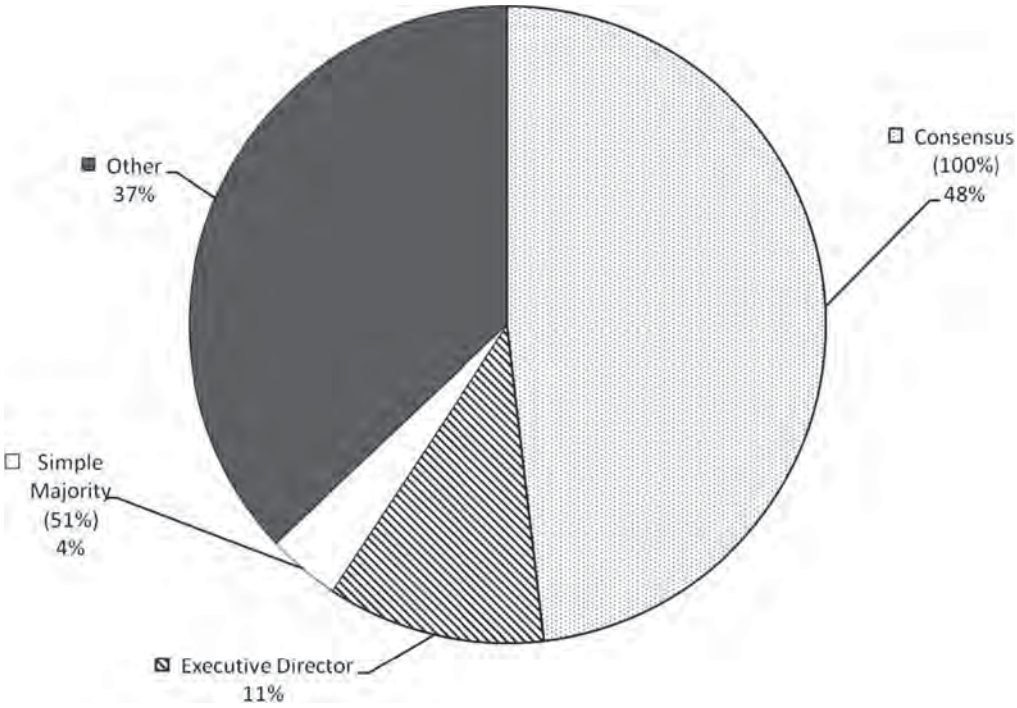


FIGURE 8 Summary of how decisions are made in existing RTSOPs ($n = 27$).

motivating factors. This suggests that agencies see inherent value in developing these programs and are self-motivated to improve operational efficiencies as opposed to being driven by funding issues or in response to public outcry. Other reasons cited as being a motivating factor for establishing these programs included the following:

- To provide a voluntary, supplementary transportation strategy to reduce ground level ozone pollution in the region.
- To address the identified strategies in an approved Regional Operations Plan or Regional Concept of Transportation Operations document that was developed by local planning partners and adopted by a regional oversight board.
- To address common signal timing parameters (clearance intervals), expedite purchasing of equipment, and facilitate coordination with utilities.
- To expedite purchasing of equipment.
- To facilitate coordination with utilities.

Agencies were asked to indicate what types of institutional agreements were used to establish their RTSOPs. In short, more than half of the agencies indicated that they did not use any formal agreement to establish their program (this includes those that indicated that they had no agreement but checked

TABLE 2
FACTORS AND/OR REASONS CONSIDERED IN ESTABLISHING RTSOPs

Motivating Factors/Reasons for Establishing RTSOPs	Frequency	Percentage
To improve progression and coordination on roadways that span multiple jurisdictions	21	70
To create operational and resource efficiencies among transportation agencies in the region	20	67
Internally motivated by one or more partner agency	18	60
To facilitate the development and/or deployment of advanced transportation management strategies (such as integrated corridor management or transit signal priority) in the region	16	53
To identify/prioritize locations for expending limited funds	14	47
To address a specific operational issue or concern on a particular route or corridor (such as diverted traffic from a major construction project spanning multiple jurisdictions)	13	43
To leverage/pool funds and/or other resources (e.g., equipment and personnel)	13	43
To leverage the staff expertise of a fellow operating agency	12	40
To respond to external public pressure	6	20
To respond to political pressure	4	13
To promote the equitable distribution of funds between competing operational entities	3	10
Mandated by local, state, or federal legislation	2	7
Other	6	20

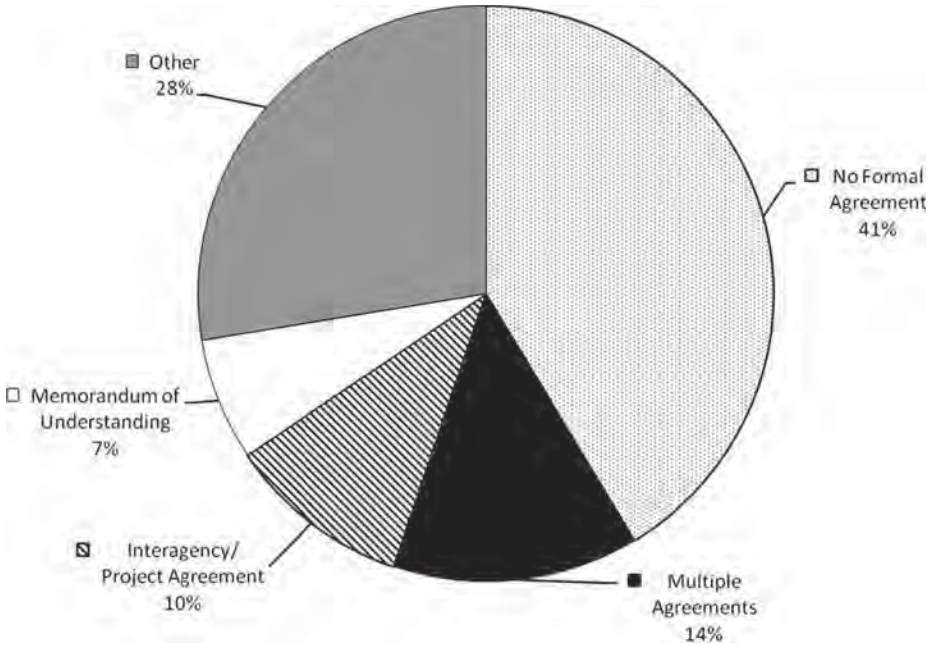


FIGURE 9 Summary of the responses pertaining to the types of agreements used to form RTSOPs ($n = 29$).

the "other" category). Several agencies indicated that they use interagency or project agreements to fund individual upgrades or synchronization projects within their programs. Only a few agencies mentioned that they used memoranda of understanding (MOUs) to establish their programs, although several of the agencies that were in the development phase indicated that they are likely to be pursuing MOUs to establish such programs. Figure 9 shows how agencies responded to the question on institutional agreements.

Agencies were also asked to indicate what operational items or elements are included in their agreements. Table 3 shows items and/or elements commonly included in the RTSOPs' operational agreements. Most agreements appear to be focused on defining the relationships between entities; for example, which agencies are involved or which agencies are performing what tasks. Technical requirements and specifications are not as widely covered in these agreements, primarily because most RTSOPs purchase only a limited amount of traffic control signal hardware and communications equipment, and because in most RTSOPs the individual agencies are responsible for operating and maintaining intersection hardware infrastructure.

Agencies were also asked if they had developed a concept of operations as part of their program. Sixty-six percent of the respondents indicated that a concept of operations document

TABLE 3
ELEMENTS REPORTED TO BE CONTAINED IN OPERATIONAL AGREEMENTS FOR RTSOPs

Items/Elements Included in Operational Agreements	Frequency	Percentage
Roles and responsibilities of participating agencies	15	75
Activities to be performed by the program and participating agencies	12	60
Identification of lead agency	12	60
Duration of agreement	10	50
Funding requirements/cost-sharing arrangements	10	50
Equipment and personnel sharing arrangements	7	35
Operational goals and objectives from the program	7	35
Organizational structure	7	35
Requirements for decision making	7	35
Scope of coordination (i.e., which arterials to manage, signals to include, etc.)	7	35
Technical requirements	6	30
Equipment specifications	5	25
Notification requirements (for changes in configuration and/or operations)	5	25
System integration requirements	5	25
Performance goals and monitoring requirements	4	20
Configuration management procedures	3	16
Personnel training requirements/schedule	2	15
Other	4	20

does not exist for their program. Thirty-four percent of the respondents indicated they have a concept of operations document that describes the roles, responsibilities, and functions of their program. Agencies were also asked if their region has a regional ITS architecture. Eighty-three percent noted that a regional architecture exists; however, only 37% of those reported that their RTSOP is specifically identified in their architecture.

RTSOP Functions

Agencies were asked to select the functions and tasks performed by their RTSOP from a pre-defined list. Table 4 shows the frequency with which agencies selected each function or task. Agencies had the ability to select multiple functions and tasks.

As shown in Table 4, providing a forum for discussing traffic signal operational issues is the most frequently cited function performed by RTSOPs, with 75% of the agencies reporting that this is one of the major functions of their RTSOP. More than half of the RTSOPs surveyed also indicated that developing traffic signal timing plans that facilitate the crossing of jurisdictional boundaries and providing consistency in signal timing practices between agencies are major functions of their programs. Only 30% of the RTSOPs surveyed reported that providing standards and specifications is one of their major functions, and only 19% cited the following activities as being major functions of their programs: providing traveler information, being the single point of contact of citizen complaints, and developing and implementing traffic signal timings for severe weather. Other functions cited as being performed by RTSOPs include facilitating the deployment and implementation of corridor-specific transit signal priority, and identifying and selecting upgrades to traffic signal equipment that enables optimized operations (typically focused on controller, communications, and indication upgrades).

Approximately 40% of the surveyed RTSOPs indicated that they provide central monitoring of traffic signal operations through a single traffic management center, and only 41% of the agencies reported that their traffic signals are integrated with other regional transportation management programs, devices, or activities.

Funding of RTSOPs

Agencies were asked to identify the sources of funds used to establish and finance projects through their programs. The type of funding used by these programs is highly dependent on the nature of the program. More than 50% of the respondents indicated that they use federal Surface Transportation Program (STP) funds. These STP funds are primarily used to install infrastructure-related capital improvements (such as hardware improvements, communications, and control center systems) and other ITS support systems (such as video surveillance camera systems or traffic volume sensors). Forty-six percent of the respondents identified Congestion Mitigation and Air

TABLE 4
NUMBER OF AGENCIES REPORTING FUNCTIONS/TASKS PERFORMED BY RTSOPs

RTSOP Functions and Tasks	Frequency	Percentage
Provide a forum for discussing traffic signal operations issues	18	75
Develop traffic signal timing plans to facilitate cross-jurisdictional traffic flow	16	59
Provide consistency in signal timing practices between agencies (i.e., clearance intervals, intersection configuration, pedestrian timings and policies, etc.)	15	56
Develop and maintain a database of traffic signal assets (hardware) for the region	12	44
Facilitate the deployment and implementation of incident management traffic signal timing plans	12	44
Facilitate the deployment of advanced traffic management concepts and control strategies, such as adaptive traffic signal control, integrated corridor management, etc.	12	44
Develop and maintain a database of timing parameters and plans for the traffic signals in the region	11	41
Facilitate the deployment and implementation of region-wide transit signal priority	11	41
Identify and establish priorities, corridors of significance, performance goals and measures, etc., for the region's traffic signals	11	41
Provide central monitoring of traffic signal operations from a regional perspective through a single traffic management center	11	41
Develop standards and specifications for communications hardware	10	37
Provide outreach to the public and decision makers	10	37
Provide training/certification for traffic signal technicians and operators	9	33
Develop standards and specifications for controller software	8	30
Develop standards and specifications for traffic signal hardware	8	30
Facilitate the deployment and implementation of regional traffic signal timing plans for severe weather	5	19
Provide a single point of contact for reporting and responding to citizen complaints	5	19
Provide travel information to travelers and commuters	5	19
Other	6	20

TABLE 5
SOURCES OF FUNDING USED TO FUND IMPROVEMENTS PERFORMED BY RTSOPs

Funding Source	Frequency	Percentage
Federal Surface Transportation Program (STP)	16	57
Federal Congestion Mitigation and Air Quality (CMAQ)	13	46
Local Capital Improvement Program (CIP)	10	36
State or Local Operating/Maintenance Budget Funds	10	36
American Recovery and Reinvestment Act (ARRA) Funds	9	32
Federal Appropriation Earmarked Funds	5	18
State Traffic Safety Funds	5	18
Federal Enhancement Funds	2	7
Other	8	29

Quality (CMAQ) funds as a major funding source for these programs. CMAQ funds are primarily used to fund the development and implementation of enabling infrastructure and equipment to provide coordinated timing plans [e.g., global positioning system (GPS) clocks]. Approximately 40% of the respondents indicated that they also use state and local capital or discretionary funds to support their RTSOP. Several states mentioned that they have a transportation tax, a portion of which are dedicated to financing their programs. Table 5 provides a summary of the types of funds agencies reported using to fund their RTSOP.

Other cited sources of funding that are used to develop and operate RTSOPs included:

- State ITS program funds,
- Federal transportation planning funds,
- Metropolitan planning funds, and
- A dedicated transportation sales tax.

Figure 10 summarizes agency responses when they were asked to identify the functions or activities in their program that are funded through formal cost-sharing arrangements. More than one-third of the respondents indicated that they do not have formal cost-sharing agreements; however, the remaining agencies do include various activities in their cooperatively funded functions. Fourteen percent of the agencies responding indicated that formal cost-sharing agreements are used to fund the day-to-day program operations. Fourteen percent of the agencies also indicated that formal cost-sharing agreements are used to support routine and preventive maintenance activities; however, in many cases, these appear to be agreements that are in place to support the maintenance of all traffic signals and not just

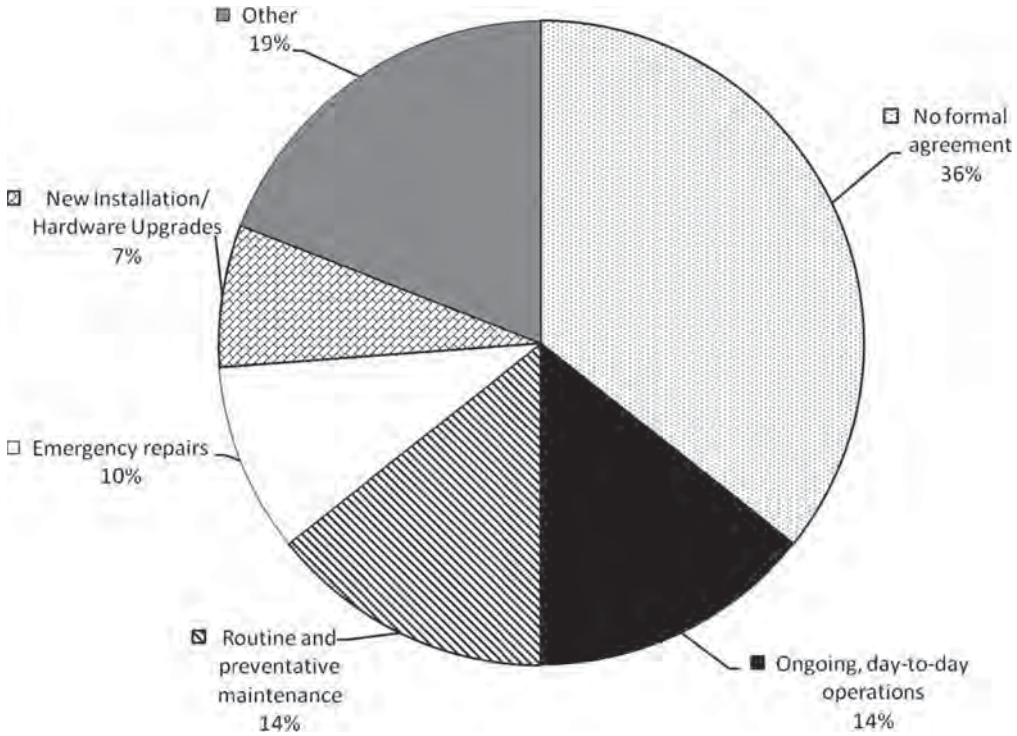


FIGURE 10 Summary of the types of RTSOP functions and activities funded through formal cost-sharing arrangements and agreements ($n = 42$).

TABLE 6
SUMMARY OF RESPONSES INDICATING HOW MAINTENANCE ACTIVITIES ARE SUPPORTED BY RTSOPs

Maintenance Responsibilities	Frequency	Percentage
Each agency is responsible for maintaining its traffic signals to its own standards.	13	50
RTSOP sets the maintenance policies and standards and each agency is directly responsible for maintaining its signals to these standards.	3	12
RTSOP is directly responsible for the maintenance of the traffic signals in the program, regardless of jurisdiction.	2	8
Other	8	31

those included in the programs (e.g., a local or state jurisdiction designated as responsible for operating and maintaining all the traffic signals in the state or region).

Several agencies provided other responses to a question concerning functions and activities funded through formal cost-sharing arrangements. Examples of these responses are provided here.

- All operations of the central control and management are funded through the regional operations center, which consists of federal STP flex, CMAQ, etc., and state match funding.
- There is an 80/20 funding match requirement between sales tax and agency funding of the 20% match for construction and maintenance of regional traffic signal control systems and communications systems. Day-to-day operations and maintenance are the responsibility of the owning agency.
- Operations and maintenance of traffic signals in the state of Pennsylvania is the responsibility of the local governments where they are located.
- If projects will be funded with federal money, localities must participate in the project selection process at the MPO level. The project ranking process is used to prioritize funding, thereby distributing funding resources.
- Jurisdictional member agencies are responsible for their equipment installation, operation, and maintenance. Funding for infrastructure installation (and some operations work) is coordinated through the MPO. Maintenance projects are handled by individual operating agencies. The MPO is typically not involved in maintenance projects.
- With each signal installation there is a participation agreement that addresses maintenance and operations. When a new signal is modernized with local funds the agreement is invoked for cost sharing.

Maintenance

Agencies were asked to select from a list the description that most closely matched how maintenance activities are supported by their RTSOP. Table 6 summarizes their responses. More than half the respondents indicated that each individual agency retains the maintenance of its signals under its RTSOP. Only two agencies indicated that their RTSOP was responsible for performing maintenance activities. Several of the respondents indicated that existing maintenance agreements between the state DOT and the local entities covered the maintenance activities of the program. At least one agency mentioned that maintenance of the central software and communications systems is the responsibility of the RTSOP, whereas the local jurisdictions are responsible for performance maintenance of the field hardware.

Table 7 shows the types of maintenance activities performed by RTSOPs. Again, more than half the agencies reported that routine preventative and emergency maintenance activities were the responsibility of the owning agencies. Approximately one-quarter of the respondents noted that they do regular maintenance activities, such as repairing or replacing detectors, adjusting phase timings, and responding to trouble calls. An in-depth review of survey responses showed that it was generally the same agencies that indicated that they are responsible for all types of maintenance activities. This suggests that if an RTSOP is willing to take on maintenance activities it generally will perform all maintenance functions as opposed to just certain aspects of maintenance (such as just maintaining the coordination timings).

TABLE 7
SUMMARY OF RESPONSES ON THE TYPE OF MAINTENANCE ACTIVITIES PERFORMED BY RTSOPs

Types of Maintenance Activities Performed by RTSOPs	Frequency	Percentage
None, each agency is responsible for performing its own maintenance	15	58
Repairing/replacing defective or malfunctioning detectors	6	23
Trouble calls/call-outs during all hours throughout region	6	23
Trouble calls/call-outs during off-hours throughout region	6	23
Emergency response to knockdowns throughout region	5	19
Re-lamping of signal heads (emergency or routine)	5	19
Preventative maintenance	4	15
Other	10	38

TABLE 8
SUMMARY OF RESPONSES INDICATING METHODS FOR FUNDING OR SUPPORTING MAINTENANCE OF RTSOPs

Methods for Funding or Supporting Maintenance of RTSOPs	Frequency	Percentage
Maintenance activities are not supported/performed through the program. Each agency is responsible for the maintenance of its own signals	14	58
Agency uses cost-sharing arrangement	4	17
Agency uses multiple sources to fund maintenance activities, depending on the type of activity being performed	4	17
Agency uses cost reimbursement agreement	3	13
Other	4	17

In addition to these activities, other types of maintenance activities performed by RTSOPs included the following:

- Preventative maintenance of wireless communications system components,
- Repair and replacement of defective or malfunctioning wireless communications system components,
- Preventative maintenance of central computer system components,
- Repair and replacement of defective or malfunctioning central computer system components,
- Annual testing and certification of conflict monitors,
- Annual railroad preemption inspections,
- Repairs to central or supervisory control and data acquisition systems, and
- Upgrades to communications, including interconnect of any type, included in the maintenance.

Table 8 provides a summary of the methods of funding (or supporting) maintenance activities performed by an RTSOP. Again, more than half of the respondents reported that maintenance activities are supported by local or state entities and not through the program. The remaining respondents indicated that they were about equally split between using cost-sharing arrangements and cost-reimbursement arrangements.

Performance Measurement and Monitoring

Agencies were asked to indicate what types of performance measures they use to assess the effectiveness of their programs. These responses are shown in Figure 11. The most frequently cited responses included corridor travel times or speeds, intersection stops and delays, and *Highway Capacity Manual* level of service. Eighty-five percent of the respondents indicated that they use corridor travel times and speeds as primary measures of effectiveness, whereas 75% indicated that they use intersection stops and delays. These performance measures are probably most appropriate given that the focus of most programs is to improve progression on major commuting corridors or roadways of regional significant importance.

In addition to these measures, some of the respondents indicated that they also used one or more of the following performance measures in assessing the effectiveness of their programs:

- Number of traffic signal malfunctions annually,
- Reduced emissions, and
- Number of traffic signals reviewed for timing plan adjustments.

Agencies were also asked how frequently they produced formal evaluation reports on the effectiveness of their programs.

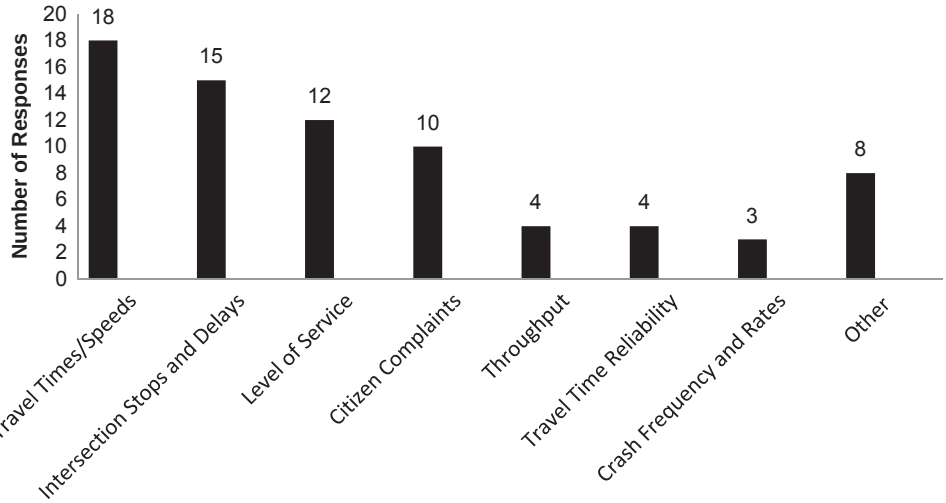


FIGURE 11 Types of performance measures used to assess effectiveness of RTSOP improvements.

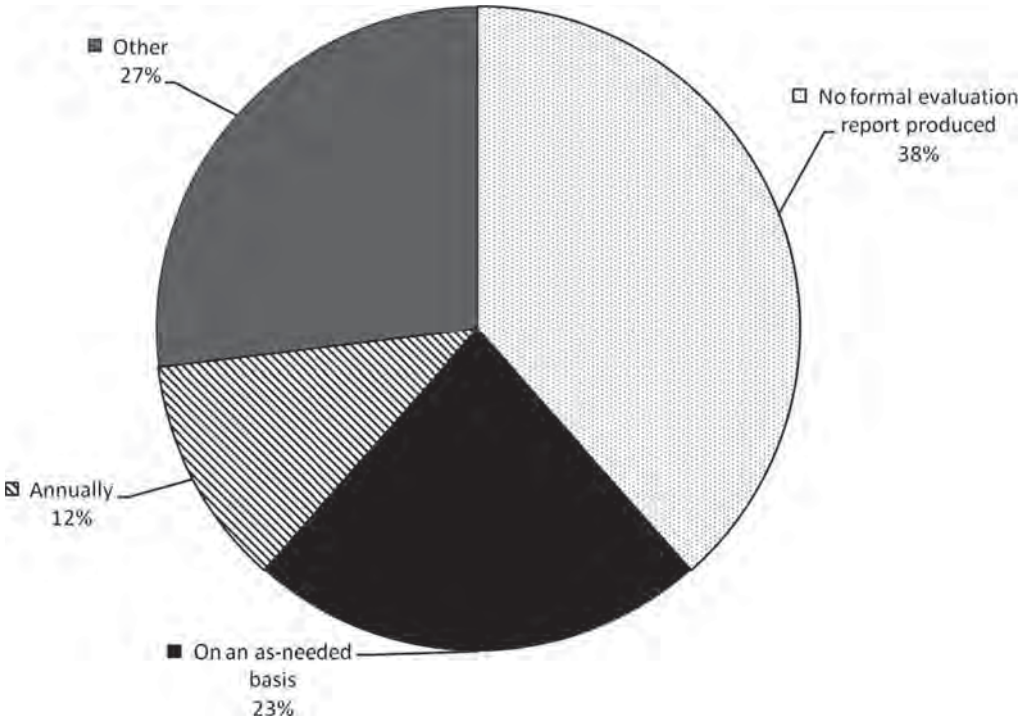


FIGURE 12 Frequency with which RTSOPs produce formal evaluation reports documenting the effectiveness of their programs ($n = 26$).

As shown in Figure 12, 38% of the respondents indicated that they do not routinely produce formal programmatic evaluation reports, whereas 23% reported that they produce performance evaluation reports on an as-needed basis. Many of the respondents indicated that as part of their funding arrangements they are required to produce project evaluations for each signal timing project after it has been completed (a requirement for using CMAQ funds). Several of the respondents, however, indicated that they use before-and-after studies in pilot demonstrations to show agencies the potential benefits of inter-jurisdictional synchronization of traffic signals. Several agencies indicated that these before-and-after studies are considered to be important in generating support for their programs.

Only a few respondents noted that they do annual assessments on the effectiveness of their programs. A more in-depth review of the survey responses revealed that their assessments deal more with the project selection process than with a comprehensive assessment of the program itself.

Outreach and Public Education

Outreach and public education was the final topic area in which agencies were surveyed. Specifically, agencies were asked to indicate how frequently partner agencies meet to discuss regional operational issues. Figure 13 provides a summary of their responses. Forty-five percent of the agencies reported that they meet on a regular basis, either monthly or quarterly. Another 34% of the respondents indicated that they meet on an as-needed basis.

Agencies were also asked to indicate the methods that they use to reach out to the public about the effectiveness of their program. Surprisingly, 43% of the agencies indicated that they do not have a formal method of public outreach concerning their program. Because many of these programs are funding operational improvements for local entities they permit the local entities to claim the credit for the benefits derived by specific improvements. Approximately one-quarter of the survey respondents indicated that they have developed websites and brochures about their programs; however, the target audience of these outreach efforts appears to be directed more toward agencies than the public. Often websites will contain information about calls for projects, project-selection criteria, and other programmatic information. Very few respondents indicated that they do direct outreach (through media interviews, press releases, direct interactions, etc.) about their programs to the public. Table 9 shows how agencies responded to the question on outreach and public education.

Several respondents indicated that they prepare signal timing briefs. These briefs are often prepared for each individual project performed through their program. These briefs are generally prepared at the end of each project and summarize the benefits and effectiveness of the project. Generally, these briefs are prepared for local decision makers and are sometimes distributed through press releases or posted on agency websites. One agency noted that it generates periodic newsletters that cover all the activities associated with that agency. Occasionally, articles will be written that highlight the activities, benefits, and effectiveness of their RTSOP program.

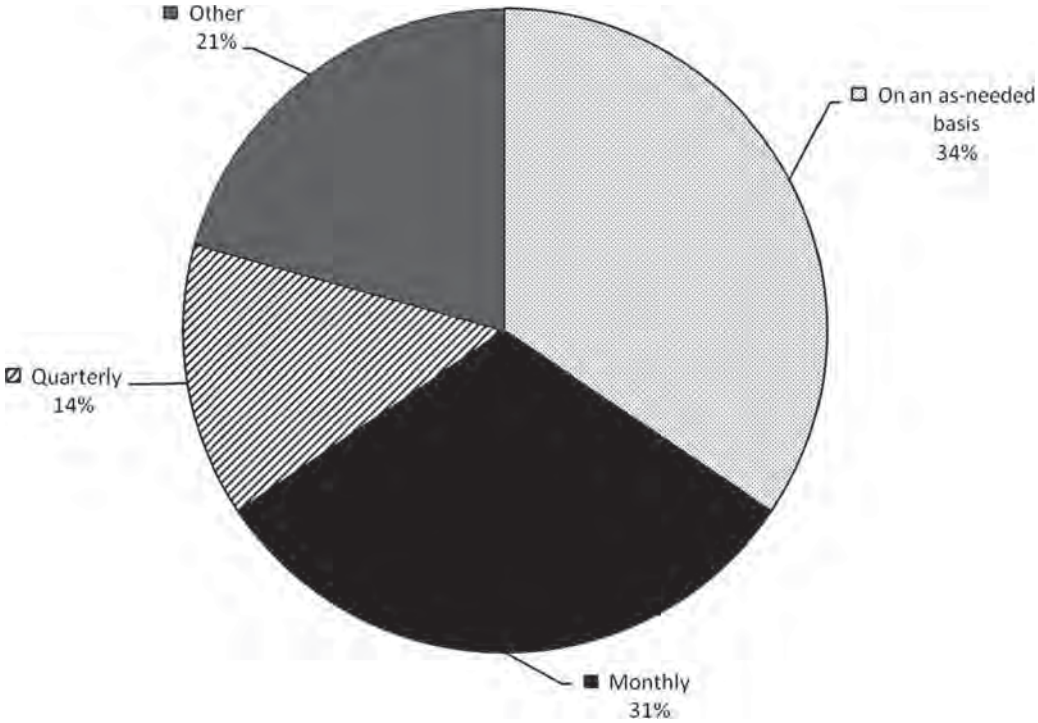


FIGURE 13 Frequency with which partner agencies meet to discuss regional operations issues ($n = 29$).

TABLE 9
COMMONLY CITED METHODS OF PUBLIC OUTREACH AND EDUCATION ABOUT RTSOPs

Methods of Providing Outreach and Public Education about RTSOPs	Frequency	Percentage
None	12	43
Maintain a website	8	29
Developed brochure about programs	6	21
Have a public information officer to support program	5	17
Routinely conduct interviews with local media outlets	4	14
Staff booth at local fair and community activities	4	14
Routinely discuss on local access television program	2	7
Provide public service announcements on radio and television	1	4
Other	11	39

CHAPTER THREE

BUILDING AND FORMING REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAMS

RTSOPs do not appear to have a single best formula for how they begin, evolve, and ultimately sustain themselves. Surveys and interviews revealed some commonalities, but no one formula appears to exist on how to start or develop an RTSOP. However, the one common link among successful RTSOPs appears to be that local relationships among committed stakeholders create the strong foundation required for success. Without a strong commitment to solve problems cooperatively among key leaders and stakeholders a successful regional program cannot be achieved.

A total of 17 entities were interviewed as part of this synthesis:

- Los Angeles Metropolitan Transportation Authority (Los Angeles, California)
- Puget Sound Regional Council (Seattle, Washington)
- Regional Transportation Commission of Southern Nevada (Las Vegas, Nevada)
- Region 4 Oregon Department of Transportation
- Regional Transportation Commission of Washoe County (Reno, Nevada)
- North Carolina Department of Transportation
- Fargo–Moorhead Council of Governments (Fargo, North Dakota)
- Southeast Michigan Council of Governments/Oakland County Road Commission (Detroit, Michigan)
- Southwestern Pennsylvania Commission (Pittsburgh, Pennsylvania)
- Denver Regional Council of Governments (Denver, Colorado)
- Pima Association of Governments (Tucson, Arizona)
- Bay Area Metropolitan Transportation Commission (San Francisco, California)
- Maricopa Association of Governments (Phoenix, Arizona)
- Niagara International Transportation Technology Coalition (Niagara/Buffalo, New York)
- Mid-America Regional Council (Kansas City, Missouri)
- North Central Texas Council of Governments (Dallas–Ft. Worth, Texas)
- Orange County Transportation Authority (Orange, California).

Table 10 shows the attributes (such as the total number of traffic signals, the percentage of traffic signals included in their RTSOP, and the level of maturity of their RTSOP) associated with each of these programs. These attributes can be used to cross reference agency responses with the general size of the program. Summaries of the interviews are found in Appendix C.

Although RTSOPs have been in existence in some regions of the country since the late 1980s, the concept of RTSOPs has gained considerable traction more recently as regions deal with increasing congestion and limited resources. In this chapter, information is provided on the activities and functions performed by RTSOPs that are in addition to simply developing inter-jurisdictional timing plans. In addition, agency roles and responsibilities are discussed and information presented on the common organizational structures used for RTSOPs in the United States. Finally, this chapter will highlight some of the tangible benefits reported by agencies that use an RTSOP framework to deliver more efficient traffic signal system operations.

PARTICIPATING AGENCIES

Most RTSOPs involve a collaboration of multiple partners in a region—all of which may have varying levels of authority and differing perspectives. Table 11 shows the types of agencies commonly participating in a sample of RTSOPs across the United States.

Most frequently the lead agency is the MPO or its equivalent [e.g., a council of governments (COG) or a transportation management authority]. Federal law requires that urbanized areas with populations of 50,000 or more that use federal funds to make improvements to their transportation system have an agency that is responsible for the continuous, coordinated, and comprehensive planning of these improvements for the urbanized area (*2*). One of the primary functions of the MPO is to conduct long-range planning for the metropolitan area, with the planning effort being coordinated across multiple jurisdictions. Therefore, the notion of linking the planning process (and the forum for cooperation and collaboration it offers) to operational activities among agencies and across jurisdictional boundaries is consistent with the purpose and mission of most MPOs. Another reason the MPO is often the lead entity in these programs is related to its role in regional funding of transportation improvements. The MPO typically coordinates the distribution of federal and state transportation improvement funds to local entities and, because of its

TABLE 10
ATTRIBUTES OF RTSOPs INTERVIEWED

Location	State	Lead Organization	Approximate Number of Traffic Signals	Percentage of Traffic Signals in RTSOP	Number of Years RTSOP Operational	Type of Agreements Used
Bend	OR	DOT	168	76 to 99%	>10 years	Project
Buffalo	NY	Governmental corporation	2,000	1 to 5%	1 to 2 years	MOU
Dallas–Ft. Worth	TX	MPO/COG	3,200	25 to 50%	5 to 10 years	Project
Denver	CO	MPO/COG	3,500	51 to 75%	>10 years	Informal
Detroit	MI	MPO/COG	More than 5,000	100%	5 to 10 years	Project
Fargo–Moorhead	ND/MN	City	240	76 to 99%	<1 year	Cooperative Agreement
State of North Carolina	NC	Department of Transportation	8,860	26 to 50%	>10 years	Cooperative Agreement
Kansas City	MO/KS	MPO/COG	6,000	11 to 25%	3 to 5 years	Cooperative Agreement
Las Vegas	NV	MPO/COGs	1,600	76 to 99%	>10 years	Program
Los Angeles County	CA	Transportation authority	4,000	51 to 75%	>10 years	Project
Orange County	CA	Transportation authority	3,200	51 to 75%	<1 year	Project
Pittsburgh	PA	MPO/COG	2,650	100%	1 to 2 years	Project
Phoenix	AZ	MPO/COG	1,200	51 to 75%	3 to 5 years	Project
Reno	NV	MPO/COG	375	100%	3 to 5 years	Project
Seattle	WA	MPO/COG	More than 5,000	51 to 75%	In development	Informal
San Francisco Bay Area	CA	MPO/COG	7,000	25 to 50%	6 to 10 years	Project
Tucson	AZ	MPO/COG	600	100%	6 to 10 years	Project

MPO/COG = Metropolitan Planning Organization/Council of Governments; DOT = Department of Transportation.

TABLE 11
TYPES OF AGENCIES PARTICIPATING IN RTSOPs IN A SAMPLE OF PROGRAMS FROM THE UNITED STATES

Participating Agencies	Region/Area															
	North Carolina	San Francisco Bay, CA	Kansas City, KS/MO	Detroit, MI	Los Angeles, CA	Dallas–Fort Worth, TX	Denver, CO	Orange County, CA	Pittsburgh, PA	Buffalo, NY	Las Vegas, NV	Phoenix, AZ	Tucson, AZ	Reno, NV	Fargo–Moorhead, ND/MN	Bend, OR
MPO	○	●	●	●	○	●	●	○	●		●	●	●	●	●	○
State DOT	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
County DOT	○	○	○	●	●	○	○	●	○	○	○	○	○	○	○	○
Local/Municipal DOT	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○
Private Consultant(s)				○		○		○		●		○		○		
Utilities				○												
Vendors				○												
University														○		

● = Lead agency; ○ = Partner agency.

regional perspective and mission, the MPO can leverage the funding available to ensure that the projects and corridors of regional significance receive adequate attention.

In a number of the RTSOPs, the county DOT may play the role of the agency with the regional perspective. These counties are typically fairly large geographically and encompass multiple jurisdictions (such as Los Angeles and Orange counties in California, and Oakland County in Michigan).

This is not to say that state and local DOTs do not play a critical role in the success of these programs. As planning agencies, MPOs are not typically owners and operators of traffic signal systems. Therefore, the regional RTSOP must rely heavily on the cooperation and collaboration of state and local transportation entities to install and operate the physical equipment in the field [although in some RTSOPs this authority may be (or eventually could be) transferred to an RTSOP entity].

ACTIVITIES AND FUNCTIONS OF REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAMS

The activities and functions performed by different RTSOPs depend on how those programs are structured. Table 12 shows the primary activities and functions performed by the RTSOPs that were interviewed. The most common functions of these programs involved the following:

- Developing traffic signal timing plans to facilitate cross-jurisdictional traffic flow;
- Providing a forum for discussing traffic signal operations' issues in the region;

TABLE 12
ACTIVITIES AND FUNCTIONS PERFORMED IN A SAMPLE OF RTSOPs IN THE UNITED STATES

	Region/Area															
RTSOP Function	North Carolina	San Francisco Bay, CA	Kansas City, KS/MO	Detroit, MI	Los Angeles, CA	Dallas–Fort Worth, TX	Denver, CO	Orange County, CA	Pittsburgh, PA	Buffalo, NY	Las Vegas, NV	Phoenix, AZ	Tucson, AZ	Reno, NV	Fargo–Moorhead, ND/MN	Bend, OR
Develop and maintain a database of traffic signal assets (hardware) for the region	●		●				●	●	●			●		●	●	●
Develop and maintain a database of timing parameters and plans for the traffic signals in the region	●		●	●				●			●		●	●		●
Provide a forum for discussing traffic signal operations issues	●	●		●	●	●	●	●	●	●		●	●	●	●	
Develop traffic signal hardware standards and specifications			●										●			●
Develop standards and specifications for communications hardware			●				●	●		●	●		●		●	●
Develop standards and specifications for controller software			●								●		●		●	●
Provide central monitoring of traffic signal operations from a regional perspective through a single traffic management center	●		●	●	●					●	●		●			●
Provide training/certification for traffic signal technicians and operators			●		●	●		●	●		●	●	●		●	
Develop traffic signal timing plans to facilitate cross-jurisdictional traffic flow	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
Facilitate the deployment and implementation of transit signal priority	●		●		●		●	●	●		●		●	●		
Facilitate the deployment and implementation of incident management traffic signal timing plans	●		●			●	●	●		●		●	●	●	●	
Facilitate the deployment and implementation of regional traffic signal timing plans for severe weather	●									●			●		●	
Provide outreach to the public and decision makers	●		●			●	●	●	●		●	●	●	●	●	●
Provide consistency in signal timing practices between agencies (i.e., clearance intervals, intersection configuration, pedestrian timings and policies, etc.)	●		●				●	●	●		●	●	●	●	●	●
Provide a single point of contact for reporting and responding to citizen complaints and concerns about traffic signal timing	●										●	●		●		●
Provide travel information to travelers and commuters	●							●		●	●				●	
Identify and establish priorities, corridors of significance, performance goals and measures, etc., for the region's traffic signals	●	●	●		●	●		●	●	●	●	●	●		●	
Facilitate the deployment of advanced traffic management concepts and control strategies, such as adaptive traffic signal control and integrated corridor management	●	●			●	●		●	●	●	●		●	●	●	●

- Identifying and establishing priorities, corridors of significance, and performance goals and measures of the region's traffic signals;
- Facilitating the deployment of advanced traffic management concepts and control strategies (such as adaptive traffic signal control, integrated corridor management, etc.);
- Providing consistency in signal timing practices between agencies (i.e., using similar clearance intervals, phasing patterns, pedestrian timings, etc.); and
- Providing outreach to the public and decision makers.

Developing Inter-Jurisdictional Timing Plans and Coordination

It appears that the primary need satisfied by most RTSOPs is in the development of regionally coordinated traffic signal timing plans for arterials that cross multiple jurisdictions. Therefore, those activities generally associated with developing these timing plans are supported financially directly or indirectly through these programs. As the roles and responsibilities for traffic signal operations differ from region to region, who is eligible to develop these timing plans can vary by location. In some RTSOPs, program funds are used to provide financial support to in-house (MPO) staff or consultants, whose responsibility it is to develop, implement, operate, and maintain regional traffic signal operations. Other RTSOPs use program funds to implement timing plans by allocating resources to local agencies. Other programs use funds to contract with outside consultants to develop regional plans that are then implemented by the owning agencies in identified corridors. It appears that the responsibility for developing the signal timing plans is highly dependent on the size of the region, maturity of the program, level of deployment of other traffic management functions and capabilities in the region, and level of in-house expertise available to the local partner agencies.

Facilitating Regional Traffic Signal Operations Forums

Almost every RTSOP currently in operation in the United States has some type of regional oversight committee or forum where local agency partners can discuss traffic signal timing and operational issues of regional importance. Their form may be either ad hoc or formal, but their general purpose is to permit an open and free exchange of information related to regional operational issues. These committees, usually composed of director-level staff from local agencies, are typically responsible for generating a concept of operations for operating traffic signals with a regional perspective (including a vision and goals), establishing criteria for selecting projects, and developing consensus on regionally acceptable technical issues, including equipment, communication, and operational standards.

Many of the traffic signal operations' programs offer additional subcommittees or forums to address more specific or technical issues, including the following:

- Traffic signal timing principles and practices;
- Recent developments in controller, communications, detection equipment, and technologies;
- Resources and training;
- Standards development and standardization benefits;
- Communications and system integration issues;
- Performance measuring and monitoring; and
- Inter-jurisdictional coordination and control.

These forums are typically where RTSOPs evolve for a region over time. Regular meetings of these committees are deemed critical in generating consensus and building strong working relationships between regional entities.

Providing Funds for Traffic Signal Operations Projects of Regional Significance

One of the primary functions of RTSOPs is to provide a collaborative environment so that funds to develop and implement coordinated timing plans on roadways of regional significance are championed and allocated by numerous groups and agencies on a regional basis. Generally, the timing plans generated are based on time-of-day, peak and off-peak, and focused on providing a progressive flow of traffic across jurisdictional boundaries. Other improvements encouraged and promoted by RTSOPs can vary significantly from location to location, depending on their scope. In addition to establishing timing plans, most RTSOPs will encourage funding allocations to agencies to purchase equipment and deploy intersection infrastructure necessary to allow more efficient regional coordination between multiple jurisdictions. Examples of the types of improvements commonly eligible for funding under RTSOPs include the following:

- Installation of or improvements to communications systems and infrastructure that support regional coordination and monitoring;
- Installation of universal timing devices (such as GPS clocks) that permit the accurate synchronization of controller time;
- Replacement of existing traffic signal controllers that are not compatible with or capable of providing coordinated operations with other equipment or protocols in the corridor;
- Addition of limited intersection signing and/or pavement markings needed to implement more efficient, progression-friendly intersection phasing;
- Installation of additional vehicular signal heads and other indications needed to permit improved intersection safety and coordination efficiency;
- Replacement or modification of vehicle detection 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; and
- Removal of existing signal indications or entire traffic signals that are no longer warranted within the corridor.

Examples of the types of improvements generally *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; and
- Addition of new sidewalks, pedestrians' ramps, and other pedestrian features.

OPERATIONAL CONCEPTS

Table 13 shows the different operational concepts currently being used by RTSOPs in the United States. These broad operational concepts present the context in which the major roles and responsibilities of the various partner agencies are defined in operating their RTSOPs, which is also important in defining the organizational structure of the RTSOP. A discussion of each of the concepts of operations is provided here.

Local Collaboration

One concept of operation used with RTSOPs in the United States is one in which the lead entity in the region serves as only the funding source for the developing regional traffic signal operations. In this instance, the regional entity (usually an MPO, but it could also be a state or county DOT) provides little direct influence over the technical activities and functions of the program, particularly with respect to the development of inter-jurisdictional coordinated signal timing schemes. Instead, the lead regional entity provides only funding and administrative oversight and does not provide any technical expertise in the development of regional timing plans. The local operating agency retains full and complete responsibility for collecting the field data needed to develop timing plans, implement the timing plans, and conduct before-and-after evaluation of the improvements. In addition to developing and installing regional timing plans, the local agencies are responsible for performing both routine and emergency maintenance on the traffic signal and communications infrastructure. Figure 14 provides an illustration of an operational concept.

This operational concept is generally used when the local entities have a fairly high level of expertise and experience dealing with traffic signal operations. These local entities may also already have traffic management centers through which they operate their traffic signals, and they may be looking for funding sources to upgrade communications and/or intersection controller equipment in the region.

The RTSOP operated by the Los Angeles County Department of Public Works (*3*) and the North Carolina DOT (NCDOT) (*4*) are examples of systems using this concept of operation. With both of these systems, the lead entity is responsible for providing funds to make improvements. Los Angeles County uses this approach to fund improvements where local entities already have operational traffic

TABLE 13
OPERATIONAL CONCEPTS USED IN SELECT RTSOPs IN THE UNITED STATES

Operational Concept	Region/Area															
	North Carolina	San Francisco Bay, CA	Kansas City, KS/MO	Detroit, MI	Los Angeles, CA	Dallas–Fort Worth, TX	Denver, CO	Orange County, CA	Pittsburgh, PA	Buffalo, NY	Las Vegas, NV	Phoenix, AZ	Tucson, AZ	Reno, NV	Fargo–Moorhead, ND/MN	Bend, OR
Local Collaboration	●			●	●											●
Regional Recommended Timings		●				●						●	●	●		
Shared Control					●		●		●							
Regional Coordinated Monitoring					●			●							●	●
Full Regional Control			●	●						●	●					

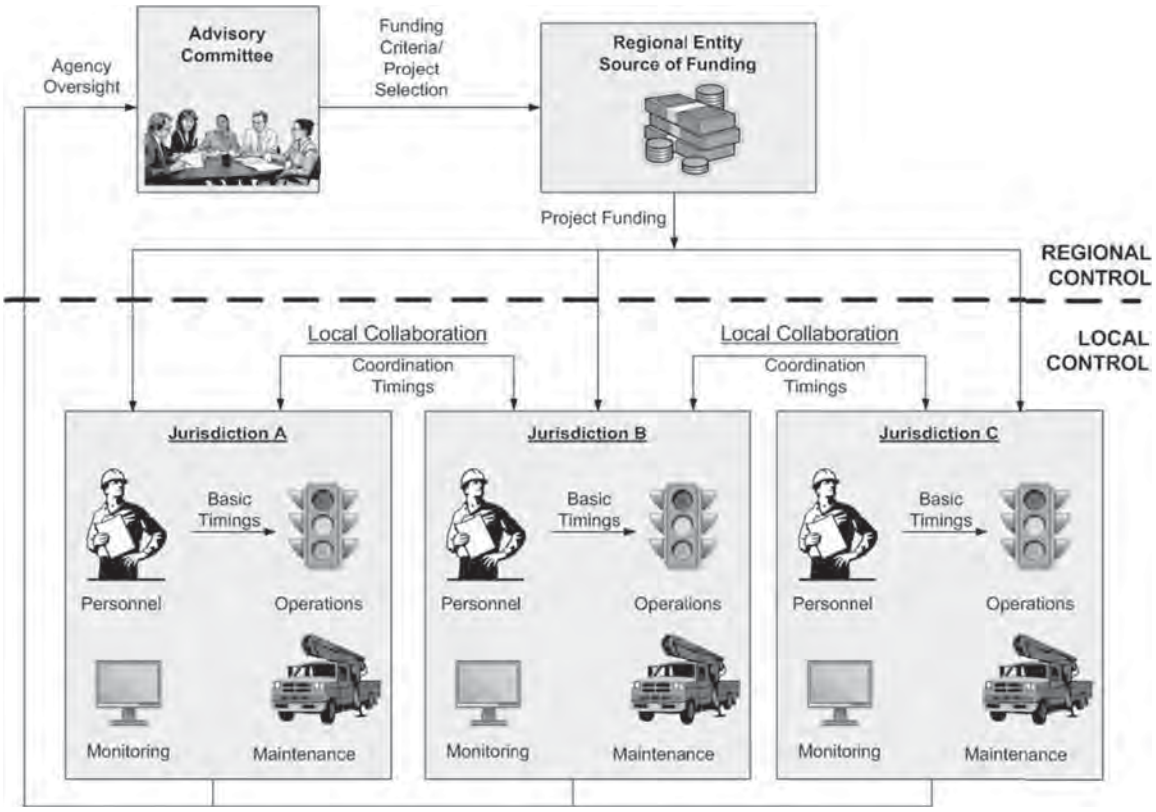


FIGURE 14 RTSOP operational concept—Local Collaboration.

management centers and high levels of on-staff or contracted technical expertise.

Regional Recommended Timings

Another common concept of operation for RTSOPs in the United States is one in which the lead entity is responsible for hiring a local consultant to develop regional timing plans for the local operating agencies. Generally, the process begins with a call for projects being issued by the regional entity. Local agencies submit applications to the regional entity defining specific projects to be performed by the regional entity. Projects are evaluated by the regional entity and/or a project selection committee to ensure that RTSOP goals and objectives are addressed. Once a project is selected by a project selection committee, the regional entity assigns a consultant to the project. The consultant, working with the local entities that submitted the application, is responsible for collecting and analyzing all information necessary for developing optimal traffic signal timings. This might include verifying existing actuated controller settings, collecting traffic volume counts, verifying intersection geometry, collecting before-and-after travel time and delay studies, and developing traffic signal optimization and/or simulation models. Using this information, the consultant is responsible for developing recommended traffic signal timing plan strategies. These recommendations may include optimal initial and actuated controller settings, time-of-day coordination plans and hours of coordinated operations, and/or transit signal priority plans and hours of operations, if applicable. The consultant may also be tasked with an assessment of communications' requirements and strategies for maintaining coordination between multiple agency systems. An illustration of this operational concept is shown in Figure 15.

Generally, the local operating agencies will retain the authority to review and approve signal timing recommendations or request modifications. In some regions, the consultant is responsible for implementing new timing plans into field controllers, whereas in other regions the local agencies complete that task with their staff. Depending on the region, the consultant may be responsible for fine-tuning controller settings based on post-implementation field observation or may assist agency staff in fine-tuning the settings. It is typically the consultant that is responsible for conducting travel time and delay studies and documenting the results in an evaluation report.

Under this operational concept, local agencies are typically not restricted to making modifications to timing plans after they have been implemented, and local agencies retain their responsibilities for operating and maintaining their traffic signals.

This type of concept of operation (or a slight variant) is used in a number of regions, including in the San Francisco

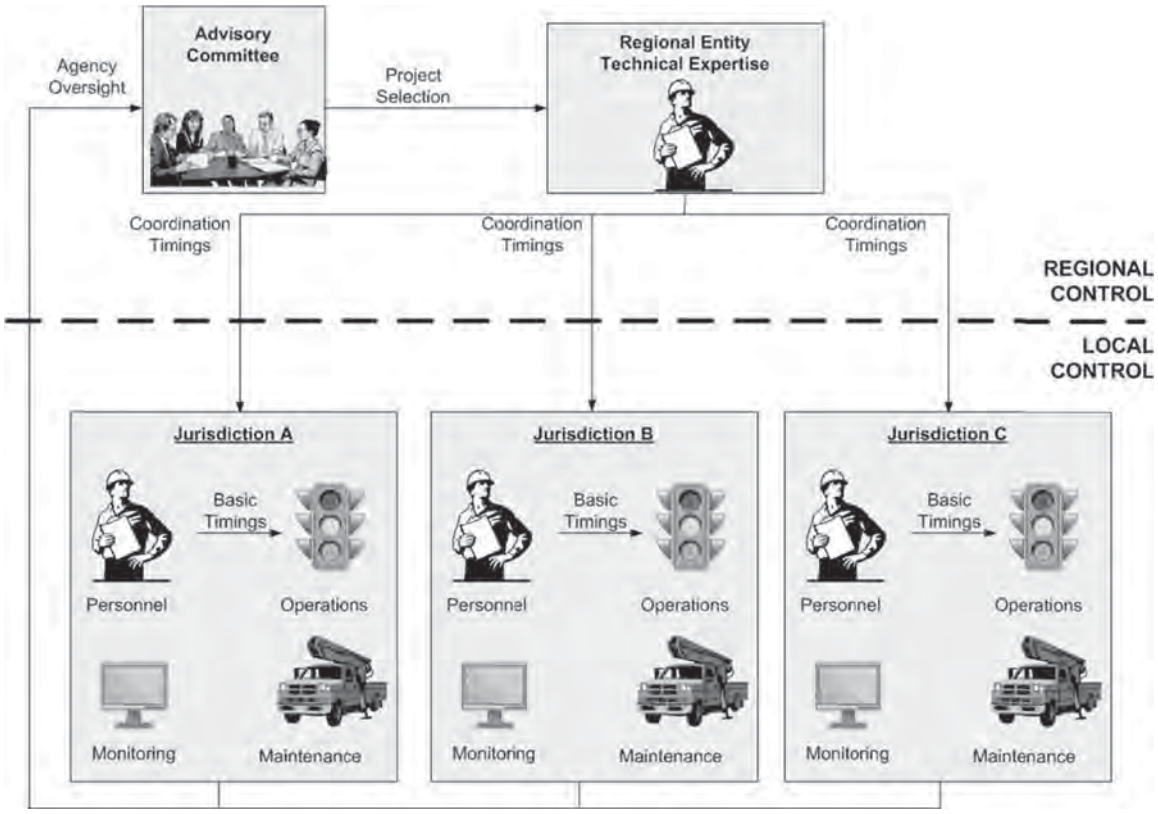


FIGURE 15 RTSOP operational concept—Regional Recommended Timings.

Bay area (*5*,*6*), Maricopa in Arizona (*7*), and the Dallas–Fort Worth metropolitan area in Texas (*8*). Because there is funding required of the local agencies, no formal project agreement is required between the RTSOP regional lead and the local agency. The regional entity is responsible for paying for the consultant's services. Any additional services required of the consultant or for equipment purchases are generally negotiated between the consultant, any vendors involved, the lead RTSOP entity, and the local agency.

One advantage of this operational concept is that local agencies do not have to hire the consulting firm—this is the responsibility of the regional entity. Under this organizational structure, the regional entity is responsible for: (1) obligating the funds required to perform the contract, (2) contracting with consultants to develop the timing plans, (3) approving contract deliverables, and (4) paying the invoices of the consultants.

In some programs, local agencies may be required to waive any claims against the RTSOP lead agency for any loss, liability, or damages resulting from the deployment of the signal timings. Local agencies may also be required to indemnify the regional entity against any and all third-party claims that may result from the agency's participation in the program. Consultants are also required to maintain liability, general commercial, and other insurance policies with the public agencies as additional insured parties.

Shared Control

Figure 16 provides an illustration of a Shared Control operational concept for an RTSOP. This operational concept is similar to the Regional Recommended Timings operational concept, except that under this concept, the regional entity (or its consultant) is responsible for both developing and implementing inter-jurisdictional timing plans for high-priority corridors. As with the previous model, local agencies will generally submit an application for one or multiple corridors that would benefit from inclusion or modification in the RTSOP program. After a review of the application, the regional entity, usually with the assistance of an oversight committee, will select projects deemed to be of regional significance. Once selected, the regional entity will work closely with the local agencies to develop multi-jurisdictional coordination schemes on the various corridors. Usually these traffic signal timing plans provide time-of-day/day-of-week coordination. The RTSOP lead agency develops these timing plans using operational constraints established by each local entity (i.e., vehicle and pedestrian clearance intervals, pedestrian walk times, local phase sequencing patterns, etc.). In contrast to the Regional Recommended Timings operational concept, once implemented in the Regional Directed Timings, local entities are restricted from making modifications to the coordination timings for a specified period of time and/or can only change the coordination timings with permission of the RTSOP lead agency and the other affected local agencies.

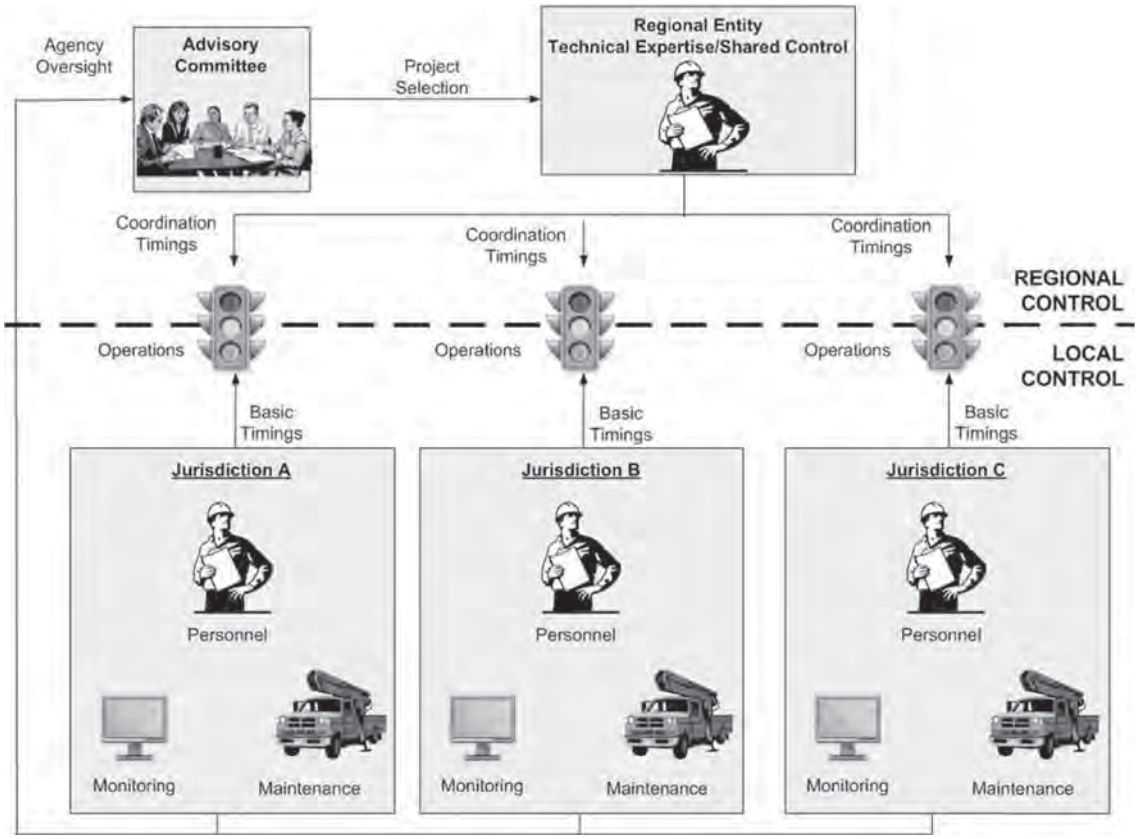


FIGURE 16 RTSOP operational concept—Shared Control.

In this concept, the RTSOP lead agency does not typically provide any real-time monitoring of corridor operations but leaves that function to the local agencies. The local agencies retain the responsibility for providing all levels of maintenance at the intersection, including maintaining the communications system needed to provide regional coordination (if provided).

The Southwestern Pennsylvania Commission (SPC) uses this concept for improving multi-jurisdictional traffic signal operations in the ten-county region around Pittsburgh (*9*). SPC provides funding and technical assistance to local agencies to develop optimized signal timing plans and to install low-cost communication systems to enable or improve coordination between adjacent jurisdictions. Although the local entities retain overall maintenance responsibilities, the funding agreement specifies that local entities are restricted from making modifications to the coordination timing plans for two years without first notifying the SPC and the adjacent signal operators.

A similar arrangement is used by Los Angeles County in instances where local entities elect to retain operational and maintenance control of their traffic signals (*3*). Under its RTSOP, Los Angeles County develops regional timing plans designed to provide coordination between local entities. As part of the application process for securing funds from the Los Angeles Metropolitan Transportation Authority, local entities must agree to implement the timing plans developed by the county and refrain from modifying those timings for two years, unless they receive prior approval from the county and the other adjacent jurisdictions.

Regional Coordinated Monitoring

With the Regional Coordinated Monitoring concept, the RTSOP lead agency is not only responsible for developing and implementing the timing plans, but also may provide real-time monitoring of the traffic signal operations. The regional entity is likely to have a central control center where information about the status of arterial operations is monitored. Operators in the control center monitor current traffic operations and identify (either manually or using decision-support tools) options for minor adjustments to the signal timing patterns. The regional entity may also have the authority to implement special timing plans for atypical operational scenarios (such as incidents, inclement weather, or special events). Generally, these timing sets are special coordination plans developed in advance specifically for certain events. They are created in cooperation with the local agencies and stored locally in the field equipment by each respective local agency. Figure 17 illustrates this operational concept.

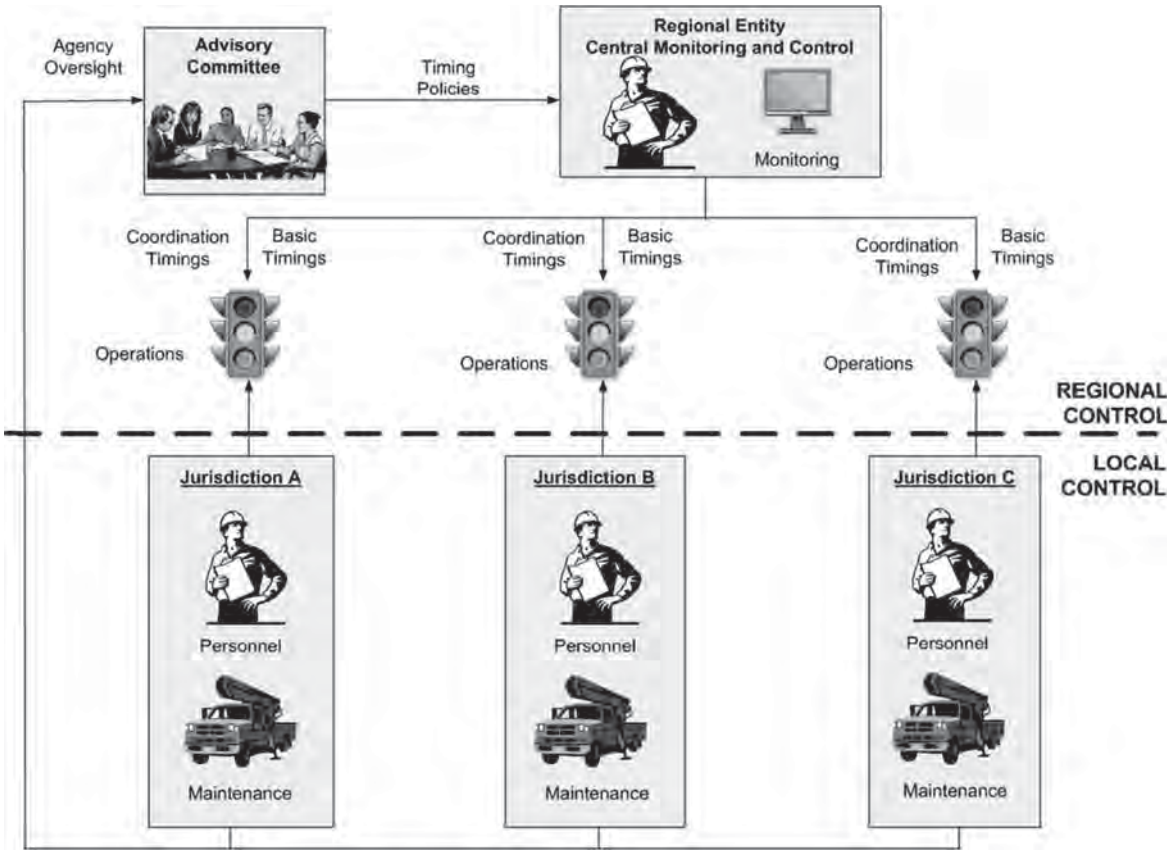


FIGURE 17 RTSOP operational concept—Regional Coordinated Monitoring.

With this concept, the local agencies remain responsible for performing routine and emergency maintenance functions; however, the RTSOP lead agency is likely to remain responsible for maintaining communications infrastructure and the computer systems needed to monitor signal operations across participating jurisdictions.

This type of concept of operation is also used in Los Angeles County (*3*). Some local agencies in the county do not have the resources or the technical expertise to operate their signals. Local agencies have the option of yielding operational control of their signals to the Public Works Department of Los Angeles County. The county has developed software called the Information Exchange Network, which allows local entities to exchange traffic signal data from different control systems (*10*). This system allows participating agencies to share signal status and arterial congestion conditions among traffic control agencies in the county. The software also allows an agency to grant limited control of their field devices to another agency.

This type of operation is also used to administer many of the traffic signals in the Salt Lake Valley in Utah. Many of the traffic signals in the cities of Salt Lake, Orem, and Provo are operated jointly by the Utah DOT (UDOT) through its traffic operations center. What makes this arrangement work in Utah is that in many of the major metropolitan areas, UDOT is responsible for operating the traffic signals on state system roadways, even though they may be located within municipal limits. The local agencies retain operation and maintenance responsibility for traffic signals within their own jurisdictions, which often parallel state-maintained facilities. To operate the traffic signals in its system, UDOT installed fiber optic communications and upgraded the traffic signal equipment at its intersections. Through handshake agreements, UDOT also upgraded the communications and control equipment on several of the corridors under local agency control to achieve interoperability. Current traffic signal operations data are brought back to UDOT's traffic operations center. UDOT developed timing plans that coordinate operations across jurisdictional boundaries for both normal and incident conditions. UDOT operators monitor the status and operations of the traffic signals and make fine-tuning adjustments to operations within specific, agreed-upon guidelines on state and local corridors. During incident conditions, operators can also deploy predetermined timing plans designed to facilitate traffic flow on designated detour routes. The UDOT cooperative arrangement was developed and deployed without formal agreements.

Full Regional Control

As illustrated in Figure 18, Full Regional Control involves the transfer of operations over to a single regional entity.

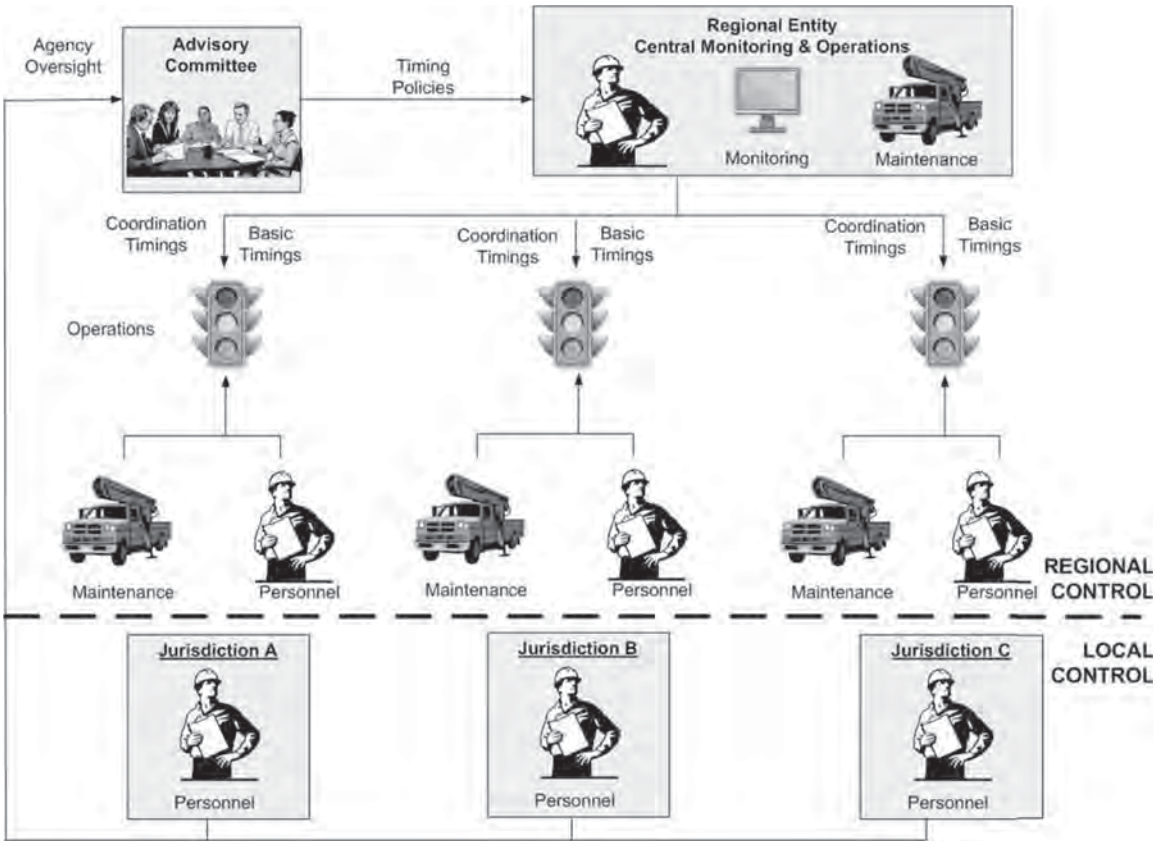


FIGURE 18 RTSOP operational concept—Full Regional Control.

Under this concept, local agencies elect to consolidate some (or all) traffic signal operations and/or maintenance functions under a single agency responsible for the region. This entity could be one with a tradition of operating with a regional perspective (such as a county or state DOT) or it can be a new entity formed specifically to perform traffic management functions (this is the case with those systems operated through an MPO). Under this concept, traffic signal maintenance functions (preventative maintenance as well as emergency repairs) often remain with the local entities; however, maintenance of communications systems, central processing systems, and control center software becomes the responsibility of the RTSOP lead entity.

In Clark County, Nevada, the Freeway and Arterial System of Transportation (FAST) is a regional transportation management center that performs both freeway and arterial management functions (*11*). Under the FAST arrangement, the cities of Las Vegas, North Las Vegas, and Henderson, as well as Clark County, agreed to combine all traffic signals in the greater Las Vegas metropolitan area (including those owned by the Nevada DOT) into a single integrated organization. The system is operated by the Regional Transportation Commission (RTC) of Southern Nevada. The RTC is an independent agency and serves as the MPO for the region. RTC staff is responsible for developing and monitoring all traffic signal timing plans from the FAST center. During normal operations, traffic signal systems operate in a time-of-day mode with seven different time-of-day coordination timing schemes. During incident conditions, operators in the control center are responsible for implementing new timing plans to accommodate shifts in demand. The RTC is also responsible for maintaining all central management and communications aspects of field devices, whereas the local entities retain preventative and emergency repair responsibilities for the traffic signal infrastructure.

Operation Green Light, in the Kansas City metro area, is another example of an RTSOP with regional operational control (*12,13*) All signal timings on select corridors in the system are coordinated by the Mid-America Regional Council (MARC) through the Kansas City Scout Traffic Operations Center. Working with federal, state, and local agencies, the MARC staff develops and implements (with owning agency approval) traffic signal timing plans on select corridors of regional significance. Timing plans include both normal time-of-day timing plans and special timing plans to be used during incident conditions. When an incident is detected on, or nearby, a corridor, MARC staff may manually change the signal timing pattern to one that is specifically designed (and agreed on by the local agencies) to accommodate different traffic flows during incident conditions. The local entities, working with MARC, determine under what conditions the incident time plans can be implemented; however, once

an incident response plan has been implemented, MARC is responsible for notifying affected agencies. After the incident has cleared, MARC is responsible for returning the traffic signals back to normal schedules. Each member agency is responsible for all maintenance associated with the traffic signal infrastructure and control system, whereas MARC is responsible for maintaining the communications systems and central control center software.

Hybrid Control

In some cases, RTSOPs use a mixture of the previously discussed operational concepts. In Los Angeles County, for example, local operating agencies have different resources and technical capabilities. Some local agencies are well funded and have highly qualified staff members that can operate and maintain their traffic signal systems themselves, whereas other agencies may not have the financial resources or technical expertise needed to adequately operate and maintain inter-jurisdictional traffic signal timings. Smaller cities that do not have the technical expertise and financial resources to operate and maintain the traffic signals in high-priority corridors can request that the county take over the full operational and maintenance responsibilities of their signals. In these circumstances, the county will develop coordination schemes and operate the traffic signals from its control center. For those agencies that want to retain their operating autonomy, the county will be responsible for developing the inter-jurisdictional timing plans, but the local agency will retain the responsibility for implementing and maintaining the new traffic signal timings. Local entities are restricted from making modifications to the regional coordination timing plans without prior notification and approval by the county and adjacent jurisdictions.

COMMON ORGANIZATIONAL STRUCTURES

A review of some of the existing programs being used in the United States revealed that several organizational structures exist and the type of organizational structure in a region varies significantly depending on a number of factors, including the following:

- The local goals and objectives for regional traffic operations,
- The size and number of local entities in a region,
- The type and amount of funds available to the region for addressing operational issues,
- The presence of a strong regional entity (e.g., a MPO, regional transportation authority, COG, or a county transportation entity),
- The existing level of cooperation and collaboration between local entities in the region,
- The existence and use of other advanced traffic management systems (i.e., freeway management/ITS centers) in the region, and
- The degree of local knowledge and expertise present in the local operating agencies in the region.

Table 14 provides a summary of common organizational structures used with RTSOPs in the United States.

TABLE 14
ORGANIZATIONAL STRUCTURES OF RTSOPs IN THE UNITED STATES

RTSOP Organizational Structure	Region/Area															
	North Carolina	San Francisco Bay, CA	Kansas City, KS/MO	Detroit, MI	Los Angeles, CA	Dallas–Fort Worth, TX	Denver, CO	Orange County, CA	Pittsburgh, PA	Buffalo, NY	Las Vegas, NV	Phoenix, AZ	Tucson, AZ	Reno, NV	Fargo–Moorhead, ND/MN	Bend, OR
DOT technical staff takes the lead on program goals and priorities and works with the local agency staff on an ad hoc basis																●
A separate, stand-alone committee comprised of traffic signal engineers and decision makers from the public entities makes technical decisions for RTSOP. Local agencies retain responsibility for daily operations	●														●	
DOT technical staff assumes control of local agency systems. Technical staff is responsible for daily operations of regional signal system				●	●			●								
Independent agency, such as an MPO, provides assistance and technical expertise to agency staff on daily operations. Local agencies assist with selecting projects for funding and provide administrative oversight		●				●			●			●	●			
RTSOP is run through an independent agency, such as an MPO. The program is managed by an executive director or program director. Technical staff is responsible for daily operations of regional signal system			●				●			●	●			●		

Informal Coalitions and Collaborations

With this organizational structure, no formal regional transportation signal operations program exists. Instead, agencies build on existing relationships and levels of trust to collectively develop, implement, and operate the traffic signals from a regional perspective. Although each agency retains the overall responsibility for operating and maintaining the traffic signals within its own jurisdictions, the local partners work collaboratively to develop timing plans and deploy infrastructure that promote regional coordination of traffic signals. In many of these cases, no formal agencies exist between operating entities. Instead, local agencies, through strong interpersonal relationships, form a loose coalition in which regional operational decisions are made. Generally, with this type of organizational model, each agency retains the responsibility for operating and maintaining the traffic signals within its respective jurisdiction.

Formal Organizational Structure

Many of the locations where the local entities have elected to consolidate operational control under a single regional entity have a more formal structure. Generally, these formal organizational structures are established by MOUs or by cooperative agreements.

Figure 19 shows an example of the organizational structure used to operate the FAST program in Las Vegas (*14*). In FAST, the local entities have agreed to consolidate all of the traffic signals in the region under the control of the RTC of Southern Nevada. FAST has two primary functions: arterial traffic management and freeway traffic management; therefore, the administrative structure has been established to support both functions. The organizational structure follows the general organizational structure of most MPOs, where there is a policy board composed of high-ranking elected or appointed decision makers responsible for establishing transportation policy for the region and a technical committee (in this case the Operational Management Committee, or OMC) responsible for providing technical input to the policy board. The OMC is comprised of:

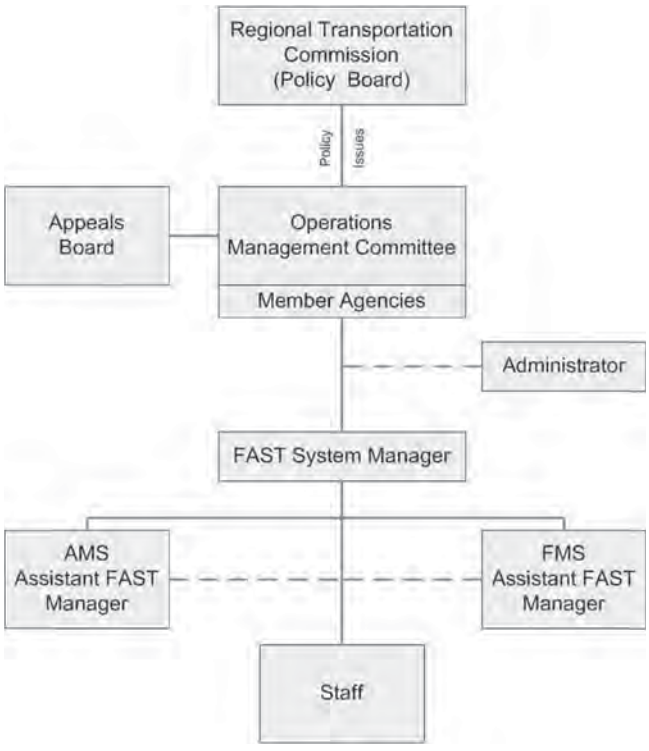


FIGURE 19 Organizational structure of the Freeway and Arterial System of Transportation (FAST) in Las Vegas, Nevada (*14*).

- The director/assistant director(s) of public works from Clark County,
- The director/assistant director(s) of public works from the city of Henderson,
- The director/assistant director(s) of public works from the city of Las Vegas,
- The director/assistant director(s) of public works from the city of North Las Vegas,
- The deputy directors(s) and deputy director/assistant director for operations or District I engineer of the Nevada DOT, and
- The general manager of RTC.

The primary role of the OMC is to provide instructions and direction to the FAST manager on policy issues, establishing other operational procedures and policies, and monitor the various aspects of the FAST system. The OMC is also responsible for developing a funding policy and funding requirements to support the operational and maintenance requirements of FAST. The OMC also assists the FAST system manger in developing traffic management strategies for freeways and arterials under control of FAST. The FAST system manager is an employee of the RTC and is responsible for daily operations of the FAST system, including supervision of the FAST staff, system operations and maintenance activities, addition of transportation management or ITS field devices, development of freeway and arterial street traffic management strategies, and preparation of an annual operating and maintenance budget. FAST staff includes professional, technical, and administrative support personnel who are also employees of the RTC.

BENEFITS OF REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAMS

The goals of most RTSOPs are to generate reductions in travel times and delay with a subsequent improvement in arterial travel speed and reduction in vehicle emissions. Some of the reported benefits achieved in mature RTSOPs in the United States include:

- At the conclusion of its first phase of improvements in 1995, Los Angeles County reported on the benefits of

TABLE 15
ESTIMATED BENEFITS OF NCTCOG'S THOROUGHFARE ASSESSMENT PROGRAM PHASE 2.0 (*15*)

Performance Measures	Estimated Benefits
Average Travel Time Savings	• 8.7% overall reduction in travel time • More than 280 vehicle-minutes or 4.7-hours reduction per weekday
Reductions in Stops	• 22.7% overall reduction in number of stops • More than 300 vehicle-stops reduced per weekday
Synchro™ Measures of Effectiveness	• Total signal delay reduced by 20.7% • Fuel consumption reduced by 19.1% – Reduction of 64,000 gallons per weekday • Emissions reduced by 12.9% – CO reduction of more than 3,500 kg per day – NOx reduction of more than 680 kg per weekday – VOC reduction of more than 800 kg per weekday
Estimated Economic Benefits	• Estimated user benefits of more than $389,000 per weekday • Annual savings of approximately $97 million

its Traffic Signal Synchronization Program (*3*). A typical project funded through the program involved upgrading all the traffic signals along a route to keep the signals synchronized, placing vehicle detectors in the pavement to detect the presence of vehicles, coordinating the timing of the signals between successive intersections, and automatically adjusting the traffic signals to facilitate the movement of vehicles through the intersections. During the first phase, a total of 39 routes and 780 signalized intersections along 220 miles of streets in 58 cities and unincorporated areas were improved at an estimated cost of $17 million. Estimates show that this program has saved motorists, on an annual basis, $218 million in vehicle costs, 14.8 million travel hours, 18.7 million gallons of fuel, and 7,700 tons of pollutants. Travel times have been reduced by as much as 24% to 29%.

- To garner support for its program, Orange County conducted two demonstration projects: one on Euclid Street (synchronizing 62 traffic signals on a 15-mile-long route through six different cities), and another on Oso Parkway/Pacific Park Drive (synchronizing 34 signals on 8 miles of suburban arterial roadways in five cities and unincorporated areas of Orange County) (*15*). A before-and-after evaluation showed that the Euclid project resulted in a 20% improvement in travel times and a 41% reduction in stops. The Oso Parkway/Pacific Park project netted similar results: a 30% improvement in travel times and a 50% reduction in stops.
- Similar improvements were reported for the North Central Texas Council of Government's (NCTCOG) resynchronization program (*16*). Table 15 shows the estimated total benefits accumulated for the improvements performed in the Dallas–Fort Worth Metroplex region by NCTCOG. In this project, a total of 482 traffic signals were synchronized on 140 miles of arterial roadways that cross through eight different cities, and two Texas DOT districts were subject to retiming.

RTSOPs can also generate significant improvements in air quality. For example, Table 16 shows the air quality benefits that have been derived by the Denver Regional Council of Governments (DRCOG) from 2006 to 2010 through its RTSOP (*17,18*). Similarly, the SPC reported that a reduction in total emissions of 26.2% was calculated based on the reduction in fuel consumption (*19*).

Other qualitative benefits of RTSOPs cited included:

- Operating agencies can achieve increased access to any funding set aside specifically for making operational improvements in the region. In these cases, traffic signal timing projects are not individually required to compete directly against capacity-enhancement projects for limited regional dollars, but may compete as a group.

TABLE 16
ESTIMATED ANNUAL AIR QUALITY BENEFITS DERIVED BY DRCOG THROUGH RTSOP (*17,18*)

Fiscal Year	Cumulative Emission Reduction for All Projects (lb/day)	Average Emissions Reduction per Project (lb/day)	Minimum Project Reduction (lb/day)	Minimum Project Reduction (lb/day)	Number of Projects per Fiscal Year
2010	1,285	183.6	55	382	7
2009	9,353	414.7	34	1,602	24
2008	1,445,250	525.7	75	1,334	11
2007	1,358,422	518.2	116	1,515	12
2006	3,776,000	737.2	61	5,670	22

- Through collaboration with neighboring entities, agencies can leverage their technical expertise, resources, and existing institutional arrangements to advance larger, more technically advanced projects for the region.
- Participating agencies can implement real solutions that have tangible impacts on regional congestion reduction and environmental goals.
- Agencies can leverage reduced project costs and shorten implementation time frames by sharing common communications and infrastructure assets.
- Agencies can reduce operating and maintenance costs by leveraging and sharing personnel and equipment common to the region.
- Agencies can leverage limited training and professional development funds to develop and retain local in-house expertise in traffic signal system operations.
- Local agencies can develop and implement alternative signal operations plans and strategies that facilitate diversion routing and traffic flows during freeway and arterial incidents.

CHAPTER FOUR

OPERATIONAL AND INSTITUTIONAL ARRANGEMENTS AND AGREEMENTS

The types of institutional arrangements and agreements used in establishing and operating RTSOPs can be grouped into (1) *program*-level, and (2) *project*-level. The type of agreement is highly dependent on the goals and functions of the program. Program-level agreements are intended to clarify the "big picture" intent of the program, defining a vision and goals for the program and dealing more with organizational structure. These types of arrangements and agreements define a formal organization structure of the program. Program-level agreements are more likely to be used when regional partners are considering consolidating operations into a single entity. RTSOPs that are proposed to keep control with the local entities will generally rely on project-level agreements among a subset of participating agencies. Program-level arrangements are intended to extend beyond the needs that are specific to an individual project or corridor where improvements are being implemented, whereas project-level agreements are designed to cover the needs of an individual project or corridor improvement. Program-level agreements tend to be focused on the longer term and to be bigger in scope, whereas project-level arrangements are short-term, lasting only long enough to implement a specific set of improvements to a corridor. Program-level arrangements can be either formal or informal and typically develop from long-term relationships among stakeholders. Project-level agreements are almost always formal and represent a contractual arrangement between two entities.

PROGRAM-LEVEL INSTITUTIONAL ARRANGEMENTS

Through the interview process, three types of institutional arrangements were identified that are commonly used in establishing RTSOPs:

- Local partnerships,
- MOU, and
- Cooperative agreements.

Table 17 shows some of the elements commonly included in agency agreements related to RTSOPs. A brief description of the different types of institutional arrangements that are commonly used to establish and sustain RTSOPs is provided here. Appendix C provides examples of program-level and project-level institutional arrangements and agreements used by various entities.

Local Partnerships

Some locations have been successful in using a partnership arrangement to develop their RTSOP. In a partnership arrangement, no formal agreements are made between entities. Instead, local entities build on existing relationships to begin a more formalized RTSOP. Usually, these partnerships evolve using spoken and/or unwritten agreements between two or more entities to define the program for the region. This type of arrangement is built on a mutual trust between agencies and has proven to be a successful approach when agencies have a long history of collaboration.

The Denver, Colorado, metropolitan area is a good example of a case where a successful RTSOP has been implemented without any type of formal agreement. A partnership arrangement between the DRCOG, Colorado DOT (CoDOT), and 32 local entities has allowed the Denver region to develop and operate its regional Traffic Operations Program since 1989 (*17*). Through a collaborative dialogue led by DRCOG, local entities work together to identify and prioritize roadways for improvement and develop implementation projects through the program. Periodic program updates, performed every three to four years, are used to list specific projects deemed important to the region. The process begins with DRCOG updating a regional inventory of the system and assessing the current operational conditions of arterials in the region. A working group composed of representatives from partner entities works together to perform a needs assessment and identify specific projects based on the following factors: criticality of need, importance of the corridor, strategic needs for communications linkages, local priorities and synergies, and cost-effectiveness. These projects are then incorporated into the Traffic Signal Systems Improvement Program, which contains both capital improvement and traffic signal timing improvement elements. This system is then used to set the priorities for the program for the funding cycle.

Memorandum of Understanding

Occasionally, an RTSOP will use an MOU to establish the institutional structure of an RTSOP. An MOU is a written agreement between two or more entities that indicate the course of action to be pursued by each of the entities to address a common goal or line of action. MOUs are generally used to provide written confirmation of agreed upon terms under an

TABLE 17
COMMON ELEMENTS CONTAINED IN RTSOP AGREEMENTS

Elements Contained in RTSOP Agreements	Region/Area															
	North Carolina	San Francisco Bay, CA	Kansas City, KS/MO	Detroit, MI	Los Angeles, CA	Dallas–Fort Worth, TX	Denver, CO	Orange County, CA	Pittsburgh, PA	Buffalo, NY	Las Vegas, NV	Phoenix, AZ	Tucson, AZ	Reno, NV	Fargo–Moorhead, ND/MN	Bend, OR
Operational goals and objectives from the program	●		●		●			●	●		●					
Organizational structure			●					●		●	●				●	
Identification of lead agency	●		●	●	●			●	●		●				●	●
Requirements for decision making			●						●	●	●				●	●
Roles and responsibilities of participating agencies	●		●	●	●			●	●	●	●		●		●	●
Activities to be performed by the program and participating agencies	●		●	●	●			●	●	●	●				●	●
Performance goals and monitoring requirements	●							●								●
Equipment and personnel sharing arrangements	●		●								●		●		●	●
Funding requirements and cost-sharing arrangements	●		●	●				●	●		●		●		●	●
System integration requirements	●							●							●	
Technical requirements	●							●	●				●		●	
Equipment specifications					●								●		●	
Personnel training requirements/schedule								●								
Duration of agreement	●		●					●	●	●	●		●		●	●
Scope of coordination (i.e., which arterials to manage, signals to include, etc.)	●		●					●	●				●		●	●
Configuration management procedures															●	●
Notification requirements (for changes in configuration and/or operations)			●		●			●								●
None, a formal agreement not used		●				●	●					●		●		

oral arrangement. They describe the basic principles and guidelines under which multiple parties will work together to accomplish specific goals and objectives. Depending on its structure, an MOU is generally a nonbinding agreement between entities and describes the relationships between entities in the program. Furthermore, MOUs are typically used when there is no need to obligate an agency to provide funding to a project or program.

MOUs are generally used at the formation stage of an RTSOP. The MOU outlines the general purpose of the RTSOP—why it is needed, what agencies are involved, and why it is necessary for these agencies to work together to accomplish the common vision. Effective MOUs contain concise statements that describe the purpose and intent of the new or proposed collaboration and the relationships between the partner agencies, as well as the administrative governance for the program.

Other items of importance that may be addressed in an MOU include the following:

- A definition of important terms and phrases that are used throughout the MOU;
- A description of the organizational structure and membership of the agencies involved in the program;
- A description of the functions, activities, and responsibilities of each of the partner agencies in the program;
- A description of the obligations of the entities for funding the program, including how the funds can be used and the formula for allocating costs between the partner agencies;
- An indication of the duration and terms of renewal of the agreement;
- Indemnity clauses; and/or
- A description of ownership of property purchased.

An MOU was used to form the Niagara International Transportation Technology Coalition (NITTEC) in the Buffalo/Niagara Falls, New York area (*20*). A copy of the MOU is provided in web-only Appendix D1. The MOU defines the overall structure of the program and the roles and responsibilities of each participating agency. The MOU also defines the committee structure that is used to manage different aspects of the program. NITTEC's RTSOP falls primarily under the purview of the Regional Transportation Coordination and Management Council and Traffic Operations Center committees.

The MOU does not actually describe how NITTEC is to manage traffic signals to promote regional traffic flow. This is done through standard operating procedures and protocols. These protocols define under what specific conditions NITTEC operators can implement changes in traffic signal timing. Appendix D2 (web-only) shows a sample protocol that defines when and how NITTEC operators can change the city of Buffalo's traffic signal timing plans during emergency and severe weather conditions.

Cooperative Agreements

Cooperative agreements are similar in concept to an MOU, but are considered to be legally binding documents. Cooperative agreements contain much of the same basic elements as an MOU; they describe the organizational structure of the program, the functions of the program, and the roles and responsibilities of each partner agency, etc.; however, where cooperative agreements generally differ from MOUs is that they are used to obligate one or more of the agencies to making a financial commitment to the program.

The Nevada DOT; cities of Henderson, Las Vegas, and North Las Vegas; Clark County; and the Regional Transportation Commission of Southern Nevada entered into a cooperative agreement to establish the FAST program in 2004. Under this agreement the local entities agreed to combine the Las Vegas metropolitan area arterial traffic management systems (known as the Las Vegas Area Computer Traffic System) and the Nevada DOT freeway management system into a single integrated organization, known as FAST. As part of the agreement, the local agencies created a new regional entity responsible for operating and maintaining both the freeway management and arterial management systems. The cooperative agreement defined not only the organizational structure of this new entity, but also the roles of the local entities and their oversight responsibilities, the level of funding to be provided by each local entity, the indemnity requirements, the duration of the agreement, and the ownership and maintenance responsibilities of the local entities. A copy of this agreement is provided in Appendix D3 (web-only).

Appendix D4 (web-only) contains the cooperative agreement for Operation Green Light, the regional traffic signal control program used in the Kansas City urban area. This particular agreement is between MARC and the city of Overland Park, Kansas—which is one of the local entities participating in the program. Although the agreement is in a slightly different form than the one used to create the FAST program in Nevada, the cooperative agreement contains the same basic types of information. The Operation Green Light agreement describes the basic organizational structure for the program; roles and responsibilities for participating agencies; functions, activities, and tasks to be performed by MARC through the program; the cost-sharing arrangement between MARC and the city; insurance requirements; equipment ownership and maintenance obligations; and other important elements of the program. The agreement is signed by appropriate signatories of both MARC and the individual city (in this case, Overland Park). Similar agreements are held with the other participating agencies in the region.

PROJECT-LEVEL AGREEMENTS

Many of the agencies interviewed use project-level agreements as part of the normal course of business for RTSOPs. Project agreements (which may also be referred to as *inter-local agreements*, *inter-agency agreements*, or *inter-jurisdictional agreements*) are frequently used in RTSOPs to initiate specific improvement projects within a program (as opposed to the program itself). Generally, these types of agreements are legally binding and are used when there is a need to exchange funds between the agency responsible for distributing funds (i.e., the regional RTSOP entity) and the agency responsible for performing the work (i.e., the local entity). Usually, project agreements exist between only two governmental entities and not between a public entity and a private consulting firm (a different type of contracting mechanism is used for this arrangement). Although the exact content can vary from location to location, the project agreement generally describes the roles, responsibilities, and relationships between the regional and local entities. Specific items usually covered in a project agreement related to RTSOPs include:

- Who is responsible for purchasing and deploying any necessary communications and field equipment upgrades;
- Who has ownership of which pieces of equipment deployed as part of the project;
- Who is responsible for testing and inspecting any field equipment deployed as part of the project;
- Who will perform the data collection necessary to develop timing plans;
- Who will develop the timing plans;
- Who will implement the timing plans in the field;
- Who is responsible for fine-tuning timing plans once they have been implemented;
- Who is responsible for conducting the different types of evaluations associated with the project;
- Who is responsible for operating and maintaining the field equipment and/or timing plans installed as part of the project;
- Who is to be notified if timing plans are to be changed and what restrictions, if any, exist on when timing plans can be changed (i.e., how long before timing plans can be changed after deployment); and
- Who is responsible for preparing specific documentation (i.e., expense reports, final reports, outreach documentation, etc.) associated with the project.

Project agreements also specify the amount of money that each agency is responsible for contributing to the project. This includes the amount and type of matching requirements (hard match, soft match, or in-kind match) that the local entity is to provide, if any. Many times, these project agreements also contain a payment reimbursement schedule and a project delivery time frame, as well.

There is likely no one single "standard" example of a project agreement that is recommended; however, Appendix D5 (web-only) shows an example of the type of inter-local agreement the NCTOG uses when funding traffic signal retiming programs. Project agreements can vary (even within the same program) depending on the type of work being done and who is designated as the lead agency on the project. For

example, the SPC COG uses two different project agreements: one for projects that are performing only signal timing improvements and one where equipment upgrades are being performed in conjunction with signal timing improvements [see Appendix D6 (web-only)]. Likewise, Los Angeles County has two different types of project agreements that are used that depend on whether a local entity will continue to operate the signal system after the improvements have been made [see Appendix D7 (web-only) or Los Angeles County is being asked to take over operating and monitoring signal performance [see Appendix D8 (web-only)]. Orange County also uses two different project agreements, depending on whether the lead agency is Orange County [Appendix D9 (web-only)] or the local agency [see Appendix D10 (web-only)].

Appendix D11 (web-only) shows a sample project agreement used in the Tucson area by the Pima County Transportation Authority for a signal upgrade project. In this particular project, the Pima County DOT served as the lead agency. The project involved upgrading the traffic signal and communications equipment in three different entities and included participation from five total agencies.

OTHER AGREEMENTS

Consultant Scope of Services and Contract

In several of the organizations interviewed, the regional entity uses consultants to develop and assist local agencies with the implementation of recommended timing plan changes for inter-jurisdictional coordination. The regional entity typically uses a *consultant services contract* to outline not only the specific project scope, but also the roles and responsibilities of the consultant in the regional retiming projects and its contractual and working relationships with the local entities. Typical items covered in a consultant contract:

- Expectations for communications among, meetings with, and soliciting input from the local entities and other stakeholders affected by the project(s);
- Data collection roles and responsibilities;
- Acceptable processes and procedures for analyzing existing conditions;
- Permitted tools and techniques for analyzing and optimizing corridor-level traffic signal operations;
- Acceptable processes and procedures for developing optimal initial and actuated timing plan settings;
- Requirements for developing coordination timing plans;
- Expectations for assisting in the deployment and fine-tuning of implemented signal timings, before-and-after evaluation roles and responsibilities;
- Expected type and schedule for deliverables; and
- Regulatory restrictions, insurance requirements, and other legally binding language specific to the contracting agency.

The Metropolitan Transportation Commission (MTC) in the San Francisco Bay area is one agency that relies heavily on consultants to produce its timing plans. The MTC has developed a standardized scope of work that it uses with all RTSOP consultants. An example of the scope of services is contained in Appendix D12 (web-only).

Cost-Sharing Agreement

Cost sharing is typically an issue when the organizational structure is one in which the local agencies have decided to create a regional entity that is responsible for the day-to-day operations and maintenance of the traffic signals on either corridors of regional significance or for all signalized intersections. Generally, when the local decision is to operate the traffic signal system through a regional RTSOP entity, the local partners are asked to share the responsibility of funding the costs for the functions and services that the regional entity performs (e.g., developing timing plans, monitoring arterial performance, improving infrastructure, or maintenance, among other functions).

A number of approaches exist for determining an equitable way of sharing costs, but the most common methods appear to be based on the percentage (or ratio) of traffic signals within a single jurisdiction compared with the total number of traffic signals under the control of the regional entity. For example, if 25 of a total of 100 intersections are within the jurisdiction of City A, then City A would be responsible for 25% of the total operating costs needed to operate the regional system.

In areas where transit priority is also provided, either the metropolitan transit agency or the regional RTSOP entity may be responsible for providing the cost share associated with operating the transit priority system (e.g., developing priority timing plans, purchasing and deploying the transit signal priority detection systems, etc.).

Operation Green Light is an example of an RTSOP where the local entities have agreed to consolidate the management of their traffic signals along arterial corridors under a signal control center operated by a regional entity, MARC (*12,13*). Under this program, each local entity has agreed to share the Operation Green Light Project annual operating costs, and MARC staff estimates the annual operating costs for the entire region. This total cost is then proportioned to each local entity based on the ratio of the number of traffic signals owned by the entity to the total number of traffic signals operated by MARC through the program. Annual operations costs are estimated assuming decreasing levels of program support by the federal government. These operating costs are then incorporated into a cooperative agreement. Figure 20 is an example of the cost-sharing arrangement contained in the Operation Green Light Cooperative Agreement for the city of Overland Park, Kansas, one of the local entities participating in the Operation Green Light Program. The entire agreement is available in Appendix D4 (web-only).

EXHIBIT 3

COMPENSATION

A. The amount the City of Overland Park, Kansas will pay MARC under this contract will not exceed **One Hundred Forty-Three Thousand, Five Hundred Forty-Six and 81/100th Dollars ($143,546.81)** This amount represents the City share of the total project cost as shown in Table 1 of this Exhibit. City shall pay MARC, upon invoice, no less than annually.

Operation Green Light Program
Table 1
Annual Operations Costs

	Total Cost
Operation Green Light Project Annual Operations Costs (includes 3% annual inflation)	$1,100,000
Total signals in OGL	606
Annual Operating Cost per Signal	1833
Total Agency Signals in OGL	44.75
Total Agency Unsubsidized Annual Cost	$82,026.75

Cost per Year at Decreasing Subsidies

Year	Federal Percentage	Annual Cost	Local Agency Cost
2009	80.00%	$82,026.75	$16,405.35
2010	72.50%	$82,026.75	$22,557.36
2011	65.00%	$82,026.75	$28,709.36
2012	57.50%	$82,026.75	$34,861.37
2013	50.00%	$82,026.75	$41,013.38
		Total Contract Amount:	**$143,546.81**

B. It shall be a condition precedent to payment of any invoice from MARC that MARC is in compliance with, and not in breach or default of, all terms, covenants and conditions of this Contract. If damages are sustained by City as a result of breach or default by MARC, City may withhold payment(s) to MARC for the purpose of set off until such time as the exact amount of damages due City from MARC may be determined.

C. No request for payment will be processed unless the request is in proper form, correctly computed, and is approved as payable under the terms of this Contract.

D. City is not liable for any obligation incurred by MARC except as approved under the provisions of this Contract.

Page 16 of 24

FIGURE 20 Sample of cost-sharing arrangement used in Operation Green Light.

The Road Commission of Oakland County, Michigan, has a long history of operating and maintaining traffic signals in its region. The Road Commission frequently enters into cost-sharing agreements with local entities to maintain operations of their traffic signals. Figure 21 shows an example of a cost-sharing arrangement between the Road Commission, an adjacent county, and two of the local entities in which the Road Commission is responsible for operating their traffic signals.

Waiver of Claims and Indemnification

Liability is a common concern with both regional and local entities when it comes to establishing and implementing an area RTSOP. Common liability issues and concerns that agencies must be worked through during the process of establishing an RTSOP include the following:

- Who has the authority to implement agreed upon timing plans in other agency cabinets and equipment,

STATE OF MICHIGAN
BOARD OF COUNTY ROAD COMMISSIONERS
OAKLAND COUNTY
AGREEMENT FOR TRAFFIC CONTROL DEVICE

Type of Work: TRAFFIC SIGNAL MODERNIZATION

Location: BECK ROAD AND EIGHT MILE ROAD

Signal No: CO 854
Date Effective: ____

Under authority of state law and by virtue of resolution formally adopted by their respective governing bodies, the under-signed hereby agree to participate in the cost of installation, maintenance and operation of the above traffic control device on the basis of the following division of costs. (Title to equipment shall remain with the purchasing agency, unless purchased for roads not under the jurisdiction of the Board of County Road Commissioner.) The proportionate share of all costs are to be billed monthly. This agreement is terminable on thirty days written notice by any party.

DIVISION OF COSTS

AGENCY	INSTALLATION Percent	INSTALLATION Estimated Cost	MAINTENANCE Percent
RCOC	50 %	$ 55,000.00	50 %
Wayne County	25 %	$ 27,500.00	25 %
City of Novi	12 ½ %	$ 13,750.00	12 ½ %
City of Northville	12 ½ %	$ 13,750.00	12 ½ %
Total	100 %	$110,000.00	100 %

It is further agreed that the agency responsible for payment of energy billings and/or leased line interconnection billings included in maintenance costs, shall be the ROAD COMMISSION FOR OAKLAND COUNTY.

It is further agreed that the agency responsible for making original and replacement installations and performing maintenance shall be the ROAD COMMISSION FOR OAKLAND COUNTY.

"In the event the traffic control device referred to in this agreement is located on a road or street that is not under the jurisdiction of the Road Commission for Oakland County, the authority having the jurisdiction over the road or street hereby agrees to save harmless, indemnify, represent, and defend the Road Commission for Oakland County from any and all claims, demands, or suits arising out of or relating to the installation, maintenance and operation of the traffic control device which is the subject matter of this agreement."

"In the event the traffic control device referred to in this agreement is located on a road or street that is under the jurisdiction of the Road Commission for Oakland County and by virtue of this agreement will be maintained by an agency other than the Road Commission for Oakland County, then and in that event the said agency hereby acknowledges that it is undertaking the Road Commission for Oakland County's duty to maintain the said traffic control device and further agrees to provide insurance coverage protecting the Road Commission for Oakland County."

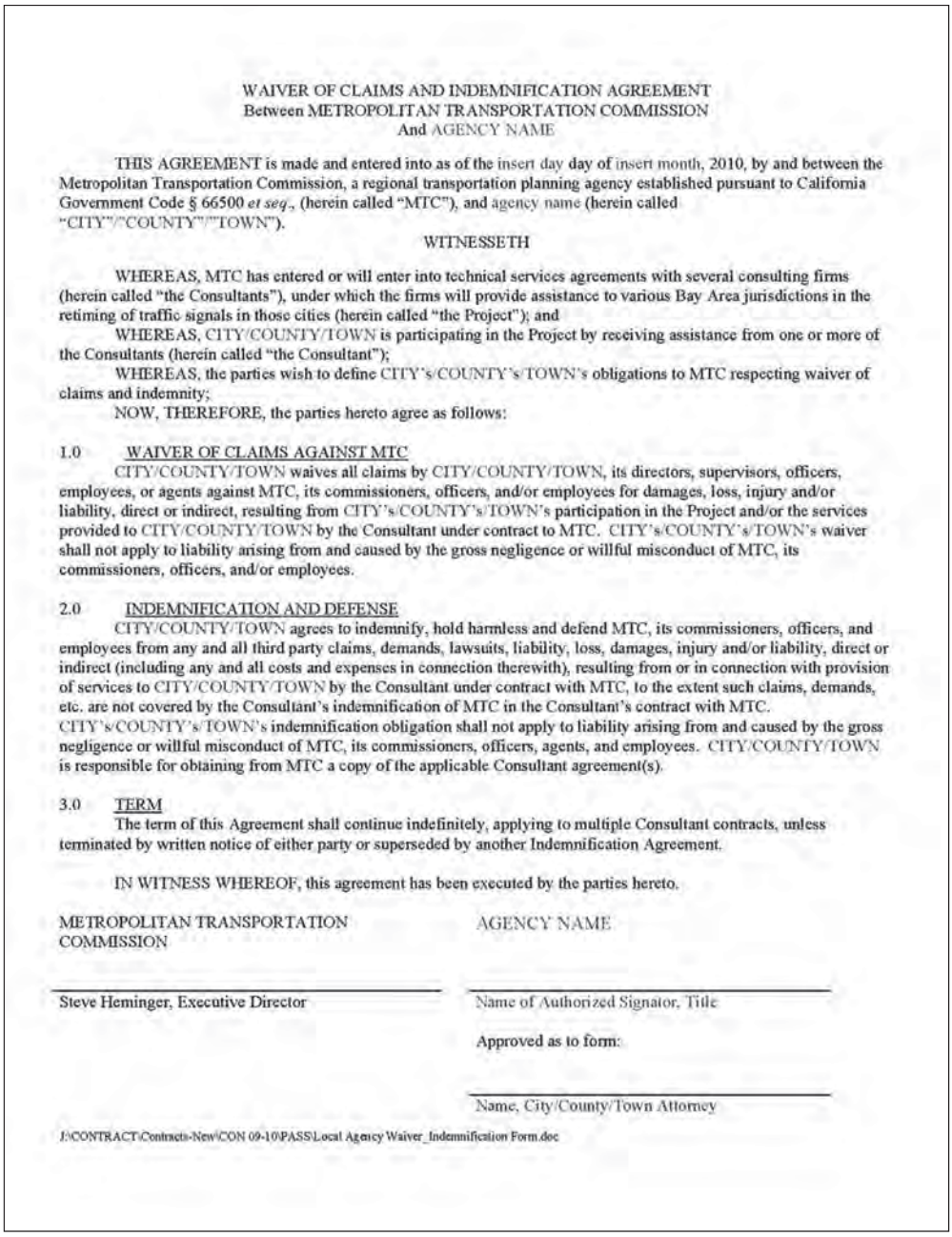
Approved:	Approved:	Approved:	Approved:
Road Commission For Oakland County	Wayne County	City of Novi	City of Northville
Date: 9-22-08	Date: 8-1-08	Date: 8-25-08	Date: 9-16-08
By: Gary Piotrowicz, Director of Traffic-Safety	By:	By: David B. Landry - Mayor	By: Street Administrator
Title of Authorized Official	Title of Authorized Official	Title of Authorized Official	Title of Authorized Official

*Certified copy of resolution must be submitted with this form for new installations

FIGURE 21 Sample cost-sharing agreement for FAST-TRAC signals in Oakland County, Michigan.

- Who is responsible for establishing minimum vehicle and pedestrian phase setting and clearance intervals,
- Who is responsible for maintaining the physical hardware—both the traffic signal hardware as well as the communications hardware—at each intersection,
- Who is responsible for maintaining the coordination timing plans once they have been implemented,
- Who is responsible for responding to citizen inquiries and complaints about traffic signal operations at intersections of regional importance, and
- What authority do local agencies have to change regional traffic signal timing plans and the process for making those changes (who is to be notified, what records need to be kept, etc.)?

Several regions have indemnification language included as part of their program-level and project-level agreements. For example, the MTC in the San Francisco Bay area requires local agencies applying for funds through their Regional Signal Timing Program to enter into an agreement with MTC to



WAIVER OF CLAIMS AND INDEMNIFICATION AGREEMENT
Between METROPOLITAN TRANSPORTATION COMMISSION
And AGENCY NAME

THIS AGREEMENT is made and entered into as of the insert day day of insert month, 2010, by and between the Metropolitan Transportation Commission, a regional transportation planning agency established pursuant to California Government Code § 66500 *et seq*., (herein called "MTC"), and agency name (herein called "CITY"/"COUNTY"/"TOWN").

WITNESSETH

WHEREAS, MTC has entered or will enter into technical services agreements with several consulting firms (herein called "the Consultants"), under which the firms will provide assistance to various Bay Area jurisdictions in the retiming of traffic signals in those cities (herein called "the Project"); and

WHEREAS, CITY/COUNTY/TOWN is participating in the Project by receiving assistance from one or more of the Consultants (herein called "the Consultant");

WHEREAS, the parties wish to define CITY's/COUNTY's/TOWN's obligations to MTC respecting waiver of claims and indemnity;

NOW, THEREFORE, the parties hereto agree as follows:

1.0 WAIVER OF CLAIMS AGAINST MTC

CITY/COUNTY/TOWN waives all claims by CITY/COUNTY/TOWN, its directors, supervisors, officers, employees, or agents against MTC, its commissioners, officers, and/or employees for damages, loss, injury and/or liability, direct or indirect, resulting from CITY's/COUNTY's/TOWN's participation in the Project and/or the services provided to CITY/COUNTY/TOWN by the Consultant under contract to MTC. CITY's/COUNTY's/TOWN's waiver shall not apply to liability arising from and caused by the gross negligence or willful misconduct of MTC, its commissioners, officers, and/or employees.

2.0 INDEMNIFICATION AND DEFENSE

CITY/COUNTY/TOWN agrees to indemnify, hold harmless and defend MTC, its commissioners, officers, and employees from any and all third party claims, demands, lawsuits, liability, loss, damages, injury and/or liability, direct or indirect (including any and all costs and expenses in connection therewith), resulting from or in connection with provision of services to CITY/COUNTY/TOWN by the Consultant under contract with MTC, to the extent such claims, demands, etc. are not covered by the Consultant's indemnification of MTC in the Consultant's contract with MTC. CITY's/COUNTY's/TOWN's indemnification obligation shall not apply to liability arising from and caused by the gross negligence or willful misconduct of MTC, its commissioners, officers, agents, and employees. CITY/COUNTY/TOWN is responsible for obtaining from MTC a copy of the applicable Consultant agreement(s).

3.0 TERM

The term of this Agreement shall continue indefinitely, applying to multiple Consultant contracts, unless terminated by written notice of either party or superseded by another Indemnification Agreement.

IN WITNESS WHEREOF, this agreement has been executed by the parties hereto.

METROPOLITAN TRANSPORTATION COMMISSION

Steve Heminger, Executive Director

AGENCY NAME

Name of Authorized Signator, Title

Approved as to form:

Name, City/County/Town Attorney

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FIGURE 22 Sample waiver of claims and indemnification agreement used by the MTC for the San Francisco Bay Area.

(1) waive any and all claims against MTC for any loss liability, and (2) indemnify, hold harmless, and defend MTC against any and all third-party claims that may result from the agency's participation in the program. MTC's program is one in which the agency assigns a consultant to prepare timing plans for agencies and its role is to monitor the work progress of the consultant. The local agencies have the ultimate responsibility to implement the timing recommendations in the controllers. A sample of this agreement is shown in Figure 22.

CHAPTER FIVE

SUSTAINING REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAMS

As part of the interview process, agencies were asked to identify key activities that need to occur to sustain an RTSOP in a region once it has been developed. Commonly identified activities included:

- Developing and sustaining a consistent source of funding not only for operational changes but for equipment and communication upgrades,
- Demonstrating benefits in new and innovative ways that the public and policymakers can understand,
- Providing public outreach and public education, and
- Developing and retaining local area expertise in traffic signal systems operations.

This section describes some of the mechanisms that agencies use to sustain their RTSOPs.

DEVELOPING AND SUSTAINING REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAM FUNDING

Funding for regional traffic signal system operations generally 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. Table 18 shows examples of the types of funding used to support select RTSOPs in the United States.

State and federal funding for traffic signal operations is available, but in many cases it is not engaged because of the confusion or misperceptions about the process and how those funds are allocated and distributed. Although federal funding traffic operations exist, the state and local funding allocation processes or formulas may make it difficult to receive funds for traffic signal operations because there are separate categories of funds for capital expenses and maintenance expenses (with which traffic signal operations are typically classified). However, 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 (SAFETEA-LU) does offer eligibility for federal funds to be used for traffic monitoring, management, and control systems using categorical funding from the National Highway System, STP, and Interstate Maintenance (for restoration and rehabilitation along Interstate routes). For regions with air quality nonattainment status and those classified as maintenance areas, CMAQ program funds may be used for operating costs if those pertinent systems can demonstrate measurable reductions in vehicle emissions.

One of the keys 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 there is funding available that they can use to keep 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 to support their programs. However, CMAQ funds are limited in that they can only be administered in regions that are (1) currently not meeting National Ambient Air Quality Standards, or (2) in compliance as a maintenance area. Furthermore, uncertainty with regard to the long-term future of the CMAQ program has caused many agencies to begin developing alternative funding sources to support their RTSOP programs.

Traffic signal operation improvement projects eligible for federal funds must be included on 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 on the Statewide Transportation Improvement Program, a regional collaboration might well rate high enough to receive priority and garner federal funding opportunity. Agencies interested in participating in the federal funding process should be aware of the local match requirements and other stipulations (not covered in this synthesis report) related to use of federal funds.

Several locations are currently supporting their programs using a portion of sales tax revenues dedicated for regional transportation improvements. In Los Angeles County, California, a portion of the local transportation sales tax revenue is dedicated to funding traffic operations improvements through the county's RTSOPs (*21*). Similarly, the voters of Orange County, California, recently renewed local transportation ordinance "Measure M," extending an existing 0.5% sales tax for 30 more years beginning in April 2011 (*15*). A key reason the measure passed was the dedicated use of a portion of the

TABLE 18
EXAMPLES OF TYPES OF FUNDING USED TO DEVELOP/MAINTAIN SELECT RTSOPs IN THE UNITED STATES

RTSOP Function	Region/Area															
	North Carolina	San Francisco Bay, CA	Kansas City, KS/MO	Detroit, MI	Los Angeles, CA	Dallas–Fort Worth, TX	Denver, CO	Orange County, CA	Pittsburgh, PA	Buffalo, NY	Las Vegas, NV	Phoenix, AZ	Tucson, AZ	Reno, NV	Fargo–Moorhead, ND/MN	Bend, OR
Federal Surface Transportation Program (STP) Funds	●		●					●		●	●		●		●	●
Federal Enhancement Funds	●															
Federal Congestion Mitigation/Air Quality (CMAQ) Funds	●	●	●	●	●	●		●	●	●	●	●				
State Traffic Safety Funds	●							●								
American Recovery and Reinvestment Act (ARRA) Funds	●		●					●			●					●
Federal Appropriation Earmark Funds			●													
Local Capital Improvement Program (CIP) Funds	●		●		●			●		●	●				●	●
State or Local Operating/ Maintenance Budget Funds	●		●					●		●	●				●	●
Other		●	●					●					●			

revenue to improve inter-jurisdictional traffic signal coordination. Measure M requires that all revenues be deposited in a dedicated fund used solely for specified freeway, street, and roadway improvement projects, transit projects, and environmental mitigation. These funds are administered by the Orange County Transportation Authority. It is anticipated that these funds will permit the synchronization of more than 2,000 signalized intersections across the county over the next three years. Local agencies will be required to provide a 20% match to use the funds for traffic signal synchronization projects. However, normal, daily operations and equipment maintenance remains the responsibility of the agency that owns the system.

NCDOT uses statewide maintenance funds to reimburse local entities that agree to operate and maintain their traffic signals to an acceptable level of operations as defined by the agency (*4*). Agencies that agree to operate their traffic signal systems at a higher performance level receive a greater allocation of annual maintenance funds from NCDOT. This funding arrangement helps ensure that traffic signal equipment and timing plans are accurately maintained and updated on a continual cycle. Table 19 shows criteria that NCDOT uses to defined acceptable levels of traffic signal operations.

DEMONSTRATING BENEFITS

In almost every interview, demonstrating the benefits of the program was cited as an essential component to successfully sustaining the program over time. Most regions use pilot or demonstration projects as a way of generating support and establishing the potential benefits of an RTSOP. Generally, these pilot or demonstration projects include a before-and-after comparison of travel times and delays associated with trips through a particular corridor. The results of the pilot demonstrations are often published in a report and/or presented to the program's technical advisory board or traffic forum. Using pilot or demonstration projects allows a regional entity to illustrate the potential benefits to be derived by the program and to build political and institutional support with local stakeholders. Pilot or demonstration projects also allow regional entities to validate and fine-tune the processes and procedures that they will implement in a full-fledged program.

TABLE 19
CRITERIA USED BY NCDOT TO DEFINE LEVELS OF "GOOD" TRAFFIC SIGNAL OPERATIONS (*4*)

Criteria	Thresholds Defining Level of Acceptable Performance				
	A	B	C	D	F
Percentage of traffic signals centrally monitored	100%	90%	80%	60%	<50%
Duration between timing plan evaluations	<6 months	<12 months	<18 months	<24 months	>30 months
Elapsed time between development and implementation of new timing plans	<3 months	<3 months	<6 months	<12 months	<18 months
Elapsed time between traffic data collection efforts	Every 2 years	Every 2 years	Every 2 years	Every 3 years	None
Time duration between signal turn-on and installation of timing plan	Simultaneous	Simultaneous	30 days	60 days	90 days
Time between preventative maintenance activities	2 times per year	2 times per year	2 times per year	1 time per year	None
Minimum percentage of operational system detectors	90%	85%	80%	60%	50%
Maximum permitted repair time of failed detectors	30 calendar days	30 calendar days	60 calendar days	90 calendar days	120 calendar days
Periods when control center staffed	a.m. and p.m. peak, special events	a.m. and p.m. peak, on-call during special events	a.m. and p.m. peak, special events	a.m. and p.m. peak, whichever is higher	a.m. and p.m. peak, whichever is higher
Updates of traffic responsive thresholds	Continually	Annually	Annually	Traffic responsive not used	Traffic responsive not used

In addition to using demonstration or pilot studies to illustrate benefits, many regions produce one-page summary sheets of the benefit derived from their programs. Summary sheets such as those shown in Figures 23 and 24 can be valuable tools that show political decision makers and citizens the benefits and effectiveness of regional coordination of traffic signals. Figure 23 shows an example of a one-page fact sheet that highlights the activities and benefits of the RTSOP program in the Reno, Nevada, region (*22*). DRCOG produces an annual summary sheet showing the travel time and fuel saving benefits produced by the retiming projects performed during the year (*18*). A copy of this summary sheet for the 2009 project performed by DRCOG is provided in Figure 24.

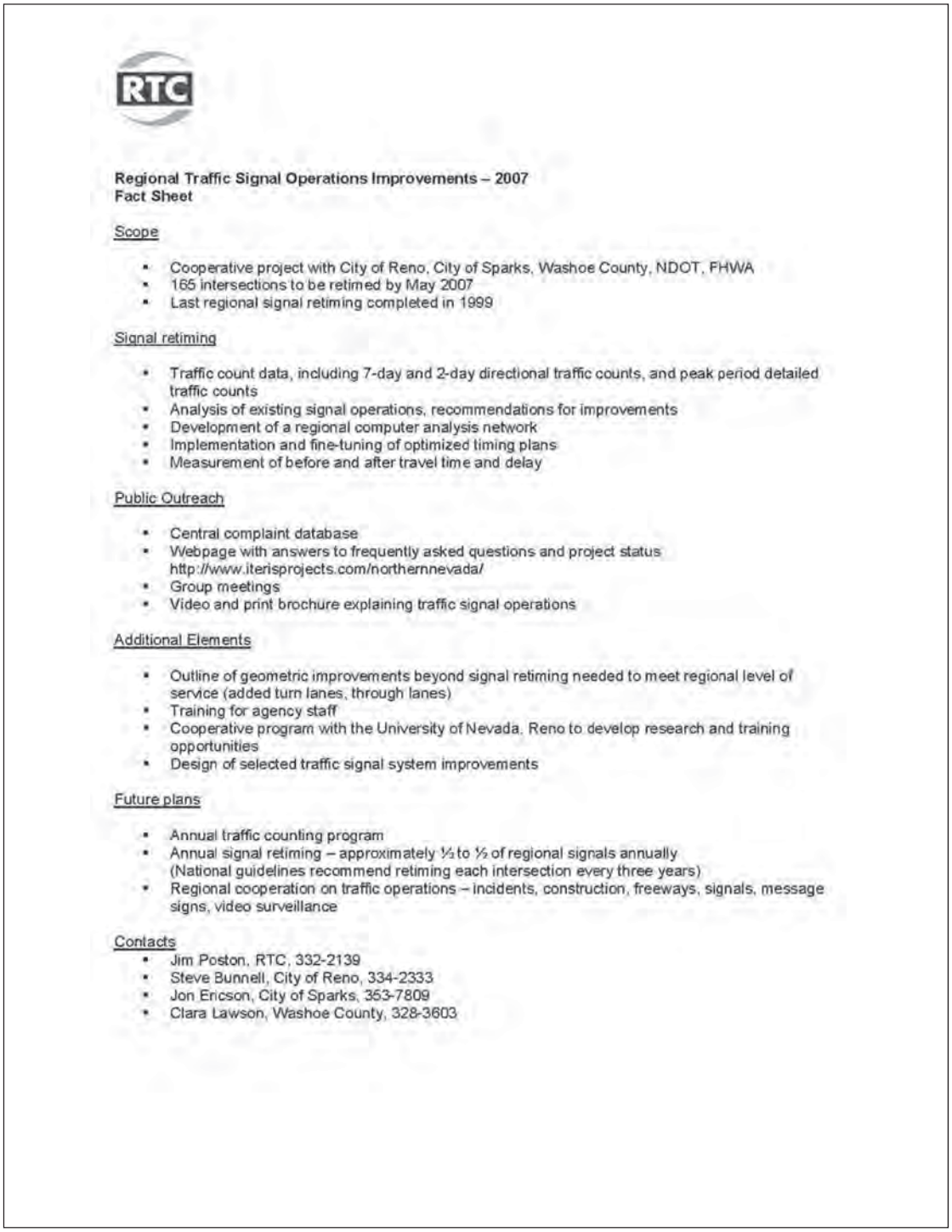
One unique approach to illustrating the benefits of traffic signal retiming projects has been the use of before-and-after videos of a single car trip in a corridor that has been retimed. As shown in Figure 25, before-and-after videos are played side-by-side and synchronized to a common time clock. The videos show the progress of the vehicle as it travels through the corridor without and with the revised traffic signal timings. The technique allows the public and decision makers to visualize the amount of time savings and the improvement in the quality of trips generated through traffic signal retiming. This technique has been used by both the SPC (*9*) and the Regional Transportation Commission of Washoe County, Nevada (*23*,*24*) to show the benefits of traffic signal retiming projects conducted in their programs.

PUBLIC OUTREACH AND EDUCATION

Public outreach and education is often viewed as a critical component to expanding and sustaining RTSOPs. Most regional entities maintain websites that provide background information about their program. Although these websites are typically accessible by the public, most are geared toward providing information to local entities that may consider participating in the program. These websites generally provide information for local agencies about calls for projects, project-selection criteria, selected projects, and reporting requirements.

Few regional entities have actively promoted their program directly to the public; instead, most regional entities prefer (and actually encourage) their local partner agencies to highlight the benefits of individual improvements made through the program. Giving local agencies a forum to highlight the benefits (and claim credit for the improvements) allows them to build the recognition and political capital needed to sustain and expand the program in the future.

One way that agencies promote the benefits of their programs is through the development of "page and a picture" summaries of individual projects performed through the program. These summaries contain a brief description of the project; a map showing the location of the project within the region; a listing of the local project partners; a summary of the project activities (traffic volumes, timing revisions, reductions



RTC

Regional Traffic Signal Operations Improvements – 2007
Fact Sheet

Scope

- Cooperative project with City of Reno, City of Sparks, Washoe County, NDOT, FHWA
- 165 intersections to be retimed by May 2007
- Last regional signal retiming completed in 1999

Signal retiming

- Traffic count data, including 7-day and 2-day directional traffic counts, and peak period detailed traffic counts
- Analysis of existing signal operations, recommendations for improvements
- Development of a regional computer analysis network
- Implementation and fine-tuning of optimized timing plans
- Measurement of before and after travel time and delay

Public Outreach

- Central complaint database
- Webpage with answers to frequently asked questions and project status http://www.iterisprojects.com/northernnevada/
- Group meetings
- Video and print brochure explaining traffic signal operations

Additional Elements

- Outline of geometric improvements beyond signal retiming needed to meet regional level of service (added turn lanes, through lanes)
- Training for agency staff
- Cooperative program with the University of Nevada, Reno to develop research and training opportunities
- Design of selected traffic signal system improvements

Future plans

- Annual traffic counting program
- Annual signal retiming – approximately ⅓ to ½ of regional signals annually (National guidelines recommend retiming each intersection every three years)
- Regional cooperation on traffic operations – incidents, construction, freeways, signals, message signs, video surveillance

Contacts

- Jim Poston, RTC, 332-2139
- Steve Bunnell, City of Reno, 334-2333
- Jon Ericson, City of Sparks, 353-7809
- Clara Lawson, Washoe County, 328-3603

FIGURE 23 Summary sheet produced by the RTC of Washoe County, Nevada, showing benefits of RTSOPs (*22*).

Traffic Operations Program
Projects Completed in Calendar Year 2009

Project (Click on the project name below to access the Signal Timing Brief)		Limits	Number of Signals	Jurisdictions (Operators*)	Project Type	Benefits			
						Travel Time (Hours/day Reduced)	Fuel (Gal/day Reduced)	Pollutant Emissions (lb/day Reduced)	User Savings ($/day[1])
T09-1	SH 121/SH 287	Arista Place to Miramonte Boulevard	9	CDOT*, Broomfield	Capital Improvement Traffic Signal Timing	620	1,720	704	$18,000
T09-2	Dillon Road/144th Avenue	120th Street to Lowell Boulevard	6	Broomfield*	Traffic Signal Timing	144	55	173	$3,050
T09-3	Federal Boulevard	Alameda Avenue to I-76 North Ramp	31	Denver*, CDOT*	Capital Improvement Traffic Signal Timing	495	253	687	$10,700
T09-4	Huron Street	119th Avenue to 144th Avenue	6	Westminster*, CDOT*	Capital Improvement Traffic Signal Timing	251	95	292	$5,350
T09-5	120th Avenue	Pecos Street to Holly Street	19	CDOT*, Northglenn*, Thornton*	Capital Improvement Traffic Signal Timing	942	326	1,072	$19,900
T09-6a	Yosemite Street	County Line Road to Lone Tree Parkway	15	Douglas County*, CDOT, Centennial	Traffic Signal Timing	150	68	171	$3,200
T09-6b	County Line Road	Quebec Street to Inverness Parkway	11	Douglas County*, CDOT*	Capital Improvement Traffic Signal Timing	379	196	497	$8,200
T09-7	Dry Creek Road and Havana Street	Yosemite Street to Arapahoe Road	10	Arapahoe County*, CDOT*, Centennial*	Capital Improvement Traffic Signal Timing	173	46	147	$3,600
T09-8	South Boulder Road	McCaslin Boulevard to Plaza Drive	7	Louisville*	Capital Improvement Traffic Signal Timing	29	14	34	$650
T09-9	South Wadsworth Boulevard	Trailmark Parkway to Eastman Place	24	Lakewood*, CDOT*	Capital Improvement Traffic Signal Timing	520	186	589	$11,000
T09-10	Federal Boulevard South	Belleview Avenue to Alameda Avenue	25	Denver*, CDOT*	Capital Improvement Traffic Signal Timing	199	48	268	$4,100
T09-11	SH 119 (Diagonal Highway), 63rd Street, Jay Road, and Lookout Road	Jay Road to SH 119	6	Boulder*, Boulder County*, CDOT	Capital Improvement Traffic Signal Timing	167	75	188	$3,600
		Jay Road to Niwot Road	8	CDOT*, Boulder County*, Boulder	Capital Improvement Traffic Signal Timing	832	58	186	$16,850
T09-12a	US 287	Arapahoe Road to Northwest Parkway	9	CDOT*	Traffic Signal Timing	588	306	711	$12,350
T09-12b	Baseline Road	US 287 to 119th/120th Streets	8	Lafayette*, CDOT*	Traffic Signal Timing	126	55	145	$2,650
T09-12c	South Boulder Road	Centaur Village Drive to Public Road	7	Lafayette*, CDOT	Traffic Signal Timing	85	38	96	$1,800
T09-13a	Downing Street	Walnut Street to Park Avenue	23	Denver*	Capital Improvement Traffic Signal Timing	102	45	117	$2,200
T09-13b	13th and 14th Avenues	Corona Street to Garfield Street	18	Denver*	Capital Improvement Traffic Signal Timing	n/a [2]			
T09-14	6th and 8th Avenues	Franklin Street to Colorado Boulevard	12	Denver*	Capital Improvement Traffic Signal Timing	177	162	341	$3,900
T09-15	State Highway 2 / 72nd Ave / 104th Ave	72nd Avenue to 104th Avenue	13	CDOT*, Commerce City*	Capital Improvement Traffic Signal Timing	293	113	307	$6,100
T09-16	South Broadway and Mineral Ave	Highlands Ranch Parkway to Belleview Avenue	30	CDOT*, Douglas County*, Littleton*, Englewood*	Capital Improvement Traffic Signal Timing	1,363	517	1,602	$28,350
T09-17	North Federal Boulevard	I-76 to 120th Avenue	21	CDOT*	Traffic Signal Timing	309	119	288	$6,500
T09-18	US 287 and SH 7	US 287: Niwot Road to SH 7 SH 7: US 287 to 75th Street	7	CDOT*	Traffic Signal Timing	311	105	277	$6,450
T09-19	Kipling Street	Alameda Avenue to 51st Place	21	Lakewood*, CDOT*, Arvada*, Wheat Ridge*	Capital Improvement Traffic Signal Timing	683	233	820	$14,150
T09-20	72nd Avenue	Zuni Street to 5400 West	10	Westminster*, CDOT*	Capital Improvement Traffic Signal Timing	223	92	241	$4,650
		Total	**356**			**9,161 Hours**	**4,925 Gallons**	**9,953 lb**	**$197,300**

1. T09-1 through T09-11: Fuel @ $3.26/Gal., Time Value @ $20.00/Hr.; T09-12 through T09-20: Fuel @ $2.15/Gal., Time Value @ $20.00/Hr.2
2. No significant benefits to report for this project.

FIGURE 24 Summary of annual benefits derived by the Denver Regional Traffic Signal Program (*18*).

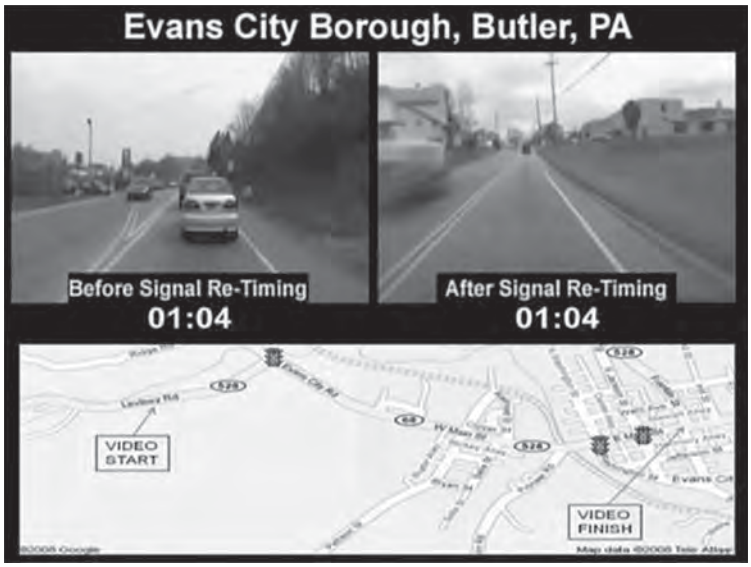


FIGURE 25 Screen capture of video tool used by the SPC to illustrate the benefits of signal timing coordination (*9*).

in travel times, etc.); a summary of the daily benefits in terms of reductions in vehicle hours of travel, fuel consumption, time and fuel costs, and total pollutant emissions; and an overall assessment of the cost savings associated with the improvements. An example of one such summary produced by DRCOG is shown in Figure 26 (*25*).

Several regional entities have developed videos (and published them online) that provide information about the nature and benefits of their programs. For example, the SPC has developed a 15-minute video that provides an overview of the commission, background on the need for the program, goals and objectives of the program, types of improvements performed through the program, and sample benefits from demonstration projects performed through the program (*9*). Similarly, the RTC of Washoe County (Nevada) has produced two videos that illustrate the benefits of its program: one that describes the overall program and another that provides a visual side-by-side comparison of sample trips in demonstration corridors. Both of these videos are available on the RTC website (*24*).

DRCOG has developed a brochure that promotes its program by illustrating the benefit of better regional traffic signal coordination (*26*). The brochure describes in laymen terms common traffic signal terminology, the process of developing coordinated traffic signal operations, and the benefits derived through better coordination (see Figure 26).

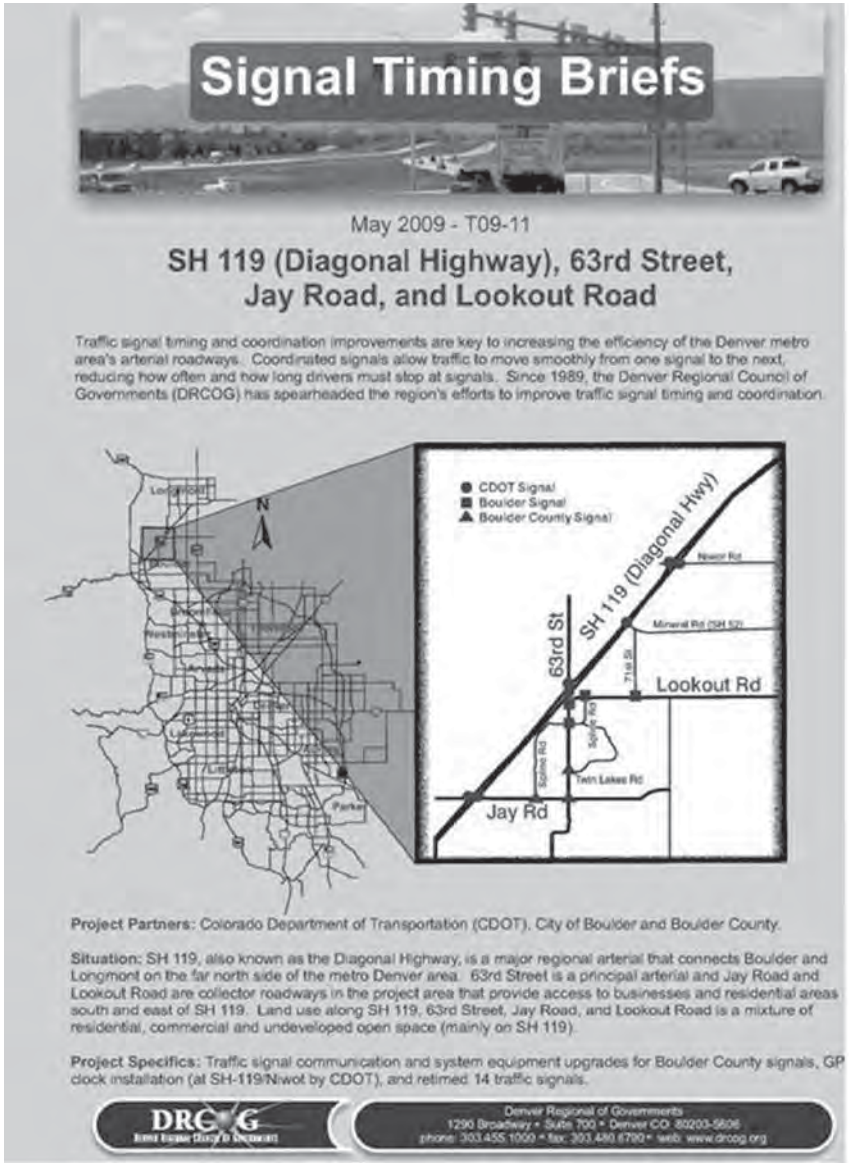
DEVELOPING LOCAL EXPERTISE

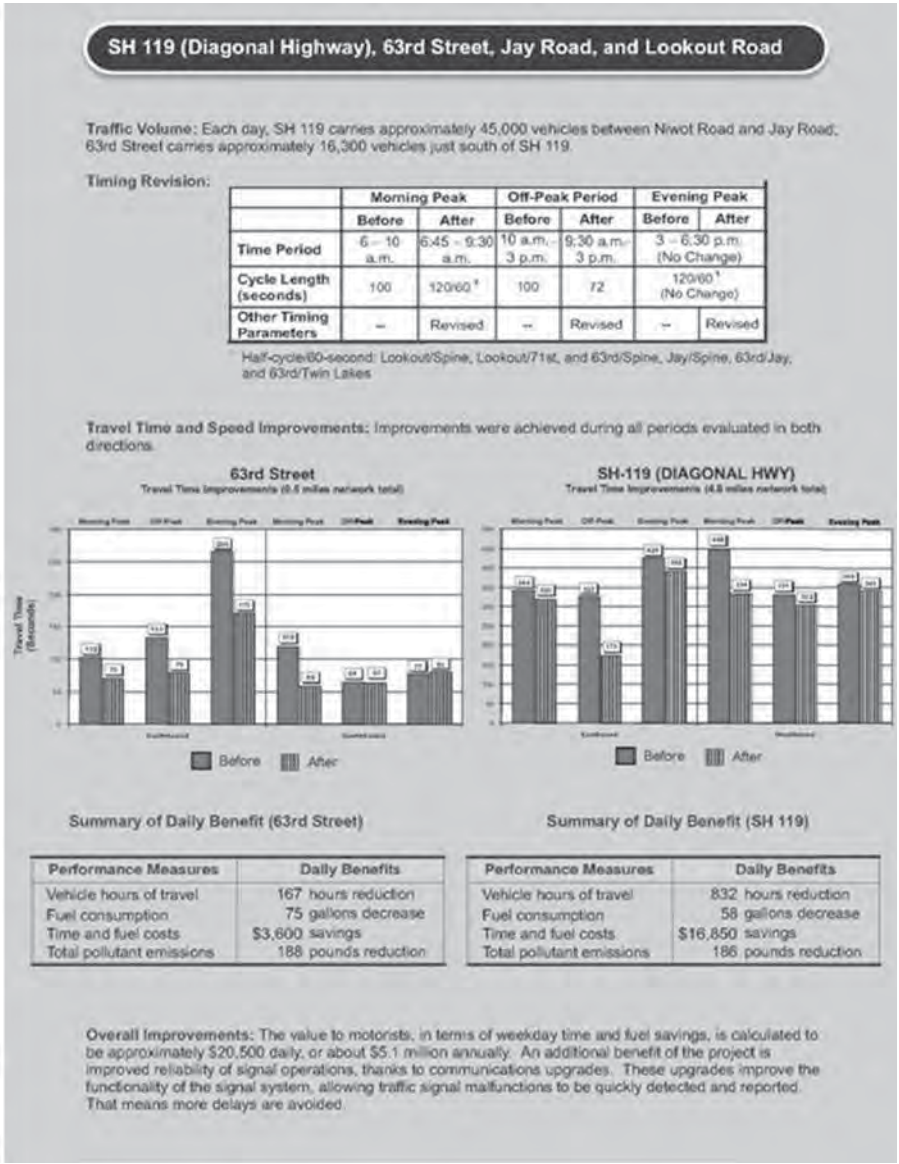
Developing local expertise in traffic signal timing and systems operation is also viewed as a critical factor essential for sustaining RTSOPs. Training and staff development is a key component of providing a reliable base of local expertise. Training enables local staff, both public and consultant, to increase their level of proficiency and effectiveness, improve their creativity and innovation, and increase their satisfaction and motivation for accomplishing regional goals. Training also permits local staff to develop working relationships with other stakeholders in the region in a collaborative environment. By working together in classroom or hands-on training, local agencies can solve hypothetical issues and problems, which might eventually lead to improved levels of trust between agency personnel.

Training and professional development can take many forms—from classroom lectures, to web-based seminars, to hands-on exercises—and can cover a variety of topics. With regional traffic signal operations, training is often needed in the following areas:

- Basic traffic signal operating principles and philosophies;
- Advanced traffic signal operating principles, including coordination and system management;
- Traffic signal hardware and software troubleshooting;
- Basic telecommunications for traffic signals; and
- Traffic signal optimization tools and software.

The Maricopa Association of Governments (MAG) is one of the few agencies that explicitly provide funding for training through its Traffic Signal Optimization Program (TSOP) (*27*). Each year, MAG sets aside approximately $10,000 to provide training for local agency personnel specifically in traffic signal operations. This training not only covers the basics of traffic signal operations and coordination, it also provides hands-on training in traffic signal optimization principles and software. As part of its program, MAG purchases the first software license of a TSOP. MAG also provides the financial support to have personnel trained in the use of the software





	Morning Peak		Off-Peak Period		Evening Peak	
	Before	After	Before	After	Before	After
Time Period	6 – 10 a.m.	6:45 – 9:30 a.m.	10 a.m. – 3 p.m.	9:30 a.m. – 3 p.m.	3 – 6:30 p.m. (No Change)	
Cycle Length (seconds)	100	120/60 [1]	100	72	120/60 [1] (No Change)	
Other Timing Parameters	--	Revised	--	Revised	--	Revised

[1] Half-cycle/60-second: Lookout/Spine, Lookout/71st, and 63rd/Spine, Jay/Spine, 63rd/Jay, and 63rd/Twin Lakes

Performance Measures	Daily Benefits
Vehicle hours of travel	167 hours reduction
Fuel consumption	75 gallons decrease
Time and fuel costs	$3,600 savings
Total pollutant emissions	188 pounds reduction

Performance Measures	Daily Benefits
Vehicle hours of travel	832 hours reduction
Fuel consumption	58 gallons decrease
Time and fuel costs	$16,850 savings
Total pollutant emissions	186 pounds reduction

FIGURE 26 Example of signal timing brief produced by DRCOG (*25*).

tool. This training is targeted to personnel who have daily responsibilities directly related to traffic signal timings and operations.

The Los Angeles County Metropolitan Transportation Authority has also developed a comprehensive training program as part of its RTSOP (*28*). The training program is intended to upgrade the skills of local traffic engineers and signal maintenance personnel on the state of the art in signal operations and maintenance. The course, taught by local experts in signal operations and maintenance, focuses on the fundamentals of good traffic signal operations. The course covers the following topics:

- National Electrical Manufacturers Association controllers and video detection
- System communications and regional traffic management centers
- Type 170 signal hardware and troubleshooting
- Bus signal priority
- Signal systems and security
- Computerized traffic control systems
- 2070 traffic control systems
- Video detection and surveillance
- Traffic signal timing fundamentals
- *Highway Capacity Manual* analysis of traffic signal operations
- Advanced traffic signal operations.

The course is available for a fee to public agencies and California DOT (Caltrans) employees working in and outside Los Angeles County, as well as private agencies and consultants.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

Regional Traffic Signal Operations Programs (RTSOPs) have been used in various configurations with various goals and objectives in the United States for at least two decades. However, there have been more recent efforts to accelerate the regionalization of traffic signal operations, recognizing the benefits of collaborative planning, implementation, management, operation, and maintenance of our traffic signal systems. These collaborations directly benefit those facilities immediately impacted by more efficient signal timing, but also indirectly benefit the entire transportation network by freeing untapped capacity in the system.

Traffic signals can have significant impacts on mobility and those impacts may be negative if these systems are not operated efficiently and maintained periodically. Operating and maintaining traffic signal systems in times of declining fiscal resources can be challenging, but many agencies have recognized the opportunities afforded by leveraging funding and technical expertise with partner agencies in forming RTSOPs. These relationships, extending from the early planning phases through project deployment and on to operations and maintenance, can be remarkably flexible and tailored to each region's needs, political realities, and stakeholder interrelationships.

SUMMARY OF LESSONS LEARNED

The following is a summary of lessons learned:

- Programs can benefit from having a regional emphasis addressing regional issues, and involving an agency that can provide a regional perspective. Often the agency that can best provide this regional perspective is the metropolitan planning organization (MPO) or county operating agency.
- It is useful to articulate a vision and generate support for the program at all levels. Although vision outreach may be directed to technical staff at local partner agencies, it may also involve key political decision makers in the region as well. Having buy-in from all levels—both the technical and governance levels—can help keep the program from being derailed in the development phase.
- In addition, a long-term vision for the program is important, but it is also important to seek opportunities for, and achieve, immediate successes. These short-term successes can help highlight the benefits and generate excitement for the program.
- When conveying the benefits of the program to the public, it is important to use a clear, straightforward, and easily understood message. The goal is to provide the public and elected officials with the information they need to formulate their own opinions while avoiding too much technical detail and too many hard-to-understand numbers and figures.
- Technical issues are relatively easy to overcome compared with institutional issues. Institutional issues are best addressed at the beginning of the process because they *will* arise later and may impede progress if they have not been addressed.
- Local knowledge of traffic operations and signal timing policy is important and needs to be incorporated in the development process. This can be accomplished by utilizing local consultants who have the appropriate level of expertise or by developing this expertise in-house.
- Local acceptance and ownership in the program is important. Too often, the perception of the local agencies is that the state or regional entity is taking over local operations. The goal is for regional entities to work collaboratively and cooperatively to arrive at solutions and program elements that satisfy everyone's needs.
- Local and regional entities can build or leverage trust in one another and develop a common regional vision for how the program might operate. Strong working relationships built upon years of experience help to develop this trust.
- It can be helpful for the regional partners and MPO to retain some flexibility in the way that projects are funded. Being able to reallocate unused funds between projects can help accomplish more in a shorter time frame. The region may implement a mechanism that captures unused funds from completed or re-scoped projects to cover unexpected program costs or immediate needs of local entities.

CONCLUSIONS AND KEY FINDINGS

This synthesis report examined the current practice of how various regions around the United States have created and now operate RTSOPs. Most agencies with operating responsibility for traffic signal systems manage them to some level; however, more agencies are realizing that synergistic impacts on both funding and operations may be realized when working in

collaboration with other regional partners. The most successful agencies have realized that they have the same challenges as the city, county, and state agency they partner with on a daily basis and that there are benefits to collaboration.

An RTSOP can be used as a conduit to improving traffic signal operations on a regional basis by leveraging the abilities and strengths of multiple agencies to address the goals and objectives of regional stakeholders and their constituents. RTSOPs have indicated that they have a greater ability to improve safety and improve efficiency than if they work as independent agencies. This result does not come without challenges because regional programs require a more collaborative effort; however, as the benefits are realized it becomes easier to influence the public, elected officials, and agency administrators to support the program. RTSOPs appear to not have a single factor that ensures success, and regions with RTSOPs in the United States have varying methods and rationale to achieve their goals; however, it does appear that these collaborative efforts have significant benefits to a wide array of agencies, and they should be encouraged wherever possible through proactive policy and funding opportunities.

This review of existing RTSOPs indicates that there are a few common themes to a successful program. These themes include maintaining momentum through good leadership and participation, developing sustainable funding sources, capturing benefits, and providing the public with knowledge of the RTSOPs' activities.

Maintaining Momentum

The feedback from existing RTSOPs clearly indicates that having a champion and an active set of leaders that emphasize the importance of regional cooperation is one of the most important factors for the success of an RTSOP. There has to be buy-in from the technical staff, from administrators, and from elected officials, but typically it is one or two key individuals who are sold on the concept and continue to promote the benefits at key times.

Maintaining momentum often then relies on an organization or agency, such as the MPO, that can provide a forum for discussion and collaboration. The MPO can often relate on how achieving the goals of an RTSOP contributes to the overall goals and objectives of the region, and can effectively program RTSOP activities into the planning process. Through the MPO, a fledgling RTSOP can help members in other agencies to begin to realize the benefits of regional collaboration.

Another way to keep momentum in an RTSOP moving forward is through a process of goal-setting and self-assessment. If any group or organization does not have a clear set of objectives that have been vetted through goal-setting and a review of needs, they are much less likely to stay active and be motivated to continue. The self-assessment and review process can be used to identify areas of improvement and need while giving some measure of performance.

Developing Sustainable Funding Sources

One key to the long-term success of RTSOPs is to develop a sustainable funding source for continual improvements. RTSOP traffic signal operation requires dedicated funding. Engineering, management, operations, and maintenance funding are all required on an ongoing basis to provide an efficient traffic signal system. However, state and local funding constraints in some cases impair the ability of traffic operations to receive enough funding to be delivered with efficiency. The problem is compounded with the difficulty and cost of quantifying the benefits of efficiently timed and coordinated signal systems. Cuts in funding are often short-term issues, with very little consideration of the strategic capital investment necessary to improve infrastructure so that cost savings are enabled. Some of the benefits of strategic investment in traffic signal operations, particularly on a regional basis, are:

- Signal timings can be changed remotely, reducing time (and staff exposure to traffic) in the field.
- Communication and closed-circuit television capability to monitor a signal may eliminate or reduce the need to dispatch a technician to address a complaint.
- Traffic signal system alarms can be sent instantly to cell phones and through e-mail to reduce trouble call response times.

Cost savings associated with fewer trips for trouble calls, fewer employee accidents while working in the right-of-way, and improved efficiency and timeliness in addressing complaints are all very good benefits to investments in traffic signal operations. However, individual agency planning and investment would likely be enhanced, with improved chances of funding, if done in collaboration with other regional agencies. When agencies combine and work together to influence elected officials and decision makers as to the benefits of operations projects, they can begin to see the benefits of the selection of larger and more significant traffic signal operations projects, as well as ones incorporated into other capital improvement projects.

The input from RTSOPs gained as part of this synthesis supports the role of the MPO as a forum for seeking participation from regional stakeholders to build an agreement on a vision for regional traffic signal operations. The MPO's role in the funding process, in the monitoring and quantification of traffic signal-related performance measures, places it in an optimal position to facilitate an RTSOP. However, the MPO is also an excellent source of input and assistance in developing programs to leverage local funding with state and federal funding for RTSOPs. Applications for state or federal funds may be given emphasis when many agencies collaborate on a common program, vision, and goals. RTSOPs indicated

that their partnerships appear to have a higher success rate for federal funding and grants because they are able to emphasize leveraging of local resources for regional benefit.

Capturing Performance and Disseminating Benefit Measures

RTSOPs may utilize performance measures to measure progress and assess how goals are being met or how a particular strategy is working. Many RTSOPs provide simple performance measures (number of signals in the program, percentage of signals with communications, or the number retimed in any given reporting period). Some RTSOPs complete before-and-after studies to better quantify some of the more tangible benefits, such as delay savings, travel time reductions, lower emissions, and agency and road user cost savings.

Feedback from RTSOPs as part of the surveys indicated that many RTSOPs believe that quantifying benefits is important, but that benefits are not typically determined to their fullest extent. Evaluations cost money, and there is always a struggle between using that money for deployment and using it to quantify benefits. However, the more successful RTSOPs understand the need and the benefits of having performance metrics for traffic signal operations in the region. Although many of the RTSOPs do define performance metrics, many have issues with evaluating those measures and being proactive as opposed to being reactive to failures and public comments, and this places them in further peril with respect to securing further funding or responding to grant opportunities in a collaborative manner.

There are numerous methods that agencies can employ to measure traffic signal operation performance, including corridor travel time, delay, efficiency, progression, and reliability. Developing a standard methodology to evaluate traffic signal system performance can help the region determine which corridors are in most need of attention and improvement. This enables the collective resources to be best managed and allocated to the most critical needs.

Public Involvement and Outreach

Developing support for the program relies on measuring success and delivering the benefits in meaningful, yet simple terms. It is important to have a process in place to report to stakeholders (and then the public) initially about the need for an RTSOP and, then once established, about the status of the programs and its benefits. Interviews with the most active and successful RTSOPs appear to emphasize the role of the evaluation of projects and being able to express the benefits of the program in tangible terms (e.g., reduced travel time and user cost, reduced fuel consumption and cost, and lower emissions). Many agencies are also sensitive to public comments and may be tempted to change traffic signal timing in response to complaints. However, traffic coordination may be sensitive to these types of "spur or the moment" changes and there may be unintended consequences to changes made without proper consideration. To combat this temptation, several of the RTSOPs and MPOs have created educational brochures and electronic media to provide for community outreach activities and initiatives.

To garner support, many RTSOPs remarked that they have fostered champions in local elected officials and administrators through meetings and other communications (published reports and brochures, executive summaries, and presentations). It is often engineers and planners that convey information about RTSOPs to elected officials and decision makers, and these individuals may not be familiar with the technical aspects of traffic signal operation. It is important that messages are communicated simply and factually, in easily understood terms that will help someone make a decision about whether or not a regional traffic signal program is providing an important and tangible benefit to its citizens. Traffic signal operations benefits can be stated in ways that relate to how people go about their work and pleasure activities, and how operations can be used to save individuals time and money and benefit the environment.

FUTURE RESEARCH NEEDS

Based on the results of the survey and the detailed interviews, the following research needs were identified:

- Continue to conduct research relating RTSOP goals and objectives and performance measurement.
- Develop methodology to capture air quality and other environmental benefits of RTSOPs through direct field measurements.
- Develop guidelines and recommendations on how agencies can overcome obstacles encountered during the development of RTSOPs.
- Develop methods of obtaining long-term, sustainable funding for RTSOPs.
- Conduct additional research and develop guidelines as to what type of facilities would benefit from inclusion in RTSOPs.
- Develop staffing and maintenance guidelines for RTSOPs.
- Conduct additional research into strategies for mitigating liability issues and concerns associated with developing, operating, and maintaining RTSOPs.
- Develop model funding and institutional arrangement agreements for different RTSOP structures.

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APPENDIX A

Survey Instrument

NCHRP Synthesis 41-07: Operational and Institutional Agreements that Facilitate Regional Traffic Signal Operations Programs

Introduction

Traffic signal operations and arterial management is critical for the effective movement of people and goods in urban and suburban areas of the United States. However, traffic congestion and delay does not recognize jurisdictional boundaries, and there is a growing need for better cooperation and coordination in the planning, design, operation, and maintenance of traffic signal systems. In response, transportation agencies and departments in many locales in the United States are beginning to come together to operate their traffic signals with a regional perspective by forming regional traffic signal operations programs.

This questionnaire is part of NCHRP Synthesis Topic 41-07 which is intended to gather information on the best practices with respect to formation and operation of Regional Traffic Signal Operations Programs (RTSOPs). The objective of this survey is to obtain basic information about your regional traffic signal operations program and how it has evolved over time and with experience.

Trial use in a survey pre-test shows that the questionnaire can be easily completed within 30 minutes. Please complete and submit the survey by March 19, 2010.

If you have any questions or would like to provide any additional information, please contact.

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Please enter your contact information. This informationwill be used by the research team to conduct follow-up interview to obtain more detailed information, if needed.

First Name

Last Name

Title

Company Name

Street Address

Apt/Suite/Office

City

State

Postal Code

Country

Email Address

Phone Number

Fax Number

Background

For the purposes of this survey, a Regional Traffic Signal Operations Program (RTSOP) is defined as any type of formal or informal program, work initiative, working group, or series of activities which involves a partnership of agencies that is focused on improving traffic signal performance, operations and efficiency from a regional perspective. This might include, but is not limited to, technical and/or institutional coordination of the operations and maintenance of traffic signals to facilitate the safe and efficient movement of vehicles on arterials crossing multiple jurisdictions.

1. Does your region or locale currently have a Regional Traffic Signal Operations Program (or anticipate having such a program in the next three to five years)?

- ○ Yes
- ○ No - If you answered "No", you have completed this questionnaire.

Description of Your Regional Traffic Signal Operations Program

2. Which of the following statements best describe the status of your Regional Traffic Signal Operations Program?

- ○ We have a formal program and it is currently active in our region.
- ○ We do not have a formal program currently but are expecting to formulate one in the next three to five years.
- ○ We do not have nor are we planning on creating a formal program, but we have been coordinating signal operations informally for some time.
- ○ At one time we had a formal program, but it is no longer active.
- Our program is in the early stages of development.
- Other (please specify)

If other, please specify:

3. Please list the entities (both public and private) that are/were partner agencies in your Regional Traffic Signal Operations Program?

4. Of the agencies you listed above, which one would you define as the lead agency?

5. Approximately how many traffic signals (total) exist in your region?

6. Approximately what percentage of these signals would be considered to be included as part of your Regional Traffic Signal Operations Program?

- ○ Less than 1%
- ○ 1 to 5%
- ○ 6 to 10%
- ○ 11 to 25%
- ○ 26 to 50%
- ○ 51 to 75%
- ○ 76 to 99%
- ○ 100%

7. How many years has your Regional Traffic Signal Operations Program been active in year region?

- ○ Less than a year
- ○ 1 to 2 years
- ○ 3 to 5 years
- ○ 6 to 10 years
- ○ More than 10 years
- ○ Our program is currently under development

8. Which of the following were considered when selecting corridors/roadways/intersections to be included in your Regional Traffic Signal Operations Program? (Please check all that apply)

- ☐ Intersections that experience excessive traffic delays
- ☐ Arterials/corridors that experience high traffic volumes
- ☐ Arterials/corridors that connect major trip generators
- ☐ Arterials/corridors that serve as primary transit routes
- ☐ Arterials/corridors that serve as major commuting corridors
- ☐ Critical facilities needed to achieve a predefined regional performance goal or expectation
- ☐ Other

If other, please specify:

9. Do you have formal criteria that you use for selecting facilities for improvement through or inclusion in your Regional Traffic Signal Operations Program?

- ○ Yes
- ○ No

If contacted, would you be willing to share a copy of your selection criteria with the research team?

- ○ Yes
- ○ No
- ○ Not Applicable

Organizational Structure

10. Which of the following organizational structures best describes the one used by your Regional Traffic Signal Operations Program (RTSOP)?

- ○ We formed a separate, stand alone committee comprised of traffic signal engineers and decision-makers from the public entities that make technical decisions for our RTSOP.
- ○ We have an executive committee of politically appointed or elected decision-makers who are responsible for establishing policy for our RTSOP. Each participating entity is then responsible for implementing the policies set by the executive committee.
- ○ We have an executive committee of politically appointed or elected decision-makers who are responsible for establishing policy for our RTSOP. The executive committee is supported by a technical committee of traffic signal engineers and agency decision-makers from the public entities that implement the policies of the executive committee.
- ○ We have an executive committee of senior decision-makers from each agency (e.g., District Engineers, Director of Public Works, etc.) that set the policy for our RTSOP. Each member entity is responsible for implementing the policy set by the executive committee.
- ○ We have an executive committee of senior decision-makers from each agency (e.g., District Engineers, Director of Public Works, etc.) that set the policy for our RTSOP. The executive committee is supported by a technical committee of traffic signal engineers and decision-makers that make implementation decisions for the RTSOP. Each member entity is responsible for implementing the decision of the technical committee.
- ○ Our RTSOP is run through an independent agency, such as a metropolitan planning organization, a council of government, or a governmental corporation. The program is managed by an executive director or program director with an independent technical staff. Technical assistance and oversight might be provided by a committee of agency representatives.
- ○ Our program is in the development. We do not have a formal structure yet.
- ○ Other

If other, please specify:

11. How are key decisions made in your Regional Traffic Signal Operations Program?

- ○ Decisions are made by consensus (100% agreement) of member agencies.
- ○ Decisions are made by simple majority (51% of vote) of member agencies.
- ○ Decisions are made by plurality (highest number of votes received).
- ○ Decisions are made by an executive director/program director with input/oversight from committee of member agencies.
- ○ Other

If other, please specify:

Agreements and Institutional Arrangements

12. What would you say was the genesis or motivating factors/reasons for establishing your Regional Traffic Signal Operations Program? (Please check all that apply)

- ☐ To identify/prioritize locations for expending limited funds
- ☐ To promote the equitable distribution of funds between competing operational entities
- ☐ To leverage/pool funds and/or other resources (e.g., equipment, personnel, etc.)
- ☐ To respond to external public pressure
- ☐ To respond to political pressure
- ☐ Mandated by local, state, or federal legislation
- ☐ Internally motivated by one or more partner agencies
- ☐ To create operational and resource efficiencies among transportation agencies in the region
- ☐ To improve progression and coordination on roadways that span multiple jurisdictions
- ☐ To address specific operational issues or concerns on particular routes or corridors (such as diverted traffic from a major construction project spanning multiple jurisdictions)
- ☐ To facilitate the development and/or deployment of advanced transportation management strategies (such as integrated corridor management or transit signal priority) in the region
- ☐ To leverage the staff expertise of a fellow operating agency
- Other

If other, please specify:

13. What type of institutional agreements was used to establish your Regional Traffic Signal Operations Program?

- ○ None, we do not have a formal agreement.
- ○ Memorandum of Understanding (MOU)
- ○ Interagency Agreement
- ○ Local Government Corporation
- ○ Contract with a private entity
- ○ We use multiple agreements to cover different aspects of our program.
- ○ Other

If other, please specify:

If contacted, would you be willing to share a copy of these agreements with the research team?

- ○ Yes
- ○ No
- ○ Not Applicable

14. What types of operational items/elements were included in your agreements? (Please check all that apply)

- ☐ Operational goals and objectives from the program
- ☐ Organizational structure
- ☐ Identification of lead agency
- ☐ Requirements for decision making
- ☐ Roles and responsibilities of participating agencies
- ☐ Activities to be performed by the program and participating agencies
- ☐ Performance goals and monitoring requirements
- ☐ Equipment and personnel sharing arrangements
- ☐ Funding requirements/cost-sharing arrangements
- ☐ System integration requirements
- ☐ Technical requirements
- ☐ Equipment specifications
- ☐ Personnel training requirements/schedule
- ☐ Duration of agreement
- ☐ Scope of coordination (i.e., which arterials to manage, signals to include, etc.)
- ☐ Configuration management procedures
- ☐ Notification requirements (for changes in configuration and/or operations)
- ☐ Other

If other, please specify:

15. Do you have a concept of operations document that describes the roles, responsibilities, and functions of your Regional Traffic Signal Operations Program?

- ○ Yes
- ○ No

If contacted, would you be willing to share your concept of operations document with the research team?

- ○ Yes
- ○ No
- ○ Not Applicable

16. Does your region have a Regional ITS Architecture?

- ○ Yes
- ○ No

If "Yes," is your Regional Traffic Signal Operations Program specifically identified as an element of your regional ITS architecture?

- ○ Yes
- ○ No

Functions of Your RTSOP

17. Which of the following functions/tasks are performed by your Regional Traffic Signal Operations Program? (Please check all that apply)

- ☐ Develop and maintain a database of traffic signal assets (hardware) for the region
- ☐ Develop and maintain a database of timing parameters and plans for the traffic signals in the region
- ☐ Provide a forum for discussing traffic signal operations issues
- ☐ Develop standards and specifications for traffic signal hardware
- ☐ Develop standards and specifications for communications hardware
- ☐ Develop standards and specifications for controller software.
- ☐ Provide central monitoring of traffic signal operations from a regional perspective through a single traffic management center
- ☐ Provide training/certification for traffic signal technicians and operators
- ☐ Develop traffic signal timing plans to facilitate cross jurisdictional traffic flow
- ☐ Facilitate the deployment and implementation of incident management traffic signal timing plans
- ☐ Facilitate the deployment and implementation of region-wide transit signal priority
- ☐ Facilitate the deployment and implementation of regional traffic signal timing plans for severe weather
- ☐ Provide outreach to the public and decision-makers
- ☐ Provide consistency in signal timing practices between agencies (i.e., clearance intervals, intersection configuration, pedestrian timings and policies, etc.)
- ☐ Provide a single point of contact for reporting and responding to citizen complaints and concerns about traffic signal timing
- ☐ Provide travel information to travelers and commuters
- ☐ Identify and establish priorities, corridors of significance, performance goals and measures, etc. for the region's traffic signals
- ☐ Facilitate the deployment of advanced traffic management concepts and control strategies, such as adaptive traffic signal control, integrated corridor management, etc.
- ☐ Other

If other, please specify:

18. Is there a single traffic management center responsible for operating the traffic signals for your region?

- ○ Yes
- ○ No

If "Yes", which agency operates this traffic management center?

19. Are the region's traffic signals integrated with other regional transportation management programs, devices, or activities?

- ○ Yes
- ○ No

If "Yes," could you please briefly describe?

Funding

20. What funding sources have been used to fund projects and activities performed by your Regional Traffic Signal Operations Program? (Please check all that apply)

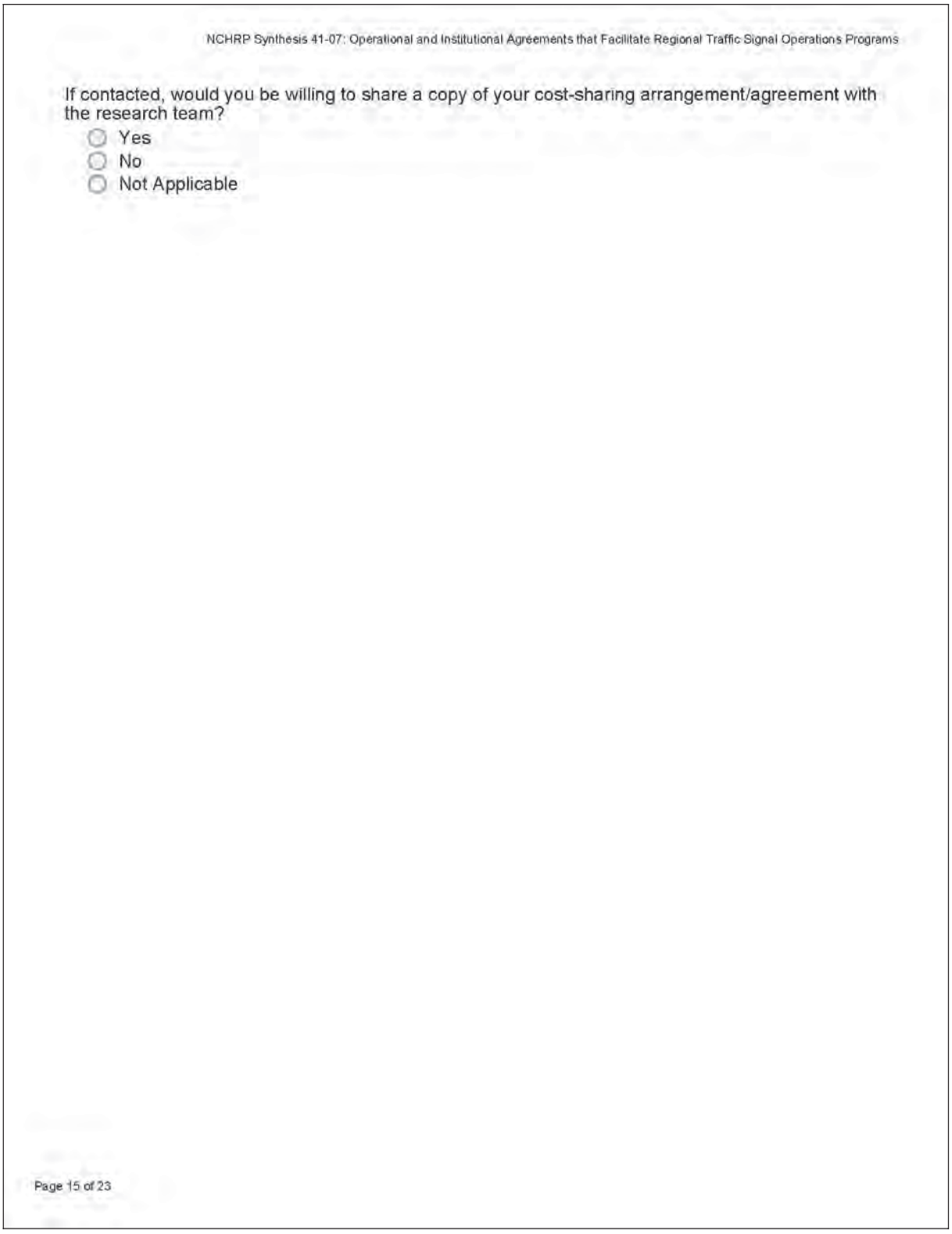
- ☐ Federal Surface Transportation program (STP) funds
- ☐ Federal Enhancement funds
- ☐ Federal Congestion Mitigation/Air Quality (CMAQ) funds
- ☐ State Traffic Safety funds
- ☐ American Recovery and Reinvestment Act (ARRA) funds
- ☐ Federal Appropriation Earmark funds
- ☐ Local Capital Improvement Program (CIP) funds
- ☐ State of local operating/maintenance budget funds
- ☐ Other

If other, please specify:

21. Does your region have a formal cost-sharing arrangement /agreement for funding the following? (Please check all that apply)

- ☐ New installations/hardware upgrades
- ☐ Ongoing, day-to-day operations
- ☐ Routine or preventative maintenance
- ☐ Emergency repair or maintenance
- ☐ We do not have any formal cost-sharing arrangements or agreements
- ☐ Other

If other, please specify:



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If contacted, would you be willing to share a copy of your cost-sharing arrangement/agreement with the research team?

- ○ Yes
- ○ No
- ○ Not Applicable

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Maintenance/Asset Management

22. Which of the following statements best describes how maintenance activities are supported by your Regional Traffic Signal Operations Program (RTSOP)?

- ○ Each agency is responsible for maintaining their traffic signals to their own standards.
- ○ The RTSOP sets the maintenance policies and standards and each agency is directly responsible for maintaining their signals to these standards.
- ○ The RTSOP is directly responsible for the maintenance of the traffic signals in the program, regardless of jurisdiction.
- Other

If other, please specify:

23. What type(s) of maintenance activities are performed by your Regional Traffic Signal Operations Program? (Please check all that apply)

- ☐ None, each agency is responsible for performing maintenance on their devices.
- ☐ Trouble-calls/call-outs during off-hours throughout region
- ☐ Trouble-calls/call-outs during all hours throughout region
- ☐ Emergency response to knockdowns throughout region
- ☐ Re-lamping of signal heads (emergency or routine)
- ☐ Preventative maintenance
- ☐ Repairing/replacing defective or malfunctioning detectors
- ☐ Other

If other, please specify:

24. How are these maintenance activities funded or supported through your Regional Traffic Signal Operations Program? (Please check all that apply)

- ☐ Maintenance activities are not supported/performed through the program. Each agency is responsible for the maintenance of their signals.
- ☐ Mutual-aid agreement
- ☐ Cost-sharing agreement
- ☐ Cost reimbursement agreement
- ☐ We use multiple sources to fund maintenance activities, depending upon the type of activity being performed.
- ☐ Other

If other, please specify:

If contacted, would you be willing to sharing these agreements with the research team?

- ○ Yes
- ○ No
- ○ Not Applicable

Performance Measurement

25. Do you have a formal mechanism for evaluating the effectiveness of your Regional Traffic Signal Operations Program?

- ○ Yes
- ○ No

26. Which of the following measures do you use to evaluate the effectiveness of your program? (Please check all that apply)

- ☐ Corridor Travel Times / Speeds
- ☐ Intersection Stops and Delay
- ☐ Throughput
- ☐ Level of Service
- ☐ Travel Time Reliability
- ☐ Crash Frequency and Rates
- ☐ Citizen Complaints
- ☐ Other

If other, please specify:

27. How frequently to you produce a formal evaluation report on the effectiveness of your program?

- ○ We do not produce a formal effectiveness report
- ○ Monthly
- ○ Quarterly
- ○ Semi-Annually
- ○ Annually
- ○ On an as-needed basis
- ○ Other

If other, please specify:

If contacted, would you be willing to share a copy of your last report with the research team?

- ○ Yes
- ○ No
- ○ Not Applicable

Outreach and Public Education

28. How frequently do the partner agencies in your Regional Traffic Signal Operations Program meet to discuss regional operational issues?

- ○ Weekly
- ○ Monthly
- ○ Quarterly
- ○ Semi-Annually
- ○ Annually
- ○ On an as-needed basis
- ○ Other

If other, please specify:

29. What types of outreach/public education activities are performed by your program? (Please check all that apply)

- ☐ None
- ☐ Routinely conduct interviews with local media outlets
- ☐ Have a public information officer to support program
- ☐ Develop brochure about programs
- ☐ Produce routine newsletter about programs
- ☐ Provide public service announcements on radio and TV
- ☐ Maintain a website
- ☐ Staff booth at local fair and community activities
- ☐ Routinely discuss on local access TV program
- ☐ Other

If other, please specify:

Comments/ Additional Information

30. If you have any comments or wish to provide any additional information about your program, please feel free to do so in the following field.

APPENDIX B

Interview Script

SCRIPT FOR FOLLOW-UP INTERVIEWS FOR NCHRP SYNTHESIS 41-07: OPERATIONAL AND INSTITUTIONAL AGREEMENTS THAT FACILITATE REGIONAL TRAFFIC SIGNAL OPERATIONS PROGRAMS

My name is Kevin Balke and I'm with the Texas Transportation Institute. I'm conducting a study for the Transportation Research Board on operational and institutional agreements that facilitate regional traffic signal operations program through the National Cooperative Highway Research Synthesis program. The purpose of my call is to first thank you for participating in our initial web-based survey and second to discuss with you in more detail some of your survey responses. The overall purpose of the study is to document the state-of-the-practice and agency experiences with establishing, operating, and sustaining regional traffic signal operations programs. You were selected to be a possible participant in this interview because of your knowledge and experience dealing with regional traffic signal operations programs. Again, this study is being sponsored by the Transportation Research Board through their National Cooperative Highway Research Synthesis program. If you agree to participate in this interview, you will be asked to answer some more in-depth questions the purposes, administrative structure, agreements, and operating procedures of your regional traffic signal operations program. The risks associated with this study are minimal, and are not greater than risks ordinarily encountered in daily life. We believe that capturing information about how your program was established and how you are sustaining it may be valuable to others who are wishing to establish similar program. Your participation in this interview is completely voluntary. You may elect not to answer any of these questions and you may terminate this interview at any time. It takes about 45 minutes to an hour to go through all the interview questions. Your responses are confidential and not identifiers linking your directly to this study will be included in the report that might be published. Records of your discussion will be stored securely and only I will have access to the records. If you have any questions regarding this study, you may contact myself at 979-845-9899 or Jon Williams with the TRB NCHRP Synthesis Program at (202) 334-3245.

This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at 979-458-4067 or irb@tamu.edu.

Do you have any questions for me about your involvement in this study before we begin? YES/NO

[*If questions are asked*—Have I answered all your questions to your satisfaction? YES/NO. *If no, continue to provide clarification until satisfied. If participant cannot be satisfied, terminate interview.*]

Are you willing to participate in this interview? YES/NO

If participant indicates "NO" terminate interview.

Purpose of RTSOPs

1) In the survey, you indicated you have/had/planning to form a formal Regional Traffic Signal Operations program, can you describe it in more detail—
   a. the goals and objectives of the program?
   b. the operational issues it was trying to address?
2) In your survey you indicated that you had/did not have formal selection criteria, what factors do you consider when selecting roadways to include in your program? What types of roadways are generally included in your program? What are their operating characteristics?
3) What are the activities/functions performed by your program?
   a. Planning activities
   b. Operational activities
   c. Maintenance activities
4) Do you ever get together as a regional to discuss signal improvements operations? How often? What types of things to you discuss?
5) How has your program changed/evolved over time? What techniques/strategies do you use for adding new elements to your program and obtaining agency buy-in?

Administrative Structure

6) In your survey response your indicated that you used . . .
   a. Formal separate stand alone committee
   b. Executive committee of political decision makers
   c. Executive committee supported by a technical committee
   d. Executive committee of senior agency decision makers
   e. Executive committee of senior agency decision makers supported by technical committee
   f. Independent agency, such as an MPO, GOG, or government corporation

Can you please describe your organizational structure and the decision-making process in more detail?

7) How have the roles and responsibilities of the partner relationships evolved over time?
8) Can you discuss the importance of have a core set of strong champions to sustain your RTSOP? How do you maintain interest in your program? How are conflicts resolved?

Agreements and Institutional Arrangements

9) In your survey, you indicated (insert selected reasons) as reasons for establishing your RTSOP. Can you expand on your selection?
10) In your survey response, you indicated that you use (insert type of agreement) to establish your RTSOP. Can you expand upon this?
    a. Who are the parties?
    b. What does the agreement cover?
11) What are the critical components of these agreements?

Funding

12) What types of funds were used to establish your program? What types of activities are funded through your program?
    a. New installations/hardware upgrades funded?
    b. Day-to-day operations?
    c. Routine/preventative maintenance?
    d. Emergency repairs?
    e. Others?
13) What was the source of these funds?
14) Is there a formal cost-sharing arrangement?

Signal Timing Plans

15) How are new signal timing plans developed? How are they implemented? Who is responsible? How often? Who initiates the retiming?

Maintenance/Asset Management

16) How are traffic signal maintained in your program? Who is responsible?
17) In your survey, you indicated you use a mutual-aid agreement/cost-sharing agreement/cost reimbursement agreement/multiple agreements to fund maintenance? Can you describe these agreements in more detail?

Performance Measurement

18) What types of tangible benefits has your program developed?
19) Do you do a formal assessment of the effectiveness of your program?
    a. How to you assess the effectiveness of your program?
    b. What performance measures do you use?
    c. What tools do you use?
20) How do you report these performance measures and to whom?

Outreach/Public Education

21) What is the role does promoting and marketing play in the success of your program?

Lesson Learned

22) What are the lessons you learned as a results of initiating your program? What institutional/operational/technical issues did you face in developing your program?
23) What information/piece of knowledge/advice that you currently possess that you wish you knew when your started your program that you want to share with others?
24) What are the keys to sustaining the program over times? How do you sustain funding for your program?
25) What are the risks associated with your RTSOP? How are these risks managed and/or mitigated?

Thanks you again for participating in the survey and the follow-up interview. Our next step is to draft up a summary of your responses to the interview questions. In drafting the response we will mention your agency name; however, you specifically will not be identified. I would like to send you a draft of our summary for you to review and to comment in the next couple of days so that you are comfortable with the way, I have summarized you program. Would you be willing to review this summary?

Again, thanks and I truly appreciate your support.

APPENDIX C

Summary of Site Interviews

APPENDIX C1. SITE SUMMARY FOR NORTH CAROLINA

Since 2000, the North Carolina Department of Transportation (NCDOT) has been using maintenance agreements and performance standards to ensure that agencies are operating and maintaining their traffic signals to an acceptable performance standard. In July 2000, the state Highway Administrator directed a comprehensive report to be prepared to assess the state-of-the-practice for operations and maintenance of NCDOT traffic signals. As part of this directive, a course of action was recommended to ensure that traffic signal on state facilities were operated and maintained at a "good level of service." This course of action has evolved into the Good Traffic Signal Systems Maintenance Program.

At the direction of the State Highway Administrator, a NCDOT committee was formed comprised of representatives from NCDOT's Traffic Engineering and Safety Systems Branch, the Chief Engineer's Office, 14 Highway Divisions, and a cross section of municipalities. The purpose of this committee was to evaluate the process used to reimburse entities for operating and maintaining their traffic signals and to define operating and maintenance standards needed to achieve a good level of service. The committee defined five levels of service. NCDOT also established the level of service "C" to be the minimum requirement needed to achieve good operating performance. For those agencies in the state that are operating and maintaining traffic signal systems, NCDOT established the following minimum criteria for a good level of service:

- Agencies are required to have a minimum of 80 percent of their signals operating as part of centrally monitored system.
- Timing plans are to be evaluated every 18 months and improvements are implemented within 6 months of completing the evaluation.
- New timing plans are to be implemented annually in corridors experiencing significant growth.
- Agencies are to actively maintain traffic data collection system with 80 percent of the system detectors being operational and a maximum time to repair not to exceed 60 days.
- New intersections are required to have timing plans implemented within 30 days of installation.
- Agencies are required to perform preventative maintenance at every intersection every 6 months.
- Agencies are required to staff their central control centers during the a.m. and p.m. peak hours and during special events that might significantly alter travel patterns.
- Field timing plans are required to operate in a traffic responsive mode, where appropriate.

To ensure that signals and timing plans are adequately maintained, NCDOT has tied the amount that individual entities will be reimbursed by the state to these performance standards. Each local municipality enters into a maintenance agreement with NCDOT that defines the agreed upon level of service standard and the specified reimbursement rate. Local municipalities are required to submit certified quarterly status reports detailing the maintenance activities performed during the quarter. These status reports include such information on intersection failures, local and system detector failures, the percentage of time the systems were off-line, the repairs that were made and the dates of when the repairs were made, any new or deleted intersections, and all traffic signal timing optimizations performed. If NCDOT determines that a municipality is not maintaining their traffic signals to the specified criteria in the agreement, then NCDOT has the right to enter into a separate maintenance agreement with a private contractor and deduct the cost of the new agreement from the municipality's funds allocation.

Funding

Funding for the program is provided from NCDOT's maintenance funds. These funds are general revenue funds and are subject to appropriations by the state legislator. Agencies that agree to operate their traffic signal systems at higher performance standards receive a greater proportion of the overall appropriations. The program was phased in over time with annual proportions of funding increasing more rapidly for signal systems maintaining a higher level of service. This provided an incentive to municipalities to operate their signals at a higher level. Table C1 shows how the allocation of funds changed during the transition phase of the program.

The amount of funds paid to each specific municipality is based on the ratio of the number of state system intersections to the total number of intersections in the computerized traffic signal system. NCDOT reimburses the municipality for maintaining the central control system and its associated hardware, CCTV surveillance system, and communication infrastructure. The annual reimbursement rate also includes NCDOT's pro-rated share of the cost for the salary and payroll additives for a System Operations Engineer(s). NCDOT has established the minimum qualifications and performance duties for this position.

Agreements

Two types of maintenance agreements are used to ensure that traffic signals are operating and maintained at predefined level: Schedule "C" and Schedule "D." Both of these agreements define the responsibilities of entities with respect to emergency maintenance, preventative maintenance, bench maintenance, and operational criteria. The Schedule "C" agreement provides reimbursement rates and levels of service for maintenance of traffic signals and associated equipment, while the Schedule "D" agreements provides reimbursement rates and levels of service for operating and maintaining central computer-based traffic signal systems.

APPENDIX C2. SITE SUMMARY FOR SAN FRANCISCO BAY AREA, CALIFORNIA

The Metropolitan Transportation Commission (MTC) is a program that provides assistance to Bay Area jurisdictions in their efforts to improve traffic operations on arterial streets by sponsoring various projects that deal with signal coordination and other arterial operations issues. One program developed by MTC

TABLE C1
ALLOCATION OF STATE TRAFFIC SIGNAL MAINTENANCE FUNDS BY FISCAL YEAR FOR GOOD TRAFFIC SIGNAL SYSTEM MANAGEMENT PROGRAM

Fiscal Year	Level of Service				
	A	B	C	D	F
2000–2001	$1,036,000	$1,036,000	$1,036,000	$1,036,000	$1,036,000
2001–2002	$2,540,000	$2,111,000	$1,698,000	$1,355,000	$1,006,000
2002–2003	$3,076,000	$2,546,000	$2,032,000	$1,608,000	$1,178,000
2003–2004	$3,232,000	$2,673,000	$2,129,000	$1,681,000	$1,225,000
2004–2005	$3,232,000	$2,673,000	$2,129,000	$1,681,000	$1,225,000

to provide this assistance is the Program for Arterial Signal Synchronization (PASS). Through PASS, MTC provides technical and financial assistance to Bay Area agencies to improve safety and operations of certain traffic signal system and corridors. The goals and objectives of PASS are as follows:

- Coordinate local and state-owned signal systems, and retime signal systems in response to changes to the state-owned system. This includes changes resulting from freeway widening, reconfiguration of interchanges or intersections, implementation of ramp metering, or altering the lane configuration on state highways.
- Establish and maintain communications between systems owned by Caltrans and local agencies. This could entail provisions of GPS units, signal interconnect cable, or other technology to enable two-way communications and coordination, as well as retiming the signals once the new communications system is activated.
- Retime traffic signal systems to support priority for transit vehicles. This would include active priority through signal preemption systems and passive priority through signal timing plans, and could include providing transit vehicles with rapid access/egress from major transit hubs.
- Retime traffic signal systems in conjunction with other established regional programs, such as safe routes to schools, safe routes to transit, smart corridors, and incident management.

Under the program, the types of activities that could be implemented include the following:

- developing and implementing signal coordination plans (a.m., p.m., and/or midday) that reduce travel time and delay on corridors that contain state and local signals;
- collecting weekday peak-period turning movement counts, including pedestrian and bicycle counts, and seven-day, 24-hour machine counts at strategic locations to determine periods of coordination;
- developing and implementing signal coordination plans based on the throughput of people rather than vehicles;
- developing and implementing flush plans for arterials that are used as diversion routes in the event of freeway incidents, in conjunction with other incident management actions;
- developing and implementing optimized actuated settings for fully actuated signals to minimize queuing during non-peak periods;
- developing and implementing signal coordination plans that reduce starts and stops and promote uniform travel speeds; and
- developing and implementing transit signal priority plans to make transit a more attractive travel option.

Project Selection

Local agencies are required to submit an application to MTC. As part of the application, the local agency must demonstrate how the proposed project meets the goals and objectives of the program. Candidate projects must involve a minimum of eight signalized intersections with interconnection or reliable time sources and are currently capable of coordinated operation, unless the project application includes provision of interconnections or a reliable time source.

Projects that improve communications systems are also eligible from funding under PASS. Communication improvements are limited to a maximum of $10,000 per project. Projects that link signals owned by Caltrans and local agencies have higher priority for funding. Projects involving traffic signals owned by one local agency receive a lower priority for funding, unless they are part of a regional program, such as safe routes to school/transit, smart corridors, or incident management.

Roles and Responsibilities

MTC is responsible for administering and managing PASS. MTC is responsible for receiving and evaluating submitted applications for local agencies. MTC is also responsible for securing consultants to perform the work specified in the application. MTC's consultant is responsible for developing the following recommended timing plans for each signal in the system:

- optimal initial and actuated settings,
- time-of-day coordination plans and hours of coordinated operations, and
- transit signal priority plans and hours of operations.

Primary responsibility for the operation and maintenance of the traffic signals remains with the agency that owns the signal. Prior to implementation, MTC and the local agencies must review and approve the recommended new timing settings. Once approved, the consultant is responsible for implementing or assisting the agency staff in implementing the new timing settings. The consultant is also responsible for fine-tuning or assisting agency staff in fine-tuning the settings once deployed in the fields.

Agreements

MTC requires PASS grant recipients to enter into an agreement with MTC to (1) waive any and all claims against MTC for any loss, liability, or damages resulting from the program, either directly or indirectly; and (2) indemnify, hold harmless, and defend

MTC against any third-party claims that may result from the agency's participation in the program. An agency that requires peer review assistance will also be required to sign such an agreement in favor of the peer reviewer.

Funding

MTC uses federal Congestion Mitigation/Air Quality (CMAQ) funds to provide funding for projects. MTC obligates approximately $1.25 million per year to fund traffic signal coordination under PASS. This level of funding allows MTC to initiate between 10 and 15 projects annually. MTC provides the 20 percent matching requirement for the local agencies.

Performance Measures

MTC requires the selected consultant to conduct before-and-after field assessments of each project. MTC requires the consultant to conduct travel time and delay studies during times and days that are representative of the times and days for which coordination plans were developed. A minimum of four runs shall be conducted for each direction for each peak period. From the studies, MTC requires the consultant to calculate the following measures of effectiveness of the improved system: delay, number of stops, travel time, fuel consumption, emissions, benefit-cost ratio, and cost effective for emissions reductions.

Outreach

MTC provides outreach through their Arterial Operations Committee (AOC). The AOC is open to all local traffic engineers and consultants interested in regional operations. The committee meets every two months to discuss various programs overseen by MTC, including regional projects that may have impacts on arterials and other relevant issues such as air quality conformity, status of funding obligations, upcoming grant and training opportunities, and new publications. Every meeting has a feature presentation where engineers can learn about the status and results of local projects.

MTC also provides a Technology Transfer Program. This program allows MTC to offer free, half-day seminars on a variety of topics of interest to local transportation engineers. These seminars include technical presentations by topic experts as well as presentations from local engineers on recent projects in the Bay Area. These seminars are held every four to six months.

APPENDIX C3. SITE SUMMARY FOR KANSAS CITY METROPOLITAN AREA

Operation Green Light is the RTSOP for the Kansas City metropolitan area. Originally funded in the late 1990s, the intent of the program was 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 progression flow. As the program developed, it began to have a more regional emphasis. Today, the program is hosted by the Mid-America Regional Council (MARC), the metropolitan planning organization for the bi-state Kansas City region. MARC is governed by a board of local elected officials, and serves a nine county region composing more than 120 cities.

Operation Green Light is one of the many programs hosted by MARC and is a regional initiative to improve traffic flow and reduce emissions through the coordination of traffic signal timing plans and improved communications between traffic signal equipment. Today, twenty-one municipalities, the Missouri Department of Transportation, the Kansas Department of Transportation, the Kansas City Area Transportation Authority, and MARC all participate in the program. The goal of the program is to improve the coordination of traffic signals and incident responses on major routes throughout the Kansas City area on both sides of the Kansas/Missouri state line.

Traffic signals controlled by MARC through the Operation Green Light program are managed from a single control center located at the Missouri Department of Transportation District 4 headquarters in Lee's Summit. The operations center shares space with the Kansas City Scout project, the region's freeway management center operated jointly by the Kansas Department of Transportation and the Missouri Department of Transportation.

Roles and Responsibilities of Partner Agencies

Working with the local entities, MARC is responsible for developing regional timing traffic signal timing plans using traffic counts and other relevant information provided by the local entities. MARC is also responsible for conducting travel-time studies and speed profiles before and after the timing plans have been implemented. Each local entity is responsible for providing MARC with an initial set of phase sequencing, splits, and offset, which MARC will use to develop an initial timing plan. Local agencies have the authority to review and determine if any changes to the initial settings are needed to optimize operations in the corridor. Once member agencies have agreed on the different timing plans, the local agencies may either download the setting themselves or request that MARC download the setting to the controller. Once implemented, MARC, in conjunction with agency staff, will monitor the operations in the field and work with the local agency to make any additional changes to further optimize flow in the corridor, if necessary. MARC is also responsible for the following tasks:

- conducting annual examination of the operations of signals that are part of the regional significant traffic corridors,
- working in cooperation with the local entity to develop special timing plans to implement when incidents occur in the corridor, and
- responding to citizen complaints and requests on operations of the traffic signals in the program.

In terms of maintenance, MARC is responsible for maintenance and replacement of all wireless communications infrastructure installed as part the Operations Green Light program. Member agencies that have the capability to maintain their own communication infrastructure may do so by agreement with MARC. MARC is also responsible for upgrading traffic controllers that are not capable of communicating with the central system software.

Organization Structure

The program is administered by MARC, which has a staff dedicated to developing timing plans and repairing and maintaining the center-to-field communications system. These individuals are MARC employees. The program is supported by five full-time employees: one engineer, three network technicians, and one administrative assistant.

Oversight for the program is provided by the Steering Committee. The Steering committee is comprised of representatives

from the participating agencies. The Steering Committee is responsible for establishing policy and priorities for the program, as well as for participating in the project decision-making process at key points through the review and approval of project deliverable and reports. The Steering Committee is also responsible for assisting in the development of subsequent inter-jurisdictional agreements for constructing, operating, and maintaining the regional traffic signal coordination system. The Steering committee meets on a quarterly basis.

Funding

The costs associated with Phase I of Operation Green light have been around $13.1 million. These costs include the following:

- the deployment of a dedicated wireless communications system to more than 600 intersections in the region;
- the deployment of a regional traffic operations center, not only to manage traffic signals, but also to coordinate incident responses; and
- the replacement of some traffic signal controller infrastructure.

The annual operating costs are approximately $1.2 million per year. The sources of funding from the program include the following:

- local Capital Improvement Program (CIP) funds,
- American Recovery and Reinvestment Act (ARRA) funds,
- federal Congestion Mitigation/Air Quality (CMAQ) funds,
- federal appropriation earmarks,
- state and local operating/maintenance budgets, and
- state ITS program funds (Kansas).

Beginning in 2012, local entities will be required to provide a 35 percent match to the federal funds. MARC is exploring options for decreasing their reliance on federal funds.

Agreement

To participate in the program, each local entity enters into a cooperative agreement with MARC. The cooperative agreement outlines the roles and responsibilities of both MARC and the local entity. The agreement also contains a matrix showing ownership and maintenance responsibilities for the various communications and central monitoring software system. Also included in an appendix of the agreement is the Operations Green Light concept of operation, which provides detailed specifics on the processes and procedures to be used to perform the following tasks:

- developing and deploying initial regional timing plans,
- providing maintenance of timing plans,
- developing and implementing incident management timing plans,
- handling and processing citizen complaints/requests,
- maintaining and replacing responsibilities for the wireless communications systems,
- upgrading controllers and working incident agency owned traffic signal controller cabinets, and
- staffing of the traffic operations center.

The cooperative agreement also contains a section that specifically identifies the maximum amount of money each entity pays to MARC over the life of the project agreement (5 years) for the maintenance and operation of the Regional Traffic Control System. Costs are allocated to each agency based on the proportion of agency-owned traffic signals to the total number of traffic signals covered by Operation Green Light. The agreement also shows the amount of money owed each year by the agency accounting from decreases in federal subsidies levels.

Performance Measures

MARC is responsible for conducting before-and-after travel time studies to assess the effects of improved coordination of traffic signals. Standard measures of reductions in travel time and delays are the performance measures used in these studies.

APPENDIX C4. SITE SUMMARY FOR SOUTHEAST MICHIGAN/OAKLAND COUNTY

While there is no formal regional traffic signal operations program, the agencies in Southeast Michigan have a long history of thinking about their traffic signal system from a regional perspective. As early as 1999, state and regional agencies held a traffic signal summit to discuss the state of traffic signal operations and timings in southeast Michigan. The summit focused on three critical issues related to signal timings: signal timing and progression, timely installation of traffic signals, and all-red clearance intervals. This summit led to the development of a traffic signal retiming program

In 2005, SEMCOG secured a grant to create a Regional Concept of Transportation Operations (RCTO). To develop the RCTO, SEMCOG staff met with tri-county and Michigan Department of Transportation (MDOT) staff and first responders to develop a common vision among transportation operators for improving operations throughout the region. The group established the following five operational goals to guide the development and deployment of their transportation management activities:

- improve responder safety;
- provide for safe, quick clearance of incidents;
- provide prompt, reliable interoperable communications disseminating operational information to stakeholders;
- retime traffic signal regularly; and
- identify priority corridors for future investment.

Administrative Structure

There is no formal administrative structure that oversees the regional operation. Funding for retiming projects is often provided by SEMCOG or MDOT. Local and counties agencies have a long history of working collaboratively and cooperatively.

Agreements

The RCOC frequently uses cost-sharing agreements for traffic signal work. Under these agreements, local agencies and the RCOC agree to share the cost of installing, operating, and maintaining traffic signals based on some agreed-upon formula—usually based on the percentage of signals located within each jurisdiction. These agreements also define who is responsible for paying the energy billings, who is the owner of the equipments, and/or who is responsible for providing and maintain the communications interconnections between signals. Agencies

are billed monthly and agreements can be terminated generally within 30 days written notice by any party.

Roles and Responsibilities

Oakland County, one of the counties in the SEMCOG region, operates its own regional traffic signal operations program, known as Faster and Safer Travel Through Routing and Advanced Controls (FAST-TRAC) system. Operated by the Road Commission for Oakland County (RCOC), FAST-TRAC is an arterial surveillance and control system designed to optimize traffic flow and squeeze out as much additional capacity as possible from the existing roadway. The FAST-TRAC system utilizes the Sydney Coordinated Adaptive Traffic System (SCATS) as the primary signal management system. Seven regional computers monitor network-wide traffic flow and balance traffic flows between major corridors. In this way, RCOC can adjust traffic signal operations area-wide to accommodate for traffic backups caused by traffic restrictions (such as incidents and work zones). These regional computers are connected to a central management computer where RCOC traffic managers can monitor operations on the network and make adjustments to signal timing strategies as needed.

SEMCOG recently purchased a traffic signal management software system to serve as a central clearinghouse for all traffic signals for the four outer counties. SEMCOG uses this software system to keep track of when traffic signals in major corridors were last retimed. Working with the local counties, SEMCOG uses this information to develop a list of intersections and corridors that need to be upgraded. Local agencies also have the ability to access signal information from other entities in the region, which can be used to coordinate operations. Local agencies that can access the system include the following: road commissions of Livingston, Monroe, St. Clair, and Washtenaw counties, as well as the cities and villages of Ann Arbor, Brighton, Dearborn, Ferndale, Fowlerville, Holly, Howell, Monroe, Pontiac, Port Huron, Royal Oak, and Ypsilanti.

Another one of SEMCOG's roles in the program is to identify regional priority corridors for signal timing upgrades and improvements. With the help of SEMCOG's Arterial Traffic Management Committee, a total of 576 corridors were evaluated region-wide. Each corridor was ranked on a point scale of 1 through 18. Table C2 shows the criteria that were used to rank the corridors. The top half of priority corridors were further grouped into tiers with Tier 1 (those receiving 16–18 points) being the highest priority corridors, Tier 2 (those receiving 14–15 points) being the next highest priority, and Tier 3 (11–13 points) being the third priority corridor. This tier system is being used to focus limited resources on roadways based on needs and potential impacts and not jurisdiction.

Funding for actual retiming projects is provided through Congestion Mitigation and Air Quality (CMAQ) funds. Local agencies are responsible for submitting applications for funding. SEMCOG is responsible for processing applications. Because of their high "readiness," traffic signal timing projects make good "backup" projects that can quickly utilize unused CMAQ funds that become available.

Funding

The program is funded using Congestion Mitigation and Air Quality (CMAQ) funds. Traffic signal retiming projects must compete along with other improvements for available funds. Eligible improvements funded through the program include the following:

- signal systems improvements, such as interconnects, retiming, actuation, or optimization along federal-aid eligible roads;
- retiming of individual signals along federal-aid eligible roads;
- addition of dedicated turn lanes of less than one-half mile in length at congested intersections on federal-aid eligible roads;
- intelligent transportation systems (ITS) projects improving the flow of traffic through congested corridors on federal-aid eligible roads;
- transit projects, such as replacement of older, more polluting buses with cleaner-running new buses and the acquisition of new vehicles for service expansion;
- operating assistance for start up of new transit service (three year maximum);
- carpool and vanpool programs;

TABLE C2
EVALUATION CRITERIA USED BY SEMCOG TO IDENTIFY PRIORITY CORRIDORS

Criteria	Points	Based On
Safety	0–3	Weighted PCI (Crash Probability Manual) per mile scaled to a maximum of 3
Congestion	0–3	Percent of corridor overlapped by congested segments scaled to maximum of 3
Freight	0–3	1 for corridors designated as truck routes
		1 for identified corridors connecting to ports, airports, or intermodal facilities
		1 for identified corridors serving high-priority regional freight corridors
Transit	0–3	Transit ridership by category (1: 1–4,999 riders per day; 2: 5,000–9,999 per day; 3: 10,000+ riders per day)
Volume	1–3	Volume by category (1: 1–9,999 vehicle per day; 2:10,000–29,999 vehicles per day; 3: 30,000+ vehicles per day)
Density	0–3	3 for corridors intersecting TAZ (traffic analysis zones) with household density > 3.0 or job density > 4.0
Activity Centers	0–3	3 for corridors intersecting one-half mile buffer around identified activity centers
Functional Classification	0–3	3 for principal arterials; 2 for minor arterials; 1 for major/minor collectors; 0 for others

- certain non-motorized paths and bicycle projects, where these can be shown to divert motor vehicle commuting traffic that would otherwise take place;
- diesel retrofit of fleet trucks; and
- construction of roundabouts on federal-aid eligible roads.

In order to enhance their readiness, traffic signal retiming projects can be entirely covered by federal funds, rather than the typical 80/20 matching requirement. This eliminates the need for local agencies to work quickly to secure local matching funds.

APPENDIX C5. SITE SUMMARY FOR LOS ANGELES COUNTY, CALIFORNIA

The Department of Public Works (DPW) of Los Angeles County has been completing Traffic Signal Synchronization Program (TSSP) projects since 1988. The program was initiated at the request of a local county politician who demanded the regional transportation provider begin operating their systems from a regional perspective. The goal of the program was to identify, develop, and implement innovative, low-cost operational improvements to the network of traffic signals on the major streets throughout Los Angeles County. Today, the program is responsible for developing coordination timing plans for more than 2000 traffic signals. The primary functions of the program include the following:

- provide training/certification for traffic signal technicians and operational personnel,
- provide a forum for discussing regional traffic signal operations issues,
- develop traffic signal timing plans that facilitate cross-jurisdictional traffic flow,
- provide consistency in signal timing practices between agencies, and
- identify and establish priorities, corridors of significance, performance goals, and measures for the region's traffic signals

Using funding provided by the MTA, TSSP projects involve upgrading all the traffic signals along a route to keep the signals synchronized, placing vehicle detectors in the pavement to detect the presence of vehicles and enable the signal to operate as a fully traffic actuated signal, and coordinating the timing of the signals between successive intersections.

Organizational Structure

Originally when the program was developed, working groups, called Regional Traffic Signal Forums, were established to facilitate the development of operational timing plans. Each forum is composed of approximately 20 local entities. Each agency is responsible for operating and maintaining the traffic signals within their agency. In some instances, agencies contract with DPW for traffic signal maintenance. Also included in each forum are representatives from the California Department of Transportation (Caltrans) and the local Council of Governments. LA County Department of Public Works (DPW) is the lead agency administering traffic projects in each forum. Each forum focuses on a set of major commuting corridors in the county. A total of five corridor projects within three forums have been initiated to address regional traffic signal coordination issues. The original intent of these forums was to identify and make decisions about operational improvements to support regional operations.

Today, the purposes of the forums are as follows:

- to identify and prioritize locations for expending regional resources,
- to develop and implement coordination timings on roadways that span multiple jurisdictions, and
- to facilitate the development and deployment of advance traffic management concepts (such as transit signal priority) in the region.

As the program has matured, the organizational structure has transitioned to more of a peer-to-peer structure, with LA County being the lead agency responsible for coordinating the improvements across jurisdictional boundaries.

Funding

Funding for improvements is provided through Los Angeles County Metropolitan Transportation Authority's (MTA) Signal Synchronization and Bus Speed Improvement program. The program is supported by local sales tax revenues. Projects funded under this program require a 20 percent match, with LA County being the primary source of the local match. These funds can be used to cover a wide variety of traffic engineering measures that can be categorized into four tiers:

- TIER 1: Conventional Traffic Engineering—such as time-based traffic signal coordination and functional intersection improvements.
- TIER 2: Transit Preferential Treatment and Priority Systems—such as traffic signal priority and bottleneck intersection improvements.
- TIER 3: Computerized Traffic Control and Monitoring Systems—such as arterial, area-wide, and central traffic signal control systems.
- TIER 4: Intelligent Transportation System (ITS) and Integrated Corridor Management (ICM)—such as multi-agency system integration and advanced communications and ITS technologies.

LA County's Traffic Signal Synchronization projects compete with other projects funded through this program. The first phase of the program was completed in September 1995 when a total of 39 routes and 780 signalized intersections along 220 miles of streets in 58 cities and unincorporated areas were improved at an estimated cost of $17 million. The second phase of the program is ongoing and involves 104 projects on 72 routes, consisting of 1,800 signalized intersections along nearly 530 miles.

Project Selection

Currently, when projects are initiated, LA County works with each individual local entity to identify the specific routes and roadways to be included in a project. Each individual agency is responsible for making its own decisions in terms of what level of involvement they want in the program. Cities can elect to have LA County operate their traffic signals from their regional control center or construct their own improvements or install their own systems. In the first situation, LA County will provide the technical expertise and interagency needs to establish multi-jurisdictional signal coordination.

To secure funds in the program, the MTA issues a Call for Projects that utilize local mobility funds to develop traffic signal synchronization and intelligent transportation system projects.

LA County works with each local community within the subregions to identify potential corridors, identify equipment upgrades, and prepare a funding request. To be eligible for project funds, the roadway must satisfy the following criteria:

- The project must be located on roadways included in the Countywide Significant Arterial Network (CSAN), a collection of major and secondary arterials of significant regional importance.
- The roadway must have a minimum of four lanes (two lanes in each direction).
- The roadway should carry a minimum average daily traffic (ADT) of 20,000.
- The roadway must currently experience a level of Service D or worse.
- Any construction that occurs must be within the existing rights-of-way.

Roles and Responsibilities of Partner Agencies

Under the TSSP program, LA County is responsible for developing the coordination timing plans (cycle lengths, splits, and offset), while both LA County and the local agencies are responsible for maintaining the timing plan in the controller in their respective jurisdictions. Coordination timing is implemented on traffic signal control hardware and software selected by each local agencies. The local agencies are responsible for establishing the basic signal timing parameters (clearance intervals, pedestrian timings, etc.) based on local policy. The local agencies are also responsible for performing routine and emergency maintenance on the intersection hardware. As part of the funding agreement, the local agencies agree to keep the coordination timing plan in the controller. If a local agency needs or desires a change to the coordination timing plan, they must have approval of DPW in its role as the lead agency administering these projects. DPW works with the individual agencies to ensure the revised timing maintains coordination for all the signals on the route.

The second component of the program is the installation of centralized traffic control systems for the cities. These systems provide central monitoring of traffic signal operations from a central location, and provide the capability to automatically adjust the traffic signals to facilitate the movement of vehicles through the intersections. With the deployment of these agency systems, the need for comprehensive software to enable DPW and each agency to view the operation of traffic signals across jurisdictional boundaries became apparent.

Therefore, to facilitate these functions, LA County has developed their own software, called the "Information Exchange Network" to support the exchange of traffic signal data from different control systems operated in the region. To date, this software provides interfaces with systems from multiple vendors, including the city of Los Angeles, McCain/Quicnet, TransCore/Transuite, and Siemens/i2 systems. LA County is also actively working on obtaining traffic signal data from Kimley Horn Integrated Transportation System (KITS) and from Econolite's Centracs systems. DPW is also working on including freeway congestion data from Caltrans into the software.

Agreements

Two types of agreements are used in this program, depending on the program component and level of supervisory control to be performed by the county. The first type of agreement is an interagency TSSP cooperative agreement. The purpose of the agreement is solely to define and document the roles and responsibilities of the respective city and the county when entering into a TSSP project and to confirm the associated liabilities of each agency. Nothing in the agreements is intended to alter the current roles and responsibilities of the participants in operating and maintaining the traffic signals and signal systems within their respective jurisdictions. Under this type of agreement, each city is responsible for designing, installing, operating, and maintaining the traffic signals within their jurisdiction. This means that each city is responsible for developing, operating and maintaining the basic signal timing parameters according to their local operating policies and practices, and that the county is responsible for developing and implementing the traffic signal coordination timings along the designated arterials to promote regional traffic movement. While each city has the authority to change any of the signal timings, they are required to notify the county of any changes that may impact the base coordination timing plans. An example of this type of agreement is provided in Appendix D7.

The second type of agreement that is used in the program is for the intelligent transportation system component and specifically for those agencies that want LA County to provide supervisory control over their signal operations. This type of agreement not only allows the county to develop and maintain coordination timing plans, but also allows the county to connect each intersection to the county's central monitoring system. Using this type of agreement, the county is responsible for funding any and all equipment upgrades necessary to support developing and coordinating inter-regional traffic operations. This include such items as the installation of wireless communications systems to link isolated intersections, the installation of a workstation and connection to LA County's central monitoring and control system, and the implementation of new traffic signal controller firmware to facilitate coordinated operations. The agreement stipulates that the county has the authority to review, observe, and, if necessary, recommend revisions to and/or modify basic and/or coordination timings at the city's signals with the approval of the city. The agreement also stipulates that each city retains the overall responsibility for operating and maintaining the signals within their jurisdiction, and will reimburse the county a specified amount for the annual costs incurred by the county for monitoring and operating their traffic signals. An example of this type of agreement is contained in Appendix D8.

Performance Measures

While LA County does not routinely produce performance measures reports, estimates showed that this program has saved motorists, on an annual basis, $218 million in vehicle costs, 14.8 million travel hours, 18.7 million gallons of fuel, and 7,700 tons of pollutants to date. Travel times were reduced by as much as 24 to 29 percent.

APPENDIX C6. SITE SUMMARY FOR DALLAS–FT. WORTH, TEXAS

In 2002, the North Central Texas Council of Governments (NCTCOG) launched a Thoroughfare Assessment Program (TAP). The goal of this program was to improve traffic flow and enhance capacity of existing arterial systems by implementing new signal timing and low-cost operational improvements along selected corridors. Under the program, local agencies can apply for funding through NCTCOG to make operational improvements such as changes to lane assignments, upgrades to vehicle detection systems, additions of pedestrian push buttons, upgrades to traffic

signal heads, upgrades to traffic signal controllers and cabinets, communications to central monitoring computers, additions of GPS clocks to provide time-of-day coordination, and minor restriping. The program was divided into three phases:

- Phase 2.0, which included signal retiming and low-cost operational improvements at 482 signalized intersections in 20 corridors;
- Phase 3.1, which included 258 signalized intersections in 13 corridors the Dallas–Fort Worth Metropolitan area; and
- Phase 3.2, which included 1,178 signalized intersections in a total of 60 corridors.

Phase 2.0 was completed in July, 2009, while Phase 3.1 and 3.2 were completed in June, 2003, and December, 2009, respectively.

Project Selection

A Project Review Committee was responsible for selecting the projects to be included in the TAP. The Project Review Committee was composed of technical representatives of agencies that submitted project requests. NCTCOG provided initial review and scoring of the projects based on criteria established by the Project Review Committee. The Project Review Committee reviewed the draft rankings and scorings and revised the project selection criteria until there was collective agreement on the priority and ranking of the projects. Final project rankings and scoring were then approved by the Regional Transportation Council, which is a policymaking body composed of elected officials from member agencies.

In addition to assisting with project selection, NCTCOG was responsible for procuring the consultant responsible for performing the assessment of corridor operations. The consultant was responsible for:

- assessing corridor operations prior to initiating improvements,
- collecting all necessary volume and turning movement counts needed to establish new timing plans,
- developing new timing plans for the corridors,
- identifying any needed changes to lane assignment or restriping that would improve operational efficiency, and
- conducting a before-and-after assessment of the improvements in operational performance once the retiming was complete.

For all corridors, the consultant was responsible for developing new timing plans for the weekday a.m., midday, and p.m. peaks. In many cases, separate versions of a.m. and midday plans were required for times when school speed zones were in operation. Some corridors also required separate timing plans for other periods (such as Saturday or late evening off-peak periods) based on traffic demands and travel patterns.

Once the new timing plans were developed, they were submitted to the local jurisdictions for approval. The local entities, with the assistance of the local consultant, were then responsible for implementing the new timing strategies in local intersection controllers. The consultant was also responsible for "fine-tuning" the new timing plans to improve actual on-street performance.

Funding

Funding for the projects was provided using Congestion Mitigation/Air Quality (CMAQ) funds. These funds were used to make operational improvements only and for minor upgrades to communication and control equipment (for example, purchasing GPS clocks to provide time-of-day coordination). Local agencies are responsible for providing the 20 percent local match that is typically associated with using CMAQ funds. No formal cost-sharing arrangements are used as part of the program.

Agreements

Because local agencies are required to submit funding for the project, an interagency agreement is required between NCTCOG and the implementing agencies. The agreement basically stipulates that the local entity is responsible for providing the match requirement for the project. The agreement does not stipulate that agencies are required to implement the timings developed by the consultant or restricts them from changing the timings once implemented in the field.

Maintenance of the traffic signal equipment and timings are the sole responsibility of the implementing agencies. Each local entity is responsible for maintaining the control and detection equipment as well as the signal timing plans when implemented.

Performance Measures

Before and after travel times and stops were used to quantify the benefits of each individual project. These runs were used to assess the average travel time savings and reductions in stops generated by the signal timing improvements. Travel times runs were made with an instrumented vehicle traveling at the pace set by other traffic. The "before" travel time runs were made at the start of the project, prior to any changes in the previous signal settings. The "after" travel time runs were made after the new signal timing plans had been installed and fine-tuned.

In addition to actual field measurements of travel times, project results were also estimated using Synchro™. For each corridor, a calibrated model of the before timings were compared with the calibrated model of the final timings. The measures of effectiveness (MOEs) that were compared included total signal delay, fuel consumption, and three categories of emissions (CO, NOx, and VOC).

Outreach

NCTCOG does not have a formal outreach effort associated with the program; instead it leaves the outreach to the individual entities deploying the improvements. NCTCOG does respond to requests for interviews from the media and assists local agencies in clarifying the benefits of the program. At the conclusion of each program phase, NCTCOG's consultant produces an executive summary describing the assessments conducted, the types of improvements recommended, and the overall collective benefits resulting from the improvements. These benefits reports are available through NCTCOG's website.

APPENDIX C7. SITE SUMMARY FOR DENVER REGIONAL COUNCIL OF GOVERNMENTS

The Denver Regional Council of Governments (DRCOG) is responsible for administering the Regional Traffic Signal System Improvement Program (TSSIP) for the DRCOG Transportation Management Area (TMA). The TMA contains more than 3,500 traffic signals operating in 32 different jurisdictions. Initiated in

1994, the goal of the program is to reduce travel times and vehicle emissions through the implementation of cost-effective traffic signal improvements and coordination timings. Originally when the program was first developed, the primary emphasis was on providing inter-jurisdictional coordination through techniques such as the deployment of a common cycle length, the replacement of unreliable equipment and controllers, and the installation of detection and monitoring systems for assessing demands. As it exists today, the program consists of two primary elements:

- a capital improvement program designed to (1) raise the base functionality of the traffic signal equipment in the region to a specified standard, and (2) provide communications linkages to traffic signals in high traffic volume corridors; and
- a traffic signal improvement program that provides new and/or updated traffic signal timing and coordination plans every three to five years.

The majority of the capital projects focus on installing communication systems to support interconnection. Over time and as improvements have been made, the priority of the programs has changed from upgrading the basic functionality of traffic signal equipment at critical intersections to deploying reliable communications systems to support the interconnection of traffic signals and other ITS.

A fundamental component of the program continues to be the development of new time-of-day, scheduled-based timing plans. TSSIP ensures coordination across jurisdictional boundaries by having all controllers and control systems synchronized with the Universal Coordinated time (WWV time) broadcast by the National Institute of Standards and Technology in Boulder.

Organizational Structure

DVCOG operates as an independent agency, separate from the operating agencies in the region. DRCOG is the MPO for the Denver region and follows the typical MPO structure. A technical advisory group, called the Transportation Advisory committee, provides assistance to the MPO staff in developing policy options and makes recommendations to the Regional Transportation Committee. The Regional Transportation Committee is the policy board for the MPO and consists of elected officials from the region. The Regional Transportation Committee must approve the TSSIP each time it is updated.

Funding

The program is funded through the use of CMAQ funds. The program is specified as a line item in the TIP that allows DRCOG to fund different projects annually. The program is funded at approximately $3.9 million annually. Approximately two-thirds of these funds are directed towards the capital needs of the program. These funds are intended to be used to replace insufficient or unreliable communications in key corridors, to extend and incorporate isolated intersections into nearby systems, and to provide higher efficiency systems and equipment in support of regional ITS deployments. Approximately $1 million dollars per year is set aside for developing signal timings and coordination plans. A small amount of funds ($250,000) has been set aside for contingencies and miscellaneous equipment purchases. These funds are used to ensure that projects can proceed to construction if actual costs exceed preliminary estimates. Once it is certain that identified construction projects can be completed with the allotted funds, the remaining contingency funds can be used for purchasing miscellaneous traffic signal equipment on an as needed basis.

Project Selection

Retiming projects that are directly tied to capital projects have the highest priority, while non-capital retiming requests generally are secondary. DRCOG's target goal is to review the timing on each of the major corridors every three to five years. DRCOG, in cooperation with the local partners, is responsible for identifying DRCOG uses of their knowledge of the local operations as well as citizen complaints to identify roadways for these targeted studies.

There is a group called the Regional Transportation Operations Working Group that meets monthly to discuss regional transportation operations issues and build consensus on technical issues of regional importance. This group assists in preparing program recommendations to the DRCOG Board of Directors as well as serving as a forum for discussing technical and institutional issues related to regional signal timing.

Roles and Responsibilities of Partner Agencies

DRCOG's Traffic Operations Program is responsible for implementing the program. The Traffic Operations Program has a staff of one supervisor, three traffic engineers, and three technicians. The staff works cooperatively with traffic operations personnel from the local entities and the Colorado Department of Transportation to develop coordination timings for the corridors specified in the Traffic Signal Improvement Program master plan.

DRCOG's responsibilities include the following:

- preparing system and operations plans in advance of design for capital improvement projects;
- developing plans and bid documents for upgrades to traffic signal and communications infrastructure;
- developing new timing and coordination plans following the completion of new capital improvements;
- assisting with the implementation, field verification, and fine-tuning of traffic signal timing plans; and
- conducting evaluation studies documenting the effectiveness of the improvement on corridor operations.

The local entities' responsibilities are as follows:

- operating and maintaining traffic signal hardware and communication infrastructure once installed,
- maintaining the traffic signal timings and coordination plans once deployed in the field,
- fine-tuning operations of the traffic signal once the initial coordination settings have been deployed, and
- approving plans and other documents prior to construction of capital improvements.

DRCOG will also conduct traffic signal retiming projects at the request of a partner agency.

Agreements

No formal agreements are required to implement the improvements identified by the program. Program priorities are identified in the Traffic Signal System Improvement Program

master plan. Because the program plan has to be approved by the Regional Transportation Committee, local agencies are obligated to abide by the projects and programs specified in the plan.

DRCOG uses a formalized standard process for developing signal timing plans. The process, which was developed early in the program and adopted by the DRCOG's technical advisory committee, provides step-by-step procedures for developing a signal timing project and highlights the reasons and responsible agency/individual for completing the step.

Performance Measures

At the conclusion of each retiming project, DRCOG is responsible for preparing an effectiveness evaluation for each project. This evaluation involves comparing before-and-after travel times to determine the amount of congestion reduction associated with each project. A benefits analysis spreadsheet is used to generate the following performance measures:

- travel time savings, in terms of hours per day;
- reductions in fuel consumption, in gallons per day;
- reduction is pollutant emissions, in pounds per day; and
- user savings, in dollars per day.

Outreach

DRCOG maintains a website (see http://www.drcog.org/index.cfm?page=TrafficSignalProgram) that provides an overview of the program as well as links to different documents associated with the program. The website provides links to summary tables that show the annual benefits associated with projects completed annually by the programs. The website also contains a link to a brochure developed by DRCOG that provides an overview of the basic philosophy and challenges associated with timing traffic signals and traffic signal coordination.

In addition to maintaining a website, DRCOG also produces a Signal Timing Brief at the conclusion of each project. Each brief contains a brief description of the project; a map showing the location of the project within the region; a listing of the local project partners; a summary of the project specifics (traffic volumes, timing revisions, reductions in travel times, etc.); a summary of the daily benefits in terms of reductions in vehicle hours of travel, fuel consumption, time and fuel costs, and total pollutant emissions; and an overall assessment of the cost savings associated with the improvements.

APPENDIX C8. SITE SUMMARY FOR ORANGE COUNTY, CALIFORNIA

Orange County is currently in the process of formalizing a program developed specifically to address regional traffic signal operations and coordination issues. Run through the Orange County Transportation Authority (OCTA), the Traffic Light Synchronization Program builds upon the success of two demonstration projects: the Euclid Street Demonstration Project and the Oso Parkway/Pacific Park Drive Demonstration Projects. Through these two demonstration projects, OCTA showed that managing signal operations from a regional perspective resulted in significant reductions in travel times and stops and dramatic improvements in air quality. As a result of the projects, OCTA is proceeding with the development of full scale Traffic Light Synchronization Program.

To date, the program has focused on developing a Traffic Light Synchronization Master Plan that outlines the goals, strategies, and components for operating traffic signals countywide. The goals of the Master Plan include the following:

- Develop a strategic plan to achieve optimized performance of traffic signals along important traffic corridors throughout Orange County.
- Build consensus among multiple cities and agencies to reach common operational goals.
- Establish a multi-year method for implementing the strategic plan.
- Maintain optimized traffic light synchronization in the future.

The Master Plan is expected to be approved by the OCTA Board of Directors in the summer of 2010. Beginning in 2011, the program will begin the process of synchronizing 2,000 signalized intersections in the county. The program will be administered through OCTA. Agencies will submit applications for funding through the program. Agencies can elect to develop their own signal timing plans or elect to have OCTA develop the timing plans for them. Each individual agency will be responsible for maintaining the coordination timing plans as well as all hardware and communications infrastructure in the system.

Funding

Recently, the voters of Orange County renewed local transportation ordinance Measure M, extending the existing $0.005 sales tax for 30 more years beginning in April 2011. One of the reasons the measure passed was the promise to use part of the funds to improve inter-jurisdictional traffic signal coordination. The measure requires that all revenues from the funds are to be deposited in a special fund and used solely for identified freeway projects, street and roadway improvements, transit projects, and environmental cleanup. These funds are administered by OCTA. It is anticipated that these funds will permit the synchronization of more than 2,000 signalized intersections across the county over the next three years. Local agencies will be required to provide a 20 percent match to use the funds for traffic signal synchronization projects. Day-to-day operations and equipment maintenance are the responsibility of the agency that owns the system.

Project Selection

To be eligible to receive project funds through the program, local agencies have to agree to develop their own Local Traffic Signal Synchronization program, which must be greater than or consistent with OCTA's Regional Traffic Signal Synchronization Plan. The Local Traffic Signal Synchronization Plan must describe the processes and steps that local agencies will take to keep their traffic signals in coordination and operating effectively. The local plan should also contain a maintenance plan that outlines the processes that will be used to keep field hardware, communications, and detection systems running. A three-year estimate of the maintenance costs must also be included in the plan.

One of the unique features of OCTA's program is that OCTA has pre-qualified eight consultants who are allowed to work on traffic signal synchronization projects. These consultants must have demonstrated experience collecting traffic signal operations data and developing and implementing coordination timings for

traffic signal systems. OCTA will select one of these consultants as their agent when they are to lead a synchronization project. When a local agency is designated as the lead, they have the option of using one of these prequalified consultants or can perform the work themselves.

Roles and Responsibilities of Partner Agencies

Roles and responsibilities for each individual project vary depending upon which agency is leading the project. Agencies have the option for using 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 as follows:

- Develop a local traffic signal synchronization program greater than or consistent with the Regional Traffic Signal Synchronization Master Plan.
- Participate in regional traffic forums.
- 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 system, 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 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 as follows:

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

Monitoring of traffic signal operations will be done from multiple traffic operations/management centers with communications interface capabilities for data, audio, and video. Maintenance of central or supervisory control and data acquisitions systems and maintenance of interconnect communications are funded through the program. All other work is considered routine maintenance to be covered by each agency's normal policies and procedures.

Agreements

OCTA is in the process of developing formal agreements that will be used to award project funds for individual synchronization projects. These agreements define the roles and responsibility of OCTA and the agency leading the synchronization project. Two different local project agreements are being considered depending on who is designated as the lead agency for the project. Appendix D9 shows the proposed model agreement to be used if OCTA is designated as the lead agency, while Appendix D10 shows the proposed model agreement to be used if a local agency leads the project.

Performance Measures

OCTA requires that a before-and-after study be performed as part of each traffic light synchronization project. In addition to standard traffic signal performance measures (intersections stops and delays, reduction in emissions, etc.). OCTA uses three primary measures of effectiveness: speed, the "Green/Red" ratio, and the number of stops per mile. The "Green/Red" ratio is the number of intersections through which a floating car can pass through on a green indication compared to the number of intersections at which the vehicle is stopped by a red indication. OCTA combines these three measures to provide the Corridor Synchronization Performance Index (CSPI). Because CSPI is a composite score, it allows OCTA to compare the effectiveness of different synchronization projects that have been designed to address different operational issues (e.g., different progression patterns for alternate times-of-day and directions of flow). Table C3 shows CSPI values for the performance measures.

OCTA sets a performance standard for acceptable level of operations—roadways that have a CSPI score of 70 or more are considered to be operating well. A report on the performance of the system is produced every 3 years.

Outreach

Outreach is a critical component of OCTA's Traffic Signal Synchronization Program. To facilitate the development and implementation of the Traffic Signal Synchronization Master Plan, OCTA hosted a series of Traffic Signal Forums. The purpose of these forums was to allow stakeholder agencies to express and address comments and concerns about regional traffic signal operations as a whole. Another purpose of these forums was to assist in the prioritization and phasing of individual deployment projects. OCTA used three tiers of traffic signal operation forums. The first tier involved representatives for all 34 cities in Orange County as well as OCTA, the county of Orange, the California Department of Transportation (Caltrans), and private consultants. At this level, discussion focused on issues of regional significance throughout the entire county. In the second tier of forums, the county was divided into two halves (north and south). This division was based on the fact that different geographic topologies impact traffic operations in the county. A third set of forums were formed to focus on operations in six different commuting corridors in the county. In these forums, agency operators discussed common operational issues specific to these corridors and identified roadways in the corridor to target through synchronization projects.

Traffic forums continue to be an important element of the program. As a precondition for receiving funds through the program, agencies are required to participate in the forums. Fur-

TABLE C3
CORRIDOR SYNCHRONIZATION PERFORMANCE INDEX (CSPI) USED BY OCTA TO EVALUATE EFFECTIVENESS OF CORRIDOR TRAFFIC SIGNAL TIMINGS

Speed		Green/Red Ratio		Average Number of Stops per Mile	
Measured Performance	CSPI Score	Measured Performance	CSPI Score	Measured Performance	CSPI Score
36	39	6.0	48	0.5	35
34	36	5.5	44	0.7	33
32	33	5.0	40	0.9	31
30	30	4.5	36	1.1	29
28	27	4.0	32	1.3	27
26	24	3.5	28	1.5	25
24	21	3.0	24	1.7	23
22	18	2.5	20	1.9	21
20	15	2.0	16	2.0	20

thermore, the forums are where decisions about changes in established coordination timing plans are made. In order to change an established synchronization timing plan, agencies must first prove to their respective forums that the results of the proposed changes are beneficial to traffic operations in the corridor as a whole before changes can be made.

APPENDIX C9. SITE SUMMARY FOR SOUTHWESTERN PENNSYLVANIA (PITTSBURGH)

In 2007, the Southwestern Pennsylvania Commission (SPC), the regional MPO for the 10 counties and the city of Pittsburgh, commissioned a study to outline transportation projects, programs, and policies to be implemented in the 10 county areas over the next twelve years. This study was an extension of the SPC's Transportations Systems Operations Plan, and defines the region's priorities for improving operations within the southwest region. Through a series of stakeholder meetings, four key operation areas emerged as high priority to the region, including the following:

- incident and emergency management,
- traveler information,
- traffic signals, and
- institutional issues.

To begin the process of executing these plans, SPC has developed the Regional Traffic Signal Program (RTSP). The goals of this program are as follows:

- 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 project for signals that are adequately equipped); and
- manage regional signals in coordination with equipment upgrades projects (i.e., projects that include both equipment upgrades and retiming and coordination plan development).

SINC projects are projects funded and supported by the SPC to improve traffic signal timings at intersections that already have the equipment needed to provide coordinated operations. These projects have a quick implementation time (4 to 6 months), and are focused at developing new timing plans that provide coordinate signal operations across jurisdictional boundaries. To be eligible for funding under this category, projects must involve two or more signals that have controller clocks that can be synchronized to a common reference (via interconnection, GPS, etc.) and are currently running in free (uncoordinated) operations or whose coordination plans have not been updated in the past three years. SPC provides the funding and technical assistance to local agencies to develop optimized regional signal coordination. This support includes field reviews, traffic counts, alternatives analysis, new timing coordination plans and other recommendations. In addition, SPC facilitates the development of multi-agency coordination and agreements to permit signals to be coordinated across jurisdictional boundaries. All efforts would be coordinated with local governments and the local Pennsylvania Department of Transportation (PennDOT) districts.

The final component of the program involves projects where minor upgrades to the traffic signal equipment are needed before the traffic signal can be retimed to provide coordination. These projects, called SINC-UP projects, include upgrades to controllers, communications, and signal indications. This program is also used to remove unnecessary signals, as long as the removal can be shown to benefit inter-jurisdictional coordination. Like SINC projects, local governments can make requests for projects to be included in this program. SPC provides the funding and traffic engineering support needed to re-optimize intersection and corridor operations. Construction of needed improvements would be coordinated through the local PennDOT District. Some examples of eligible projects are the following:

- modifications to traffic signal timings;
- modifications to traffic signal phasing;
- replacement or modifications to traffic signal coordination equipment and cables;
- replacement or modifications to traffic signal controller, controller cabinet assemblies, electrical service, and related electronic equipment;
- replacement of incandescent vehicular and pedestrian signals with LED Module vehicular and pedestrian signals;
- replacement or modifications to pavement markings on the roadway;
- replacement or modifications to vehicular detectors and associated hardware;
- replacement or modifications to traffic control signage;

- replacement or modifications to electrical and communication conduit and junction boxes that do not impact, disturb, or modify pedestrian usability;
- replacement or modifications to traffic signal electrical cabling;
- removal of existing signal installations that are no longer warranted;
- in-kind replacement or repair of existing sidewalks and accessible ramps only to the extent that is necessary due to the above mentioned work (areas must be less than 100 linear feet and less than 500 square feet); and
- maintenance and protection of traffic and other incidental items related to the above work.

Improvements not eligible under this program include the following:

- relocating and replacing of traffic signal pole or mast structures;
- signalizing intersections that are currently unsignalized;
- adding pedestrian features to an intersection where none currently exist (e.g., new sidewalks, accessible ramps, and/or new pedestrian signal where none currently exist);
- widening any roadway;
- performing any work that will permanently impact, disturb, or modify pedestrian usability; and
- funding of complete replacement of signal infrastructure (unless otherwise authorized by the project selection committee).

Funding

The program utilizes Congestion Management Air Quality (CMAQ) funds to fund traffic signal synchronization and signal equipment upgrade projects. All projects must include timing revisions that result in optimized operations of traffic signals. Projects that involve signalizing intersections of currently unsignalized intersections or roadway widening are not eligible for project funds. Complete replacement of existing traffic signal installations can only be partially funded through the program. Only construction associated with the electrical components are eligible for project funding through the program.

Local agencies are required to provide at least a 20% match of these funds. Tasks performed by local agencies using either in-house staff or outside contractors can be applied toward the local match requirement. Examples of eligible tasks include implementing new timing plans and/or installing new equipment and design services.

SPC anticipates spending up to $3,000,000 in federal funds to implement traffic signal synchronization projects over the next two years (2008–2010).

Project Selection

To secure project funds, local municipalities must submit an application for program funds. Submitted applications are reviewed by a selection committee composed of traffic engineers from the local PennDOT districts and from SPC's regional planning partners. Projects are evaluated based on the following criteria:

- total amount of delay experience in the corridor (or roadway functional classification if not a priority corridor),
- number of intersections being coordinated,
- traffic volumes,
- transit ridership,
- truck percentages, and
- accident rates.

Additional bonus points are awarded to projects that are located in environmentally sensitive areas, involve integration with other regional traffic management functions, provide priority treatment for transit, or include additional local match. The project selection criteria are shown in Figure C1.

Selected projects are reviewed and approved by the SPC Administrative Board prior to the awarding the funds to the municipalities.

Roles and Responsibilities of Partner Agencies

Prior to beginning any construction or implementing any timing improvements in the corridor using project funds, SPC and the local agencies must enter into either a memorandum of understanding (for SINC projects) or local project agreement (for SINC-UP projects), which define the roles and responsibilities of each agency for the project. For both SINC and SINC-UP, SPC (or their designated consultant) is generally responsible for the following activities:

- conducting field reconnaissance to inspect and verify field conditions and collect information on the study area required for a capacity analysis, including performing turning movement counts during weekday and/or weekend peak-period conditions;
- performing a capacity analysis of existing conditions using SYNCHRO/SIM Traffic and/or Highway Capacity Software (HCS);
- performing an analysis of the collision history in the corridor and identifying collision trends and potential countermeasures; and
- developing recommended short-term operational improvements such as revised signal phasing, optimized signal timings and offsets, additional signal coordination, revised pavement markings, and revised signage.

For those projects where construction is involved, SPC is responsible of the following additional items:

- preparing all plans, specifications, estimates and bid proposal documents required to bid the project;
- securing all necessary approvals, permits, and licenses from all other governmental agencies as may be required to complete the project;
- submitting all required bid documents to PennDOT and the local municipality for review and approval; and
- inspecting and supervising the construction work to insure its compliance with the approved plans and specifications.

Local agencies have the following roles and responsibilities in each project:

- provide at least 20 percent match of the total project costs,
- maintain the traffic signal equipment in accordance to established local and statewide policies and practices and existing maintenance agreements, and
- maintain the signal timings implemented in the project for a period of 1 year after completion of the project (unless changes have been authorized by SPC).

Regional Traffic Signal Program
Evaluation Criteria for Prioritizing Corridors
SINC and SINC-UP Projects

Delay/ADT factors	**10 Points**	**8 Points**	**6 Points**	**4 Points**	**2 Points**
CMP Corridors – Total Delay (Vehicles/Mile)	>80	60-79	40-59	20-39	<20
Delay/ADT factors	**5 Points**	**4 Points**	**3 Points**	**2 Points**	**1 Points**
Non CMP Corridors – National Functional Classification	Principal Arterial (non-freeway)	Minor Arterial	Major Collector	Minor Collector	Local

ALL CORRIDORS	**5 Points**	**4 Points**	**3 Points**	**2 Points**	**1 Points**
# of Intersections being coordinated	>8	6-8	3-5	2-3	<2
Two-way ADT (veh)	>20,000	15,000 – 19,999	10,000 – 14,999	5,000 – 9,9999	<5,000
Transit ridership	>10,000	7,500 – 9,999	5,000 – 7,499	2,500 – 4,999	1 – 2,500
Truck %	>8%	6.1% – 8%	4.1% – 6%	2.1% – 4%	< 2%
Safety (% above average crash rate for corridor type)	>100%	50 – 99.99%	25 – 49.99%	25 – 49.99%	0.01-9.99%

BONUS PIONTS	**Yes**	**No**
Multi-municipal involvement	See Note	0
Air Quality: Does the nearest ozone monitoring station exceed the 8-hour national standard at least three times in the last year?	2	0
TM Integration (project allows for control of signals or ITS devices from regional or District TMS)	1	0
Does the project propose transit priority?	1	0
Local match between 20-29.99%	1	0
Local match between 30-39.99%	2	0
Local match between 40-49.99%	3	0
Local match is 50% or above	4	0
Is Project located on Key CMP Corridor List?	5	0

Note: One bonus point for each municipality involved above one, up to maximum of 5.

FIGURE C1 Evaluation criteria for prioritizing regional traffic signal operations projects performed by SPC.

Local agencies can also complete their own optimization study, design, and construction as long as they follow the requirements outlined by SPC, PennDOT, and FHWA.

Agreements

Within one month of award, fund recipients are required to enter into an agreement with SPC to waive all claims and indemnify SPC against any third-party claims that may result from the agency's participation in the program.

Prior to the commencement of any work by SPC, recipients are also required to enter into a local project agreement specific to each individual project that indicates the recipient's commitment to their responsibility for providing the local match, and indicates the scope, schedule, budget, and each agency's responsibilities for the project.

For SINC-UP projects (i.e., projects involving minor construction), recipients must also enter into a cost reimbursement agreement with PennDOT prior to beginning the design and construction of improvements. A sample of this agreement is contained in Appendix D6.

Since all signals in the Commonwealth of Pennsylvania are operated and maintained by local jurisdictions, local municipalities are already required to have local maintenance agreements with PennDOT. These agreements require the local jurisdictions to maintain their signals to a standard set by PennDOT. Any and all existing maintenance agreements between PennDOT and the local jurisdictions remain in effect after the signal retiming projects are complete. These maintenance agreements generally have the following requirements:

- periodic inspections;
- functional reviews of traffic operations;
- appropriate preventative maintenance, including cleaning, lubricating, and refurbishing all electrical equipment;
- a systematic recording-keeping system; and
- a means of handling the notification and implementation of emergency repairs.

Performance Measures

After completion of the project, fund recipients are required to provide a report to their governing boards and SPC documenting the benefits of the project. This report typically includes a before-and-after comparison of travel times and delays in the corridor, reduced emissions estimates, and reduced stops. SPC is responsible for providing the data to be used in the final report.

Outreach

SPC maintains a website that provides important technical information related to traffic signals (see http://www.spcregion.org/trans_ops_traff_mun.shtml). This website provides a location where local agencies can find the following information:

- federal and state technical publications;
- local traffic bid prices; and
- information about advantages, estimated benefits, cost savings, and grant applications associated with converting incandescent bulbs to LED.

The website also contains a before-and-after video that shows the magnitude of the benefits that can be achieved through the program. The video provides a driver's eye view of a trip before and after the traffic signals were retimed in one of the pilot projects. Through the video, local decision makers can see how upgrading the signal timing minimizes stops and improves traffic flow in the pilot corridor. The website also includes formal before-and-after evaluation reports for other pilot deployments in the region.

In addition to operating this webpage, SPC regularly hosts training and professional development seminars about traffic signal operations. In 2008, SPC hosted training provided by the International Municipal Signal Association (IMSA) that resulted in more than 50 individuals achieving Traffic Signal Level 1 certification. SPC also hosted 7 regional workshops that outlined the benefits of using LED signal indications. SPC plans to continue its regional training efforts as future needs arise.

APPENDIX C10. SITE SUMMARY FOR NIAGARA FALLS/BUFFALO, NEW YORK

The Niagara International Transportation Technology Coalition (NITTEC) is an organization of fourteen agencies in western New York and southern Ontario, Canada, whose goal is to improve regional and international transportation mobility, promote economic competitiveness, and minimize adverse environmental effects related to regional transportation systems. NITTEC operates a 24-hr traffic management center that collects and analyzes real-time traffic sensor information, operates traveler information systems, and performs incident management functions for the Buffalo/Niagara region. To date, most of the deployments of transportation management functions and services have been oriented towards the regional freeways; however, NITTEC is expanding their role to take on more responsibilities in assisting in managing operations on the arterial street system.

Funding

The member agencies in the Buffalo area have established a $5.3 million revolving account. NITTEC is responsible for managing this account and, with the assistance of the local agencies, identifying what types of projects will be funded through this account. The account is used by member agencies to deploy and operate ITS traffic management improvements that provide integration and coordination within the region. NITTEC plans to use a portion of these funds to fund regional traffic signal operations and coordination projects. Agencies would be required to submit an application to "borrow" funds from NITTEC to fund their projects. Applications are then reviewed by a standing committee of peer agencies from multiple agencies. If the application is deemed reasonable, funds are then transferred to the requesting local agency. Funds can be used to pay for the development of regional traffic signal timing plans, and for minor communications upgrades that permit the interconnection of traffic signals systems. All central control room operations and management are funded through federal STP Flex and CMAQ funds, with appropriate matching requirements.

Roles and Responsibilities of Partner Agencies

NITTEC is responsible for staffing the operations control center. The operations control center is staffed 24-hours a day, 7-days a week. Through the center, NITTEC operates the regional partners' freeway management assets (CCTV cameras, dynamic mes-

sage signs, etc.). Their primary mission is to manage these assets during incident conditions. NITTEC is currently working with the city of Buffalo to establish scenarios in which NITTEC operators would also operate the city's traffic signals during incident conditions. These responses would be limited to invoking specific timing plans developed specifically for these scenarios. Deployment of the timing plans would be through NITTEC's existing central control software. In addition to these activities, NITTEC would be responsible for providing the following:

- facilitating the deployment and implementation of regional traffic signal timing plans for severe weather events;
- providing central monitoring of traffic signal operations throughout the region;
- hosting forums for discussing regional traffic signal operations issues;
- developing standards and specification for communications hardware;
- facilitating the deployment and implementation of incident management traffic signal timing plans;
- identifying and establishing priorities, corridors of significance, and performance goals and measures for the region;
- facilitating the deployment of advance traffic management concepts and control strategies in the region; and
- providing travel condition information to travelers and commuters.

Just as NITTEC is responsible for operating and maintaining the traffic management center software, NITTEC would also be responsible for integrating the disparate signal control software used by the regional partners into the core center software. NITTEC would also be responsible for managing and maintaining the communications network from the central system to the field devices. Each individual entity is responsible for maintaining the traffic signal hardware infrastructure.

Agreement

NITTEC is an independent operating agency responsible formed through a memorandum of understanding (MOU) that states the willingness of each partner agency to cooperate and coordinate with other stakeholders to improve regional and cross-border mobility. A total of 14 agencies participated in the formation of NITTEC, including the following:

- Buffalo and Fort Erie Public Bridge Authority,
- City of Buffalo,
- City of Niagara Falls, New York,
- City of Niagara Falls, Ontario,
- Erie County,
- Ministry of Transportation, Ontario,
- New York State Department of Transportation,
- New York State Thruway Authority,
- Niagara County,
- Niagara Falls Bridge Commission,
- Niagara Frontier Transportation Authority,
- The Niagara Parks Commission,
- Niagara Region, and
- Town of Fort Erie.

The MOU does not provide specifics on how NITTEC is to operate the system, but establishes a general vision for how the transportation system is to operate from a regional perspective. It identifies the roles and responsibilities of the various entities and identifies the structure of the program. A copy of the MOU is provided in Appendix D1.

NITTEC has developed an operating protocol with the city of Buffalo that describes how NITTEC will operate certain roadways within the city during emergency situations, such as incidents or severe weather. The protocol defines three scenarios in which NITTEC can modify the signal timing plans from the standard plans:

- when an incident or disabled vehicle blocks some or all of the lanes on a highway that results in adjacent or parallel city of Buffalo streets becoming congested,
- when weather conditions (e.g., flooding, snow, ice, etc.) require the closure of a roadway or impede the flow of traffic, and
- when an emergency evacuation of the city is ordered, resulting in several roadways becoming congested.

The signal timing plans (and the conditions in which they can be implemented) were developed by the city of Buffalo. The protocol requires the following to occur:

- The TOC may initiate a timing plan change when the TOC operator can detect that the conditions on the roadways are deteriorating. The operator is required to contact the city of Buffalo prior to initiating established scenario-based signal plan change.
- The city of Buffalo may contact the TOC and request that a signal plan be changed based on the specific scenario.
- The TOC is required to monitor the traffic impacts on the city of Buffalo streets and notify the city when the situation has been resolved prior to reverting back to a standard timing plan.

Performance Measures

NITTEC produces annual system reliability reports that show the monthly activities performed by the Traffic Operations Center. The following lists the types of performance measures included in these reports:

- total number of incidents throughout the region,
- incident severity,
- number of incident response team assists,
- incident response and clearance times (by type of incident),
- total number of incidents worked by Traffic Operations Center, and
- reliability (up time) reports for CCTV, DMS, and other ITS equipment.

APPENDIX C11. SITE SUMMARY FOR LAS VEGAS, NEVADA

The Freeway and Arterial System of Transportation (FAST) in Las Vegas is one of the nation's first truly integrated transportation management centers. A department of the Regional Transportation Commission of Southern Nevada (RTC), FAST is both a freeway management system and a regional traffic signal operations program run from the same traffic management center. The FAST system combines elements of the Las Vegas Metropolitan Area Arterial Traffic Management System [formerly known as the Las Vegas Computerized Traffic System (LVCST)] and the Nevada Department of Transportation (NDOT) freeway management system. The system consists of more than 100 video surveillance cameras, 52 dynamic message signs, 29 ramp control signals, and more than 1200 traffic signals. FAST manages the

majority of traffic signals in the city of Las Vegas, the city of North Las Vegas, the city of Henderson, and Clark County—all of whom, along with the NDOT and RTC, are partners in FAST.

Organizational Structure

FAST is organized as a regional transportation management entity under the direction of RTC. RTC is both the regional transit authority and the transportation planning authority for Southern Nevada. Oversight of day-to-day operations is provided by the Operations Management Committee (OMC). The OMC is comprised of one representative from each of the member agencies. Member agencies include the NDOT, Clark County, the city of Henderson, the city of Las Vegas, and the city of North Las Vegas. The OMC is responsible for recommending policy, establishing operational procedures and principles, and providing oversight of RTC's FAST system operators. Member agencies are responsible for upgrades and expansions to the FAST infrastructure that is within their jurisdictional authority.

The FAST system is managed by a System Manager. The FAST System Manager is an employee of RTC and is responsible for the daily operators of FAST, including the day-to-day supervision of FAST staff, system operations and maintenance activities, the approval of additions of transportation management infrastructure, the development of transportation management strategies, and the preparation of the annual budget. RTC employs a total of 36 TMC operators, field technicians, and communication technicians to support both FAST freeway and arterial management functions.

Roles and Responsibilities

All traffic signals in the region are managed through a single traffic management software. Except for communications failures, FAST operators do little real-time monitoring of traffic signal operations. Instead, FAST signals are designed to operate on a time-of-day pattern. A total of seven time-of-day plans are used to manage arterial flows (an early morning plan, an a.m. peak plan, a mid-day plan, a p.m. peak plan, an evening plan, a late-night plan, and free operations). Operators can call special timing plans or make real-time adjusts to traffic signals during incident conditions.

FAST operators are responsible for developing the coordination timing plans for each of the major corridors. This includes establishing the cycle length, splits, and offsets associated with each coordination plan. RTC attempts to review timing plans from approximately two-thirds of the network annually.

The cities and county are responsible for maintaining the base signal timing parameters (including minimum and maximum green settings, yellow and all-red clearance intervals, pedestrian intervals, etc.). Each local agency is responsible for maintaining the signal equipment within their own jurisdiction, including repairs to intersection controllers and signal field equipment. Each local agency is also responsible for maintaining the detection system used by FAST. Operators in the control center monitor the status of intersection detectors and notify the appropriate agency when maintenance is required. The local agencies are responsible for replacing and/or repairing failed detectors.

Agreements

FAST is established and operated through a cooperative agreement between the member agencies. This agreement defines the organizational structure of FAST, including the composition of the OTC; the roles and responsibilities of the OTC, the member agencies, the RTC (as the administrative agency for FAST), the FAST System Operator, and the FAST staff; and the mechanisms and formula for funding support of operations and maintenance of the FAST. The agreement also includes an indemnification section that requires each of the member agencies to be responsible for any and all liability resulting from injury or damage to any person or property that occurs within their individual jurisdictions. Member agencies are also responsible for any and all liability arising out of the hiring, firing, or termination of the FAST system manager or the administrative staff, if such action has been performed at the request of the OMC. RTC retains the liability for hiring, firing, or terminating the FAST system manager if such action is not requested by the OMC.

Funding

RTC used to receive funding from local agencies based on a funding formula that considered the number of traffic signals and/or ITS field devices within each member's jurisdiction; however, RTC now receives funding supported by an eighth of a cent transportation tax. These funds are used to finance major roadway capital improvements and other transportation improvements. A small portion of this tax revenue is used to fund the arterial management portion of the FAST program. These funds are primarily used to provide staffing support for the FAST center. These funds are also used to provide support for improvements and upgrades of the region's signal program, to maintain the communications network, and to facilitate repairs to controller equipment. Funding for the freeway management side of FAST is provided by the Nevada Department of Transportation (NDOT).

Performance Measures

While the RTC does not have a formal mechanism for evaluating the effectiveness of their RTSOP, they do produce evaluation reports on an as-needed basis. When formal evaluation reports are produced, the primary measures of effectiveness used include intersection stops and delays, corridor travel times and speeds, and vehicle throughput. The RTC also used citizen complaints as a primary way of identifying corridors where signal timing improvements are needed.

Outreach

The OTC meets once a month to discuss issues and topics of interests related to traffic operations. These meetings are open to the public and agendas and meeting minutes are public record. RTC publishes meeting minutes on their website.

In addition to monthly coordination meetings, the RTC routinely conducts interviews with local media outlets about on-going and planned projects. RTC has a very capable governmental affairs media group that proactively coordinates with local media. This group also staffs booths at local fairs and community activities.

APPENDIX C12. SITE SUMMARY FOR PHOENIX, ARIZONA

The Maricopa Association of Governments (MAG) is responsible for administering the Traffic Signal Operations Program (TSOP) for the entities in the greater Phoenix, Arizona, metropolitan area.

The program began in 2003 when MAG developed a Regional Concept of Transportation Operations that serves as an overall plan for improving transportation operations in the region. This plan led to the establishment of the Traffic Signal Operations Plan (TSOP) in 2004. 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 contract with approximately 15 consultants. These consultants provide local agencies with the following technical services:

- 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 offset and timing adjustments following implementation of initial timing plan settings, and
- acquisition of turning movement counts for the a.m., p.m., and off-peak periods.

Roles and Responsibilities

MAG is responsible for administering the TSOP in the region. MAG has on call several local consultants who have extensive experience developing multi-jurisdictional timing plans for local agencies. Once a plan is approved, MAG works with the local agencies to develop a final scope of work for the project. MAG then issues a task order to one of its consultants under the terms of their on-call project. The consultant firm is then responsible for coordinating the development of the timing plans with the local entity and making recommendations to the local entity for signal timing improvements that promote inter-jurisdictional operations. Local agencies are not required to approve and implement the required timing plans; however, as the local agencies have numerous opportunities to provide input throughout the process, the likelihood of a local agency rejecting the recommended timing plans are minimized. By applying for funding through the program, local agencies are required to perform the following:

- appoint a project manager to be the point of contact between the agency and the assigned consultant;
- provide all necessary background information to the consultant including local requirements and policies concerning phasing sequencing, clearance intervals, and speed limits for all intersections within the boundary of the project;
- coordinate required traffic counts during the a.m. peak., p.m. peak, and off-peak periods (only if the agency has volunteered to do so in the application);
- implement the signal timing plans recommended by the program in field devices; and
- provide the agency's implemented signal timing data to MAG to share with adjacent jurisdictions via the Regional Archive Data Server.

Implementation of the new signal timing plans is the responsibility of the local entities. Depending upon the project, some timing plan changes are entered as the project is finished; in other cases, new signal timing plans are implemented as soon as practical after they have been delivered to the local entity. The local entities are responsible for all maintenance functions during and after each project.

Agreements

The MAG does not require any formal agreements with the local entities to participate in the program. To receive funding through the program, local entities are required to submit an application. Candidate projects are evaluated by the MAG ITS Committee, which is composed of traffic and transportation engineers from the local entities. Preference is given to projects that have the following attributes:

- requests for assistance in obtaining SYNCHRO or HCS (applicable only for those agencies that do not currently have these software tools for analyzing and optimizing traffic signal operations),
- requests for hands-on training in SYNCHRO or HCS for agency personnel who are directly responsible for developing and implementing traffic signal timings and daily operations of traffic signals, and
- agencies that do not have in-house staff resources or expertise in developing traffic signal timings.

Requests for project funding are evaluated based on the following criteria:

- Technical Merit (maximum 25 points)—Based on the complexity of the project's problem: High (25 points), Medium (15 points), and Low (5 points);
- Multi-agency coordination (maximum 10 points)—Number of agencies participating in the project determines the score, with projects involving a single agency receiving 5 points and projects involving two or more agencies receiving 10 points;
- Intersection/corridor performance (maximum 40 points)—Based on the average a.m./p.m. peak intersection level of service (LOS) from the 2003/2007 MAG travel time and delay study or more current local data. Roadways with intersections operating at LOS F receive 40 points, LOS E receive 30 points, and LOS D receive 20 points; and
- Longevity of project impacts (maximum of 0 points)—Negative points are awarded if the likelihood of a major roadway construction project will occur in the vicinity of the proposed projects within the next two years that will minimize the effects of the retiming. Projects expecting high impacts due to construction receive −10 points, while projects expecting medium and low impacts receive −5 points, and 0 points, respectively.

The MAG Regional Council, comprised of political decision makers from the entities, has the final approval over the projects selected.

Funding

Initial funding for the program was provided utilizing Congestion Mitigation/Air Quality (CMAQ) funds. The program was identified as a specific line item in the Region's Transportation Improvement Plan. This allowed MAG the ability to fund multiple projects of varying sizes under one umbrella project description. Local agencies were not required to provide local match from the program—MAG provided all the local match for the local agencies through their in-kind services from administering the program. This allows 100 percent of the funds to be used to address project needs.

Recently, funding for the program has changed. Voters in the region have approved a local 0.5 percent sales tax to be used to fund transportation improvements in the region. MAG has committed to using a portion of the region's tax revenue to continue funding the TSOP. The total amount of funds available for the

program in fiscal year 2010 is $321,000. Individual projects have a maximum limit of $25,000.

Performance Measures

No formal evaluation is required at the conclusion of each project. MAG routinely performs travel time and data studies as part of their model validation and verification process. These data are frequently used by MAG and applicants in the project justification and selection process.

Outreach

MAG's main outreach effort is though a website that contains information about the program. The website provides a brief description of the program and lists the current and completed projects. Users can click on links that provide greater information about each project funded through the program.

In addition to the website, MAG routinely hosts training and professional development seminars to their local partners on topics of importance to the region. This training includes hands-on instruction related to the use of traffic signal optimization and evaluation software as well as traffic signal timing basics. This training is provided annually and has been credited with significantly raising the level of knowledge of operation personnel throughout the region.

APPENDIX C13. SITE SUMMARY FOR PIMA COUNTY (TUCSON), ARIZONA

Nearly 100 percent of the traffic signals in the region are operated through the Regional Traffic Operations Center (RTOC). Originally, established in the mid-1970s, the RTOC is one of the few multi-jurisdictional traffic signal systems in the United States. The RTOC is operated by the city of Tucson. The center provides the city with real-time monitoring of traffic operations as well as emergency response. In addition to the arterial traffic signal system, the state of Arizona has installed a Freeway Management System (FMS) that includes cameras, variable message boards, and a fiber optic communication backbone along the Tucson freeway system. These devices are monitored by the RTOC as well as by City 911, the Department of Public Safety (DPS), and the Arizona Department of Transportation (ADOT).

Organizational Structure

Pima County's RTSOP is run through the Regional Transportation Authority (RTA). Members of the RTA include the cities of South Tucson and Tucson; Pima County; the Towns of Marana, Oro Valley, and Sahuarita; the Pascua Yaqui Tribe; the Tohono O'odham Nation; the Arizona Department of Transportation; and the Pima Association of Governments (PAG). Representatives from these agencies are responsible for establishing policy and making technical decisions associated with the program. PAG provides contacted technical staff assistance to the RTA to assist agencies in developing a systematic approach to the selection of signalized locations for analysis and for developing coordination timing plan for corridors of regional significance.

Roles and Responsibilities

Each individual agency is responsible for installing, operating, and maintaining the equipment within their jurisdiction. The PAG is responsible for providing funding of infrastructure upgrades and some operations work. Each operating agency has a verbal agreement with the city of Tucson for sharing data and connecting individual traffic signal projects to the RTOC. Maintenance activities are not supported or performed through PAG's regional program.

Through their regional program, PAG administers a regional traffic signal service contract. PAG has hired two retired traffic engineers formerly with the city of Tucson as their contractors. These contractors are responsible for establishing a methodology for identifying which intersections and corridors are in need of retiming, and developing timing plans designed to improve regional coordination across jurisdictional boundaries. These consultants serve in an advisory capacity only to the local entities and their responsibility stops short of implementing the new timing plans strategies in the field. Each agency is responsible for implementing new timing plan strategies in their own equipment. Once the respective agencies have implemented the signal timing plan changes, PAG is responsible for conducting an evaluation of the timing plan changes and providing a report documenting the effectiveness of the timing plan changes.

PAG's consultant is also responsible for developing and maintaining a regional Synchro™/SimTraffic™ model for the region. The model includes all but 12 of the region's traffic signals. This model serves as the foundation for developing coordination timing plans.

Funding

Funding for RTSOP projects are provided through the Regional Transportation Authority (RTA). The RTA was formed in 2004 after legislation creating the authority was signed by then-Governor Janet Napolitano in April. The RTA became effective August 25, 2004. The RTA is governed by a nine-member board, including representatives from the cities of South Tucson and Tucson; Pima County; the Towns of Marana, Oro Valley, and Sahuarita; the Pascua Yaqui Tribe; the Tohono O'odham Nation; and the Arizona State Transportation Board. Representatives of these agencies developed a 20-year, $2.1 billion plan of roadway, safety, transit, and environmental and economic vitality projects. Elements of the plan include intersection and capacity improvements, elderly and pedestrian safety improvements, transit corridor bus pullouts, signal technology upgrades, and improvements to at-grade railroad crossings and bridges. Funding for the improvements is being provided by a ½ cent sales tax over a 20-year period. Fifteen million dollars has been set aside for improving signal and communications technology upgrades. The plan and the tax increase were approved by the region's voters in 2006.

Performance Measures

Although no formal process is used to assess and identify the quality of the signal timing in the region, PAG is working with local agencies to develop a draft methodology for assessing regional signal operations. The draft methodology uses both field measurements coupled with regional modeling to assess the overall effectiveness of regional operations and identify system deficiencies. Candidate performance measures include the following:

- intersection stops and delays,
- number of traffic signal reviewed for timing plan adjustments,

- corridor travel time/speeds,
- level of service, and
- throughput.

Agreements

Once a project has been identified, local agencies are required to enter into an intergovernmental agreement with the RTMA to implement the desired improvements. The intergovernmental agreement defines the types of improvements that will be implemented, the responsibilities of the participating agencies, the design standards to be used in the project, the financial accounting requirements, and ownership issues associated with installed equipment. The intergovernmental agreement also outlines the payment and construction schedule for the project.

APPENDIX C14. SITE SUMMARY FOR WASHOE COUNTY (RENO), NEVADA

The Regional Transportation Commission (RTC) has just completed a 3-year program to develop and improve regional coordination between local entities in the Truckee Meadows area. Participants in the program included the city of Reno, the city of Sparks, Washoe County, and the Nevada Department of Transportation. During the program, the timing plans of more than 165 intersections were reviewed and timing plans were developed to promote progressive traffic flow along arterials of major significance in the region.

The goal of the program is to ensure that the timing plan at every intersection in the region gets reviewed and upgraded at least once every three years. RTC performs signal timing review on approximately a third (150) of the intersections annually. The program is expected to continue into the near future. Future objectives for the program include implementing a new traffic signal system that can be accessed at all five entities in a multi-user, multi-tasking manner, and upgrading the traffic signal communications network in the system to provide a more reliable and stable operating environment.

In addition to this Signal Retiming Program, RTC, in cooperation with the local entities, recently completed a Regional Transportation Plan (RTP). This plan provides a long-term vision to address the current and predicted traffic operations issues for the region. In the Reno–Sparks urban area, there are three agencies that operate traffic signal systems and all three use the same manufacturer of hardware and software. Of the approximately 390 traffic signals that exist in the Truckee Meadows area, almost 65 percent are connected to a central control and monitoring system. Stakeholders are now discussing developing a regional concept of transportation operations and the feasibility of coordinating operations activities through a consolidated traffic/transportation management center.

Roles and Responsibilities

The initial focus of the program was to develop good time-of-day coordination timing plans that coordinated traffic operations through an arterial of regional significance. Many of these corridors cross through multiple jurisdictions. RTC was the lead agency in the program and was responsible for providing resources and expertise to assist the local entities. Using program funds, the RTC hired a series of consultants to assist them with the signal retiming efforts in the identified corridors. The consultants worked with the local entities to develop time-of-day coordination plans. The consultants were responsible for collecting all the data necessary to analyzing the existing operations, analyzing current operating conditions, developing optimized regional timing plans, and assisting the local entities with implementing and fine-tuning the coordination timings in the field.

The local entities maintain the overall responsibility of the intersection. This includes day-to-day operations of the signal as well as all emergency and preventative maintenance. While the local entities are not restricted from altering timing plans once they have been implemented, cities are required to notify RTC when changes to the coordination scheme are made and provide a record of the changes. The city of Reno has developed a formal policy and protocol for providing traffic signal timing protocols. This protocol is provided in Figure C2.

Organizational Structure

Under the initial program, the RTC operated as an independent agency. A Traffic Operations and Management Committee, comprised of the traffic engineers from the city of Reno, city of Sparks, Washoe County, and the local district of the Nevada Department of Transportation, assisted with establishing policy (i.e., common vehicle and pedestrian clearance intervals, default actuation parameters, etc.), and priorities for the program. Actual implementation of the timing plans occurred as a collaboration between RTC (and its consultant) and the local entities. Agencies are currently exploring developing a more formal structure in which the RTC (or one of the other partner agencies) would be responsible for coordinating operational activities through a consolidated traffic/transportation management center.

Funding

In this initial phase, project improvements were funded using Congestion Mitigation/Air Quality (CMAQ) funds. Local match for the funds was provided by RTC.

Agreements

No formal agreements existed between any of the local partners during the initial phase of the program. RTC was responsible for hiring and providing administrative oversight for the consultants. No formal agreements requiring the local entities to implement the timing plans developed by the consultant were developed; instead RTC, the consultants, and the local partners developed the signal retiming strategies collaboratively. RTC is in the process of developing formal operating procedures and standards that can be used in future regional timing upgrades.

Performance Measurement

RTC performed before-and-after travel time runs in the corridors to evaluate the effectiveness of the retiming efforts. The "before" travel time runs were collected immediately prior to implementing the new coordination plans and the "after" runs were conducted after fine-tuning was complete. Before and after video was also collected of each run for each project. For a select few projects, RTC developed a video providing a side-by-side comparison of travel times before and after the improvements in the corridor. The video show how far ahead a vehicle finishes

City of Reno
Traffic Signal Timing Protocol

Changes Performed by Signal Maintenance

- Changes in the field to be entered in the cabinet log.
- Changes through the ATMS to be logged through the intersection notes window.
- Non-safety related timing changes must be approved within 24 hours after implementation by Traffic Engineering.
- Safety* or construction related changes may be performed without prior approval if immediate attention is required.
- Notify the appropriate Traffic Engineering and Signal Maintenance staff within 24 hours of the change through email.

Changes Performed by Traffic Engineering

- Changes in the field to be entered in the cabinet log.
- Changes through the ATMS to be logged through the intersection notes window.
- Notify the appropriate Traffic Engineering and Signal Maintenance staff within 24 hours through email if a significant timing change is implemented.

Changes Performed by Outside Agencies

- Any timing change must be approved a minimum of 2 business days in advance by Traffic Engineering.
- Safety* or construction related timing changes may be verbally approved by Traffic Engineering or Signal Maintenance for immediate implementation.
- After approval changes in the field to be entered in the cabinet log.
- After approval changes through the ATMS to be logged through the intersection notes window.
- After approval changes through the VMS must be documented by email notification within 24 hours to appropriate City of Reno Traffic Engineering and Signal Maintenance staff.
- Notify the appropriate City of Reno Traffic Engineering and Signal Maintenance staff within 24 hours of any timing change through email.

* Safety related changes are defined by existing timing not conforming to ITE or MUTCD standards, include but not limited to clearance intervals, minimum green time, phasing conflicts, etc.

Note: Current Reno Operations Group email address can be used for notification.

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FIGURE C2 City of Reno Signal Timing Protocol.

a trip after the improvement is made compared to the before condition. RTC uses the video to illustrate the benefits of the retiming efforts.

Outreach

RTC maintains two websites where stakeholders and the public can obtain information about the program. On the first website, designed as a public education site, users can learn basic information about traffic signal timing, traffic signal coordination, the benefits of coordination, and the disadvantages and limitations of signal coordination. The public can also provide feedback about operational problems that they are experiencing in the system (i.e., report operational problem, maintenance issues, etc.). The second website provides more detail about the specifics of the program itself. It contains links to the following:

- the RTC Traffic Signal Demonstration Video, which shows the side-by-side comparison of before-and-after travel times on select improvement corridors;
- the RTC Traffic Signalization Video that highlights the purpose of the program;
- a benefits fact sheet;
- a map of the corridors and facilities where timing plan changes were performed and/or analyzed; and
- a list of the intersections included in the initial program.

APPENDIX C15. SITE SUMMARY FOR FARGO, NORTH DAKOTA/MOORHEAD, MINNESOTA

The Fargo (ND)–Moorhead (MN) metropolitan area consists of five signal operators between two states; therefore, it represents several unique challenges in establishing a regional traffic signal operations program. Most major and minor arterials cross at least

two transportation agencies and jurisdictional boundaries, and at least one corridor involves the coordination of five transportation agencies. The Fargo–Moorhead metropolitan area has a total population of 170,000, and the transportation system functions satisfactorily during most periods, but high demand levels during peak periods, traffic incidents, special events, and inclement weather all contribute to traffic congestion in the region.

As in many regions, traffic signals comprise the majority of traffic devices in the region and have the largest potential for addressing regional traffic operations issues. The Fargo–Moorhead metropolitan area has 233 signalized intersections, 66% of which are operated by the city of Fargo. Control over the remaining signals is equally distributed among the city of Moorhead and the city of West Fargo, or either the Minnesota Department of Transportation (Mn/DOT) or the North Dakota Department of Transportation (NDDOT). In 2008, FHWA conducted an assessment of traffic operations in the Fargo–Moorhead area. This study found the following limitations associated with the current transportation system in terms of operations:

- lack of coordination on inter-jurisdictional corridors,
- varying levels of resources for agencies in terms of training and number of staff dedicated to traffic operations,
- different software and hardware (field devices) between agencies that might hinder integration and information sharing (traffic data and traffic images), and
- no established regional practices for traffic control and dealing with large-scale special events, incidents, or emergencies (e.g., flooding).

To address these operational problems, the FM Metropolitan Council of Governments (Metro COG) formed a traffic operations working group to begin addressing the issues of traffic signal coordination and other operational issues. This committee is composed of representatives from the following agencies:

- North Dakota Department of Transportation,
- Minnesota Department of Transportation,
- City of Fargo,
- City of Moorhead,
- City of West Fargo,
- Cass County Highway Department,
- Clay County Highway Department,
- Metro Area Transit, and
- Fargo–Moorhead Council of Governments (the regional MPO).

One of the first steps of this committee was to develop an FM Traffic Operations Action plan, which focused on improving signal operations, developing system performance, implementing incident management, and creating a traffic operations center. This working group identified the following functions of the traffic operations center:

- collect and share information about traffic signal timings, traffic congestion, incidents, road construction, and real-time video monitoring among the partner agencies;
- implement inter-jurisdictional traffic control plans that coordinate traffic signal timings on major corridors and at freeway interchanges;
- implement traffic management strategies in response to traffic incidents, including modifying traffic signal timings and coordinating incident responses; and
- provide information to travelers using different media, include dynamic message signs, Internet web pages, and traditional radio and television media.

One of the unique features of this region is that unlike other areas that are building their programs in a piecemeal fashion, the Fargo–Moorhead area is taking a top-down approach. During the initial program planning phase, the idea of conducting a demonstration project was discussed; however, because the area is not very large geographically, the local partners decided not to focus on just one initial corridor. Instead, regional partners decided to focus the program on providing interconnection of the various deployed signal systems. Therefore, the current emphasis is on building the regional infrastructure from the very outset of the program.

Funding

Because the region is not designated as a Transportation Management Area (an urbanized area with a population of more than 200,000 that has not met certain other requirements, such as air quality control), the region is building their program using traditional funding mechanisms. These include local capital improvement program funds, federal and state transportation program funds, and state and local operating and maintenance budgets.

Agreements

Work is currently underway to develop a joint powers agreement that would allow each of the three operating entities (the city of Fargo, North Dakota, the city of Moorhead, Minnesota, and the North Dakota Department of Transportation) to operate their traffic signals from either a hybrid or centralized traffic management center. While a final agreement has not yet been produced, the local partners have reached a consensus about the items to include in the agreement. Items currently being discussed for inclusion in the agreement include the following:

- performance requirements for operating and maintain coordination timings on facilities of regional importance,
- performance standards for maintaining traffic signal and detection equipment and performing emergency repairs, and
- requirements for sharing and retaining traffic and signal performance data.

A final agreement is expected to be drafted and adopted within the next 8 to 18 months. Three levels of interagency agreements are needed in the Fargo–Moorhead region:

- agreements between a state entity and local entities,
- agreements between multiple local entities, and
- agreements between two state entities.

Outreach

Outreach is envisioned to be a critical component of the Fargo–Moorhead regional traffic signal operations program development process. The MPO includes information about the regional signal efforts in its newsletters and other monthly publications. The MPO recently hosted a workshop where the benefits of regional traffic signal coordination were discussed. Efforts are currently underway to develop materials for communicating information about the program to public and elected officials.

APPENDIX C16. SITE SUMMARY FOR DISTRICT 4, OREGON DOT (BEND, OR)

The Region 4 Traffic Section of the Oregon Department of Transportation (ODOT) is responsible for traffic engineering, operations, maintenance, and safety in central Oregon. Region 4 is responsible for the construction, operation, and maintenance of U.S. and state highways from the Columbia River to the California border and from the crest of the Cascade Range to the Oregon High Desert. The Traffic Section is responsible for the maintenance and operation of traffic signals on state system roadways within the region. ODOT operates approximately 170 traffic signals in the region, more than three-quarters of which are included in an RTSOP. Primarily a rural area, Region 4 is often responsible for operating traffic signals for small cities and urban transition areas. The RTSOP in the region has been operational for more than 10 years.

Organizational Structure

Region 4 uses a more traditional organizational approach to their RTSOP. The state DOT technical staff takes the lead on developing the program goals and objectives and works with local agencies to implement the plan. The key to success in Region 4, however, is the personal relationships that ODOT operations staff has with the other stakeholders in the region. Personal relationships make it easy to form ad hoc committees when needed to address operational problems or to respond quickly to opportunities for collaboration. In these situations, decisions are made by consensus. Most of the collaboration occurs when large land developments are being planned for areas.

ODOT stated that having strong relationships built on years of experience and working together is critical to the success of their program. Through the years, stakeholders have developed a common thought process for identifying opportunities for collaboration.

Roles and Responsibilities

According to ODOT's *Traffic Signal Policy and Guidelines*, the region traffic manager (designated representative) is responsible for the timing of traffic signals on state highways. Generally, ODOT is responsible for the design, inspection, timing, and maintenance of traffic signals at intersections of state highways and country roads or city streets. Typically, ODOT will enter into an intergovernmental agreement with the local agencies to clarify roles, arrange for maintenance, and allocate costs. ODOT's primary role is to ensure that traffic signals are installed to the standard defined by the *Traffic Signal Policy and Guidelines.* For the intersection of two (or more) non-state highways, ODOT's responsibility is generally limited to design review and contract inspection, although ODOT may perform survey, design, construction administration, and inspection through an interagency agreement. Often, the costs for these services are billed to the local agency.

Common functions performed by ODOT through their RTSOP include the following:

- develop standards and specifications for traffic signal hardware,
- provide consistency in signal timing practices between agencies (i.e., clearance intervals, intersection configuration, pedestrian timings and policies, etc.),
- provide outreach to the public and decision makers,
- develop traffic signal timing plans to facilitate cross-jurisdictional traffic flow,
- develop standards and specifications for controller software,
- develop standards and specifications for communications hardware,
- develop and maintain a database of timing parameters and plans for traffic signals in the region,
- provide central monitoring of traffic signal operations from a regional perspective through a single traffic management center,
- provide a single point of contact for reporting and responding to citizen complaints, and
- facilitate the deployment of advanced traffic management concepts and control strategies, such as adaptive traffic signal control, integrated corridor management, etc.

Funding

Funding for the program is provided through typical state DOT funding mechanisms. All of the following funding sources have been used to fund projects and activities performed by the RTSOP: local capital improvement project (CIP) funds, American Recovery and Reinvestment Act (ARRA) funds, federal Surface Transportation Program (STP) funds, and state and local operating/maintenance discretionary funds. Depending upon the location of the signal systems, ODOT has cost-sharing agreements with local entities to provide emergency maintenance repairs, ongoing daily operations, and/or routine and preventative maintenance.

Performance Measurement

Currently, a formal approach is not used to evaluate the effectiveness of ODOT's Region 4 RTSOP. Other than citizen complaints, ODOT Region 4 currently does not follow a strategic process for identifying roadways that would benefits from increased inter-jurisdictional control. ODOT Region 4 currently does not routinely produce a formal effectiveness report of their program. This is primarily due to the nature of their program and the relatively few opportunities for inter-jurisdictional collaboration.

Outreach and Public Education

ODOT Region 4 does not have a formal process for outreach and public education. Outreach generally occurs on a project-by-project basis, when needed. ODOT's primary mechanism for providing outreach and public education is through local media. Region 4 personnel will be interviewed by local media occasionally to discuss changes in traffic operations or signal timings at key locations.

APPENDIX C17. SITE SUMMARY FOR PUGET SOUND (SEATTLE, WASHINGTON)

Beginning in 2007, the Puget Sound Regional Council (PSRC) has been working to develop an RTSOP for the Puget Sound, near Seattle, Washington. The need for the program came about as a result of an FHWA-led assessment of the current state-of-the-practice of traffic signal operations in the region. This study found that the limited focus on support for operations at all levels and the absence of regional agreements on operations of traffic signals limited the effectiveness of traffic signal operations in the region. To address these issues, PSRC developed an advisory group, the Regional Traffic Operations Committee, comprised of representatives from more than 30 agencies, including cities, counties, and the Washington State Department of Transportation

(WSDOT), to begin creating the foundation for an RTSOP in the Puget Sound area. Building upon the success of the regional freeway management/ITS system, this group has been working to develop a regional concept of traffic operations and identifying strategies for improving the operations of the arterial network. Much of the work so far in the program has focused on two region-wide planning documents: the Regional ITS Implementation Plan (RITSIP) and the Regional Concept of Traffic Operations (RCTO). The RITSIP identifies ITS improvements for 25 key multi-jurisdictional arterial corridors, while the RTCO identifies the relationships, procedures, and resource arrangements needed to operate these corridors. Regional signal coordination is a core function to be used in these corridors.

Organizational Structure

Figure C3 shows the proposed structure for implementing RTSOP in the Puget Sound area. The concept proposed utilizes lead agencies, partner agencies, and contact agencies. The lead agency would typically be the agency with the most traffic signals in the corridor. It would be the lead agency's role to develop daily and incident timing plans using global parameters that were agreed upon by the local partners. Partner and contract agencies would provide data collection and performance analysis support. While ideally all of the corridor's signals would be on a single system and operated by the lead agency, a partner agency may still operate the signals along a segment of the corridor and coordinate their operation with the lead agency. Most likely, there would be multiple lead agencies across the region, depending on the geographic basis of the projects being implemented. WSDOT would continue to operate its freeway management system.

Roles and Responsibilities

Under the proposed structure, the following have been identified as potential roles and responsibilities for partners participating in the program:

- Corridor Lead Agency—This entity would be the one agency primarily responsible for operating the traffic signals in the corridor. Their primary roles would be to develop and implement signal timing plans (with input from the other partner agencies); provide for the daily operations of the system; and conduct before-and-after analyses and respond to inquiries from the public.
- Partner Agencies—These agencies would continue to operate their traffic signals not centrally controlled or spaced too far from the system to prevent coordination. Each partner agency would retain the ability to control the signal that they are currently operating.
- WSDOT—WSDOT could continue to operate the ramp control signals through its freeway management system. WSDOT may take on the role of a lead agency or partner agency depending upon the circumstances and nature of the corridor.
- Contract Agency—This would be an agency that does not have direct responsibility for operating traffic signals, but provides data collection and other support.

Agreements

Currently, no formal agreement exists between partner agencies; however, the local partners have expressed a preference to use formal agreements as the program develops. This will allow the local partners to build support with decision makers who must sign the agreements. These agreements are currently under development by the PSRC.

Funding

According to the RCTO, no secured funding source has yet been identified for implementing the proposed program in the Puget Sound area. Currently, the plan is looking for a dedicated source of funds through the PSRC.

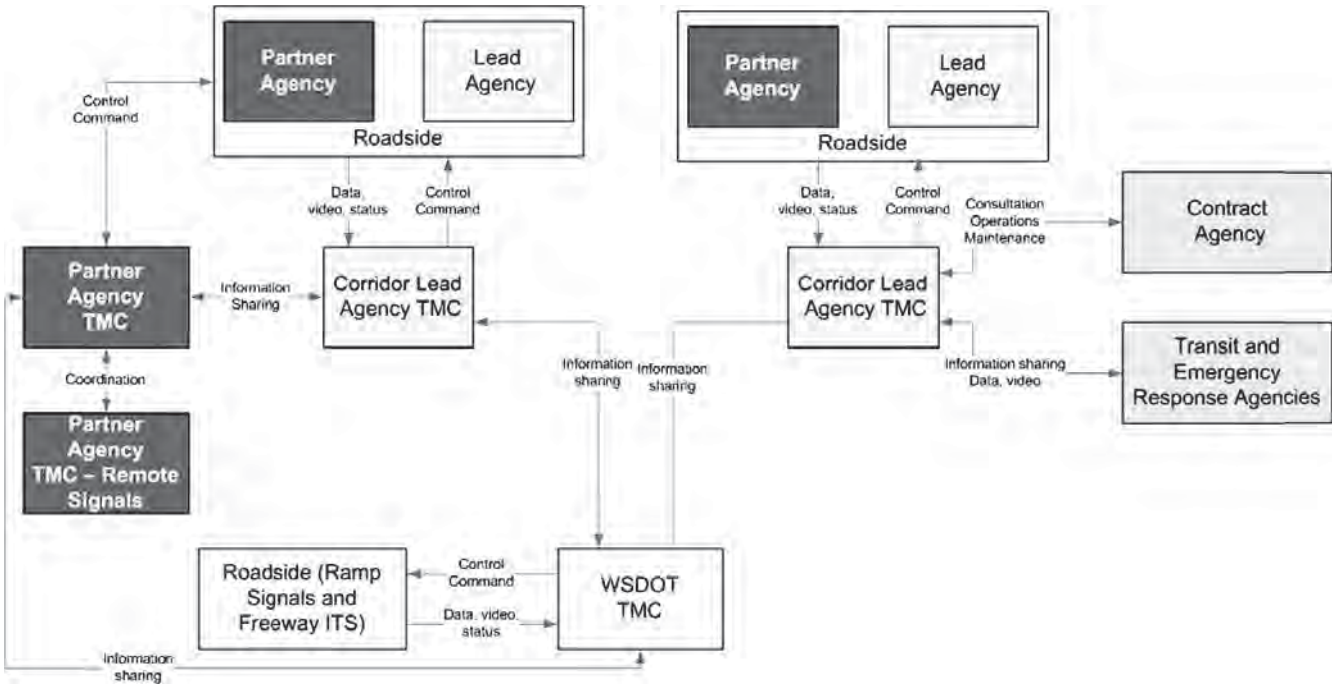

FIGURE C3 Proposed operational concept for regional signal coordination in the Puget Sound area.

APPENDIX D

Sample Agreements

APPENDIX D1. SAMPLE COOPERATIVE AGREEMENT: NIAGARA INTERNATIONAL TRANSPORTATION TECHNOLOGY COALITION (NITTEC)

MEMORANDUM OF UNDERSTANDING
Niagara International Transportation Technology Coalition ("NITTEC")

This Memorandum of Understanding (this "MOU") is amended and restated as of this thirty-first day of March, 2008, by and between the Ministry of Transportation Ontario ("MTO"); New York State Department of Transportation ("NYSDOT"); New York State Thruway Authority ("NYSTA"); Niagara Frontier Transportation Authority ("NFTA"); Erie County; and such additional public entities that may become Policy Members as defined herein.

WITNESSETH:

WHEREAS, the Niagara International Transportation Technology Coalition ("NITTEC") is a consortium of agencies, authorities, municipalities and other entities in the Niagara Frontier region of New York and the Niagara region of Ontario; and

WHEREAS, the mission of NITTEC is to maintain a regional, cooperative approach to transportation management and thereby improve regional and international transportation mobility, promote economic competitiveness, and minimize adverse environmental effects related to the regional transportation system; and

WHEREAS, to accomplish such mission, the Members of NITTEC wish to improve safety and operations and reduce congestion on the transportation network by coordinating transportation incident notification and response, construction projects, and deployment of Intelligent Transportation System (ITS) elements; and

WHEREAS, in pursuit of such mission, the parties first entered into a Memorandum of Understanding dated September 22, 1995 that established the organizational and operational structure of NITTEC; and

WHEREAS, the parties subsequently entered into Memorandums of Understanding dated March 31, 1999, March 31, 2002, March 31, 2004, and March 31, 2006 to maintain the organizational and operational structure of NITTEC; and

WHEREAS, the parties hereto find it necessary and convenient to execute this amended and restated MOU to achieve the stated mission of NITTEC.

NOW, THEREFORE, in consideration of the covenants herein contained, the parties hereto do hereby agree that the operation of NITTEC shall be as follows:

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For purposes of this MOU relative to Policy and General Members, "active participants" shall mean that designated representatives shall attend at least two-thirds of the meetings of the Councils and Committees to which they have been designated as representatives.

Article II – Council and Committee Structure

Section 2.1 - Executive Council

A) Each Policy Member shall have one vote on all matters brought before the Executive Council, which vote shall be exercised by the Policy Member's chief executive officer or his/her designee. All actions taken by the Executive Council shall be by unanimous consent. The Executive Council shall:

- Provide overall program and policy direction with respect to all matters involving NITTEC and within the scope of this MOU.
- Direct the work of the RTCMC which will provide input to the Executive Council with respect to the overall program and policy decisions regarding NITTEC.
- Establish the NITTEC Operating Procedures and NITTEC's annual budget.
- In its discretion, accept new members to the Policy, General and Affiliate Member classes.

B) The Executive Council shall elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the Executive Council and for calling and establishing the agenda for an annual meeting of the Executive Council.

The Executive Council shall elect one of its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two-year term as set forth herein.

Section 2.2 - Regional Transportation Coordination & Management Council (RTCMC)

A) Each Policy Member shall have one vote on all matters brought before the RTCMC, which vote shall be exercised by the Policy Member's officially designated representative. All actions taken by the RTCMC shall be by unanimous consent. The duties of the RTCMC include, but are not limited to:

- Facilitate the coordination of capital and operational issues among the NITTEC Members.

- Have oversight and approval responsibilities for the activities of the NITTEC Executive Director. This includes the hiring and firing of personnel to fill the Executive Director position to the extent NYSDOT has delegated to the RTCMC its power to do pursuant to the Host Agreement as defined in Section 3.3 herein.

- Have oversight and approval responsibilities for the activities of the Traffic Operations Center Committee, Technology and Systems Committee, Western New York and Ontario Incident Management Committees, Border Crossing Committee, Construction Coordination Committee, Strategic Planning Committee and other Committees and project teams as deemed appropriate by the Executive Council.

- Implement the decisions of the Executive Council.

- Perform such other functions and duties as directed by the Executive Council.

B) The RTCMC shall elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the RTCMC and for calling and establishing the agendas for regular meetings of the RTCMC.

The RTCMC shall elect one its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two-year term as set forth herein.

Section 2.3 - Traffic Operations Center (TOC) Committee

A) The duties of the TOC Committee shall include, but not be limited to:

- Establish the operating procedures and protocols of the NITTEC TOC(s) to monitor and report traffic conditions on the transportation system (including incidents) on a real-time basis to NITTEC Members and the public.

- Recommend/coordinate traffic management strategies to minimize delays and improve safety.

- Participate in planning for, and managing, the transportation system during special events and during major incidents.

- Prepare and submit to the RTCMC an annual TOC Committee report and work plan.

- Perform such other functions and duties as directed by the Executive Council or the RTCMC.

B) The TOC Committee shall by consensus elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee.

The TOC Committee shall by consensus elect one of its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two year term as set forth herein.

Section 2.4 - Technology and Systems (T & S) Committee

A) The duties of the T & S Committee shall include, but not be limited to:

- Identify and coordinate NITTEC Members' plans for use of ITS architecture and elements for Advanced Traffic Management (ATM).
- Facilitate the development and introduction of regionally compatible ITS architecture and technology for traveler information and traffic management.
- Review Revolving Loan Fund project applications for consistency with Regional ITS objectives and compatibility with existing systems for integration. Provide recommendations to the RTCMC on technical aspects of Loan Applications.
- Prepare and submit to the RTCMC an annual T & S Committee report and work plan.
- Perform such other functions and duties as directed by the Executive Council or the RTCMC.

B) The T & S Committee shall by consensus elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee.

The T & S Committee shall by consensus elect one of its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of

Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two-year term as set forth herein.

Section 2.5 - Western New York (WNY) Incident Management Committee

A) The duties of the WNY Incident Management Committee shall include, but not be limited to:

- Develop recommendations for the better coordination, integration and implementation of operations to enhance the effectiveness of the region's highway incident management process.
- Foster communications and coordination among transportation agencies/authorities, public safety agencies/authorities, emergency service providers and traveler information sources that will lead to the development of policies, procedures and protocols for the management of highway incidents.
- Plan and execute real time traffic management for special events.
- Prepare and submit to the RTCMC an annual Incident Management Committee report and work plan.

B) Each year, the WNY Incident Management Committee shall by consensus elect one of its members to serve as a Co-Chair. The term of the Co-Chairs shall be two years. For the second year of his/her two-year term, a Co-Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee. For the first year of his/her two-year term, a Co-Chair shall assist the other Co-Chair who is performing the above enumerated duties. In the event a Co-Chair in the second year of his/her term cannot perform the above enumerated duties, the other Co-Chair shall assume those responsibilities.

Section 2.6 - Ontario Incident Management Committee

A) The duties of the Ontario Incident Management Committee shall include, but not be limited to:

- Develop recommendations for the better coordination, integration and implementation of operations to enhance the effectiveness of the region's highway incident management process.
- Foster communications and coordination among transportation agencies/authorities, public safety agencies/authorities, emergency service providers and traveler information sources that will lead to the development of policies, procedures and protocols for the management of highway incidents.
- Plan and execute real time traffic management for special events.

- Prepare and submit to the RTCMC an annual Incident Management Committee report and work plan.

B) Each year the Ontario Incident Management Committee shall by consensus elect one of its members to serve as a Co-Chair. The term of the Co-Chairs shall be two years. For the second year of his/her two-year term, a Co-Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee. For the first year of his/her two-year term, a Co-Chair shall assist the other Co-Chair who is performing the above enumerated duties. In the event a Co-Chair in the second year of his/her term cannot perform the above enumerated duties, the other Co-Chair shall assume those responsibilities.

Section 2.7 - Border Crossing Committee

A) The duties of the Border Crossing Committee shall include, but not be limited to:

- Develop recommendations to foster communications and coordination among NITTEC Members, border agencies and stakeholders that will lead to the development of policies, procedures and protocols for the management of the border crossings for efficient movement of people and goods across the region's bi-national border.

- Prepare and submit to the RTCMC an annual Border Crossing Committee report and work plan.

B) The Border Crossing Committee shall by consensus elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee.

The Border Crossing Committee shall by consensus elect one of its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two-year term as set forth herein.

Section 2.8 - Construction Coordination Committee

A) The duties of the Construction Coordination Committee shall include, but not be limited to:

- Standardize the manner in which NITTEC Members will communicate, coordinate and manage construction information.
- Coordinate and manage the development and implementation of the NITTEC Members' traffic management plans and activities related to construction.

- Review the NITTEC Members' construction programming to identify potential conflicts and mitigation.
- Identify ITS and operational opportunities within scheduled construction projects to minimize the impacts on regional mobility.
- Prepare and submit to the RTCMC an annual Construction Coordination Committee report and work plan.

B) The Construction Coordination Committee shall by consensus elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee.

The Construction Coordination Committee shall by consensus elect one of its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two-year term as set forth herein.

Section 2.9 - Strategic Planning Committee

A) The duties of the Strategic Planning Committee shall include, but not be limited to:

- Assess NITTEC's performance in meeting member, stakeholder and public expectations.
- Establish strategic initiatives to meet NITTEC's mission.
- Review and maintain NITTEC agreements, programs and documentation to reflect the current state of practice and regional conditions.
- Review and maintain strategic planning documentation to establish priorities and identify needs.
- Identify, initiate and manage operations, planning, studies and requirements for establishing NITTEC goals, objectives and services.
- Continue to work with the Metropolitan Planning Organization (GBNRTC) to coordinate regional transportation planning and operations activities.

- Make recommendations to the RTCMC on NITTEC's long term direction.
- Prepare and submit to the RTCMC an annual Strategic Planning Committee report and work plan.

B) The Strategic Planning Committee shall by consensus elect one of its members to serve as Chair. The term of the Chair shall be two years. The Chair shall be responsible for directing the business before the Committee and for calling and establishing the agendas for meetings of the Committee.

The Strategic Planning Committee shall by consensus elect one of its members to serve as Vice-Chair. The term of the Vice-Chair shall be two years, to run concurrently with the term of the Chair. In the event the office of Chair is vacant or the Chair is unable to perform the duties of the Chair by reason of illness, disability or absence, the Vice-Chair shall perform the duties of the Chair until such time as the Chair is able to perform such duties. The Vice-Chair shall automatically assume the position of Chair at the end of the Chair's two year term, at which time a new Vice-Chair will be elected for a two-year term as set forth herein.

Section 2.10 - Additional Committees

The Executive Council and the RTCMC may, in their discretion, establish additional standing or ad-hoc committees and/or project teams and assign to them such duties and functions as they deem appropriate. In the event additional standing committees are established, each such committee shall conduct its business in a manner similar to all other Committees set forth in this MOU (except the Incident Management Committees), including the election, term and duties of a Chair and Vice-Chair, and the submission of an annual report and work plan to the RTCMC.

Article III – Staff and Funding

Section 3.1 - NITTEC Executive Director

The NITTEC Executive Director shall be responsible for:

- Managing the day-to-day operations of NITTEC in accordance with all applicable laws, rules and regulations, directives from the Executive Council and the RTCMC, and Policy Member directives as appropriate.
- Overseeing the Traffic Operations Center, which operates and controls selected ITS elements for Members and identifies conflicting mobility restrictions such as lane closures on parallel facilities for construction contracts, maintenance and utility operations.
- Progressing items contained within the approved work plans for the year, which are prepared by the Committees and approved by the RTCMC.
- Administering the Revolving Loan Fund.

- Preparing the annual NITTEC budget for review and action by the Executive Council.
- Communicating to the RTCMC Chair about business that the RTCMC needs to address.

Section 3.2 - NITTEC Staff

All administrative functions related to the employment of NITTEC staff shall be as described in the Host Agreement, as defined in Section 3.3 herein.

Section 3.3 - Host Agreement

NFTA will continue to serve as administrative host of NITTEC as provided for in the Agreement between New York State Department of Transportation and Niagara Frontier Transportation Authority for Operation of Traffic Operations Center dated January 16, 2001, as amended.

Section 3.4 - Funding

The Executive Director shall each year prepare an annual budget for the fiscal period April 1 to March 31. The Executive Director shall submit the annual budget to the Executive Council for its review and consideration. Once approved by the Executive Council, NYSDOT, on behalf of NITTEC, will incorporate the approved budget into its presentation to the Greater Buffalo-Niagara Regional Transportation Council for inclusion in the region's Transportation Improvement Program.

Section 3.5 - NITTEC Participation

The parties hereto understand and agree that execution of this MOU and participation in NITTEC does not obligate a party to commit any funds to NITTEC.

Article IV – Miscellaneous

Section 4.1 - Term

This MOU shall commence on April 1, 2008 and shall terminate on March 31, 2010.

Section 4.2 - Withdrawal

Any Policy Member may withdraw from this MOU at any time by providing written notification to the other parties sixty (60) days prior to its withdrawal. In the event of such a withdrawal, this MOU will continue in effect with the remaining parties.

Section 4.3 - Parties in Interest

This MOU shall be solely for the cooperative benefit of the NITTEC Members. No other person or entity shall be a beneficiary of its provisions, nor have a right to enforce its terms against the parties hereto.

Section 4.3 - Entire Agreement
This MOU, together with any appendices, attachments, schedules or exhibits, constitutes the entire understanding between the parties and there are no other oral or extrinsic understandings of any kind between the parties. This MOU may not be changed or modified in any manner except by a subsequent writing, duly executed by the Policy Membership.

In WITNESS WHEREOF, the parties hereto executed this MOU on the date first above written. This MOU may be executed in several counterparts that, when taken together, shall constitute one and the same instrument.

ERIE COUNTY
95 Franklin Street
Buffalo, NY 14202

BY: _____
Commissioner
Date: 4/20/08

NIAGARA FRONTIER TRANSPORTATION AUTHORITY
181 Ellicott Street
Buffalo, NY 14203

BY: _____
Executive Director
Date: 4-23-08

NEW YORK STATE THRUWAY AUTHORITY
200 Southern Boulevard
Albany, NY 12209

BY: _____
Executive Director
Date: 4/25/08

NEW YORK STATE DEPT OF TRANSPORTATION
100 Seneca Street
Buffalo, NY 14203

BY: _____
Regional Director
Date: 4-30-08

MINISTRY OF TRANSPORTATION ONTARIO
3rd Floor Ferguson Block
77 Wellesley Street W.
Toronto, Ontario M7A 1Z8

BY: _____
Asst. Deputy Minister
Date: April 29/2008

ATTACHMENT 1

AFFILIATE MEMBERS

New York State Police
Ontario Provincial Police
GBNRTC
Federal Highway Administration
Town of Amherst
Town of Tonawanda
Town of Niagara on the Lake
New York State Department of Environmental Conservation
John's Towing
Rusiniak's Towing
US Customs and Border Protection
Canada Border Services Agency

Execution Page to

MEMORANDUM OF UNDERSTANDING ("MOU")
Niagara International Transportation
Technology Coalition ("NITTEC")

for General Members

The undersigned General Member hereby agrees to the terms of the NITTEC MOU, as it may be amended from time to time by the Policy Members in accordance with its terms including those terms applicable to the General Member class.

By: _____

Title: _____

Date: _____

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Execution Page to

MEMORANDUM OF UNDERSTANDING ("MOU")
Niagara International Transportation
Technology Coalition ("NITTEC")

for Affiliate Members

The undersigned Affiliate Member hereby agrees to be bound by the terms of the NITTEC MOU, as it may be amended from time to time by the Policy Members in accordance with its terms, including those terms applicable to the Affiliate Member class.

By:_____

Title:_____

Date:_____

APPENDIX D2. SAMPLE OPERATIONS PROTOCOL: NIAGARA INTERNATIONAL TRANSPORTATION TECHNOLOGY COALITION (NITTEC)—TIMING PLAN CHANGES DURING EMERGENCY EVENTS

NITTEC

PROTOCOLS FOR CITY OF BUFFALO SIGNALS

June 24, 2005

INTRODUCTION

The NITTEC Traffic Operations Center (TOC) Operators obtains traffic information through Closed Circuit Television Cameras (CCTV), incident detection systems, and credible sources; including police, fire, member agencies personnel, etc. Recent events have proven that severe congestion can occur during traffic or weather incidents and if the City needs to be evacuated. The City has designated specific corridors as emergency evacuation routes which also experience significant overflow of traffic during weather events and incidents. The interconnection and coordination of all signal systems along these routes will allow for the capability of adjusting the signal timing and remote prioritization of directional movements to improve traffic flows when congestion occurs. The corridors included in this plan are:

- Genesee Street
- Niagara Street
- South Park Avenue
- William Street

SCENARIOS

Three scenarios which a signal plan would need to be modified from the standard timing plan by a TOC Operator are for an incident, which includes accidents and emergency road closures, weather related events, and evacuation events. The signal timing plans and the establishment of preset timing plans for the scenarios will be determined by the City of Buffalo. The following are examples of the scenarios that would impact traffic and require a signal plan to be changed.

The standard timing plan will be established by the City of Buffalo as the default setting for the system. This timing plan will be based on normal conditions as defined by the City of Buffalo and will remain active until the City of Buffalo approves changing to a scenario based timing plan based on real time conditions.

Incident:

- An accident or disabled vehicles that block some or all of the lanes on a highway result in adjacent or parallel City of Buffalo Street to become congested. A signal plan change on the alternate routes would improve mobility through the corridor.

- Upon approval by the City of Buffalo, a TOC Operator will activate a preset timing plan established by the City of Buffalo to address this scenario.

Page 1 of 3

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Weather Event:

- A weather condition that requires the closure of a roadway, including flooding, snow, ice, etc. result in motorists using alternate routes. This causes traffic to get congested on City of Buffalo streets. A signal plan change on the alternate routes would improve mobility through the corridor.
- Weather conditions can impede the flow of traffic on a roadway resulting in motorists using alternate routes. This causes traffic to get congested on City of Buffalo streets. A signal plan change on the alternate routes would improve mobility through the corridor.
- Upon approval by the City of Buffalo, a TOC Operator will activate a preset timing plan established by the City of Buffalo to address this scenario.

Evacuation Event:

- The Seasonal Transportation Plan may be enacted in an evacuation event. This may result in gridlock around the City. Several routes have been identified as evacuation routes. A signal plan change on the alternate routes would improve mobility through the corridor.
- In an emergency evacuation of the City, several roadways may become congested. Motorist may seek alternate routes, causing congestion on those routes. A signal plan change on the alternate routes would improve mobility through the corridor.
- Upon approval by the City of Buffalo, a TOC Operator will activate a preset timing plan established by the City of Buffalo to address this scenario.

ENACTMENT

The TOC shall assist in relieving congestion on City of Buffalo streets caused by incidents, weather events or evacuation events. The TOC Operators will verify traffic impacts on designated City of Buffalo streets and contact the City of Buffalo prior to initiating any established scenario based signal plan changes. The City of Buffalo may call the TOC and request a signal plan change based on the specific scenarios. The signal timing presets for each corridor will be predetermined by the City of Buffalo. The TOC shall continue to monitor the traffic impacts on City of Buffalo streets and notify the City of Buffalo when the situation has been resolved prior to reverting to the standard timing plan.

Should an event occur, NITTEC TOC Operators shall contact one of the following City of Buffalo personal, to request an operational change of the signal plan. In priority order, contact shall be made with:

1. Commissioner of Public Works, Parks and Streets
2. City Engineer
3. Traffic Engineer
4. Superintendent of Traffic Signal Systems

SUPPLEMENTAL INFORMATION
Upon designation of additional corridors, this agreement may be revised to include said corridors as mutually agreed to by written letter from/to each party hereto.

This agreement may be modified or cancelled by the City or NITTEC provided an alternate agreement is executed as mutually agreed to by both parties hereto.

This agreement shall be automatically renewed each year unless modified or cancelled as per this agreement.

DATED: 9/23/05

Thomas George, P.E., Executive Director
NITTEC

DATED: 3/13/06

Joseph N. Giambra, Commissioner
Department of Public Works, Parks & Streets
City of Buffalo

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APPENDIX D3. SAMPLE COOPERATIVE AGREEMENT: LAS VEGAS FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)

Highway Agreement No. _____

Cooperative Agreement for the
Las Vegas Freeway and Arterial System of Transportation

This Agreement, made and entered into on the 16 day of June, 2004, by and between the STATE OF NEVADA, acting by and through its DEPARTMENT OF TRANSPORTATION (NDOT), CLARK COUNTY, the CITY OF HENDERSON, CITY OF LAS VEGAS, CITY OF NORTH LAS VEGAS, and the REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA (RTC), hereinafter referred to as the MEMBER AGENCIES.

WITNESSETH:

WHEREAS, a Cooperative Agreement is defined as an agreement between two or more public agencies for the "joint exercise of powers, privileges and authority"; and

WHEREAS, pursuant to the provisions contained in Chapter 408 of the Nevada Revised Statutes, the Director of the Nevada Department of Transportation (NDOT) may enter into agreements necessary to carry out the provisions of the Chapter; and

WHEREAS, NRS 277.110 authorizes any two or more public agencies to enter into agreements for joint or cooperative action; and

WHEREAS, the voters of Clark County approved Ballot Question No. 10 on November 5, 2002, which provides the RTC with the financial capability to administer and operate the FAST System; and

WHEREAS, the purpose of the Agreement is to supplant the existing FAST Agreement No. NM176 03 016; and

WHEREAS, Clark County, the City of Henderson, City of Las Vegas, City of North Las Vegas, Regional Transportation Commission (RTC) of Southern Nevada, and NDOT each own and operate transportation infrastructures within the boundaries of Clark County, Nevada, and the NDOT District I; and

WHEREAS, the Agreement to combine the Las Vegas metropolitan area arterial traffic management system, referred to as the "Las Vegas Area Computer Traffic System" (LVACTS), and the NDOT freeway management system (FMS) into a single integrated organization, hereinafter referred to as the "Freeway and Arterial System of Transportation" (FAST) was entered into on April 15, 2003; and

WHEREAS, continuance of the FAST System will be of benefit to the Member Agencies and to the people of the State of Nevada: and

WHEREAS, the Member Agencies are each willing and able to perform the requirements described herein; and

NOW, THEREFORE, in consideration of the premises of the mutual covenants herein contained, it is agreed as follows:

1

SECTION I: DEFINITIONS

Administrator - The Administrator is responsible for the Human Resource, administrative, and financial functions necessary for the operation and management of FAST, as more specifically described in Section III D below, and is the Regional Transportation Commission of Southern Nevada.

Appeals Board - A three-member board whose function is to hear and rule on Operation decisions or actions contested by Member Agencies, as more specifically described in Section II C below.

Arterial Management System (AMS) - The AMS manages the movement of traffic on the local street network. An AMS includes a combination of ITS Field Devices, communication networks, computer hardware and software platforms to manage and control traffic.

FAST System Manager- The System Manager reports to the General Manager of the RTC, and is responsible for the daily operation of FAST, the Traffic Management Center, and implementation of the Transportation Management Strategies.

FAST - FAST is a division of the RTC consisting of the management structure, the OMC, the Appeals Board and the freeway and arterial system managers, and other professional, technical, and administrative staff.

FAST System - Components consist of a Traffic Management Center, Transportation Management Infrastructure, and the Transportation Management Strategies that are combined to provide a system to safely and efficiently manage the transportation infrastructure. The System includes the operational functions and features of the freeway and arterial management systems. This would include the central system software and hardware platform, operator work stations, video wall, the communication system including the fiber optic and microwave network, and the ITS Field Devices and traffic signals.

Freeway Management System (FMS) - The FMS manages the movement of traffic onto and on the controlled access roadway facilities owned or maintained by NDOT. An FMS includes a combination of ITS Field Devices, communications networks, computer hardware and software platforms to manage and control traffic.

Incidents - An incident is an unscheduled event generally characterized as non-recurrent congestion or a traffic accident.

Intelligent Transportation System (ITS) - ITS is the collective term for using technology to implement measures targeting the efficient operations and management of transportation facilities and services.

ITS Field Devices - Field equipment located along existing roadways, such as, but not limited to traffic signals, Closed Circuit Television (CCTV), Dynamic Message Signs (DMS), trailblazer signs, communications infrastructure, ramp meters, detection stations, and Highway Advisory Radio (HAR).

Jurisdictional Boundary – For the Member Agencies, other than NDOT, the jurisdictional boundary shall be the legal boundary of the entity, as established by statute or charter. NDOT's jurisdictional boundary shall be right-of-way it either owns or maintains which is covered by the FMS.

Jurisdictional Management Centers (JMCs) - The site(s) or location(s) designated by agencies controlling and monitoring those freeway and arterial FAST ITS Field Devices authorized through this Agreement.

Member Agency - Is a public agency as defined by Nevada Revised Statutes and a party to this Agreement.

Operations and Maintenance (O & M) - The Operating and Maintenance activities associated with the Transportation Management Infrastructure. O & M costs may include, but are not limited to, such items as staff salaries and benefits, utility costs, purchase of equipment and supplies, rental and leasing of equipment or facilities, purchase and repair of vehicles, consultant/contractors costs, and the upgrade and repair costs of equipment.

Operations Management Committee (OMC) - The OMC shall recommend policy and oversee the day-to-day operations and operational parameters of FAST, as more specifically described in Section II A below.

Policy Board - The Regional Transportation Commission of Southern Nevada (RTC), whose function is to establish policy, as the governing body, as recommended by the OMC, RTC General Manager, or FAST System Manager.

Policy Issue - A statement or plan which guides present or future decisions. FAST policy issues placed on the RTC agenda shall be considered Metropolitan Planning Organization issues. The director of NDOT will be entitled to vote on these issues as provided in the Interlocal Contract for Regional Transportation Planning. A Policy Issue cannot be employed to countermand or establish Transportation Management Strategies, nor can a Policy Issue be used to determine signal timing, phasing, or transit priority during periods that are not Priority Times.

Priority Times - The period of time, as recommended by the OMC, during which all Transportation Management Infrastructure is operated and controlled according to the OMC approved Transportation Management Strategies. Typically, this would include the time of day during peak periods of traffic, such as morning and afternoon rush hours, the time before, during and after special events, scheduled construction and maintenance activities, and incidents. Determination of Priority Time shall be considered a policy issue.

Traffic Management Center (TMC) - Site at which the FAST operational staff and equipment capable of controlling and coordinating the arterial, freeway and other FAST System elements are located.

Transportation Management Infrastructure - The various telecommunications and field components, such as, but not limited to, conduit, fiber optic cable, traffic signals, closed circuit television, ramp meters, dynamic message signs and trailblazer signs that are part of the FAST System.

Transportation Management Strategies - Traffic control and other transportation measures that are approved by the OMC and used to manage the transportation infrastructure, including but not limited to freeways, arterials and transit for maximum safety and efficiency during priority times.

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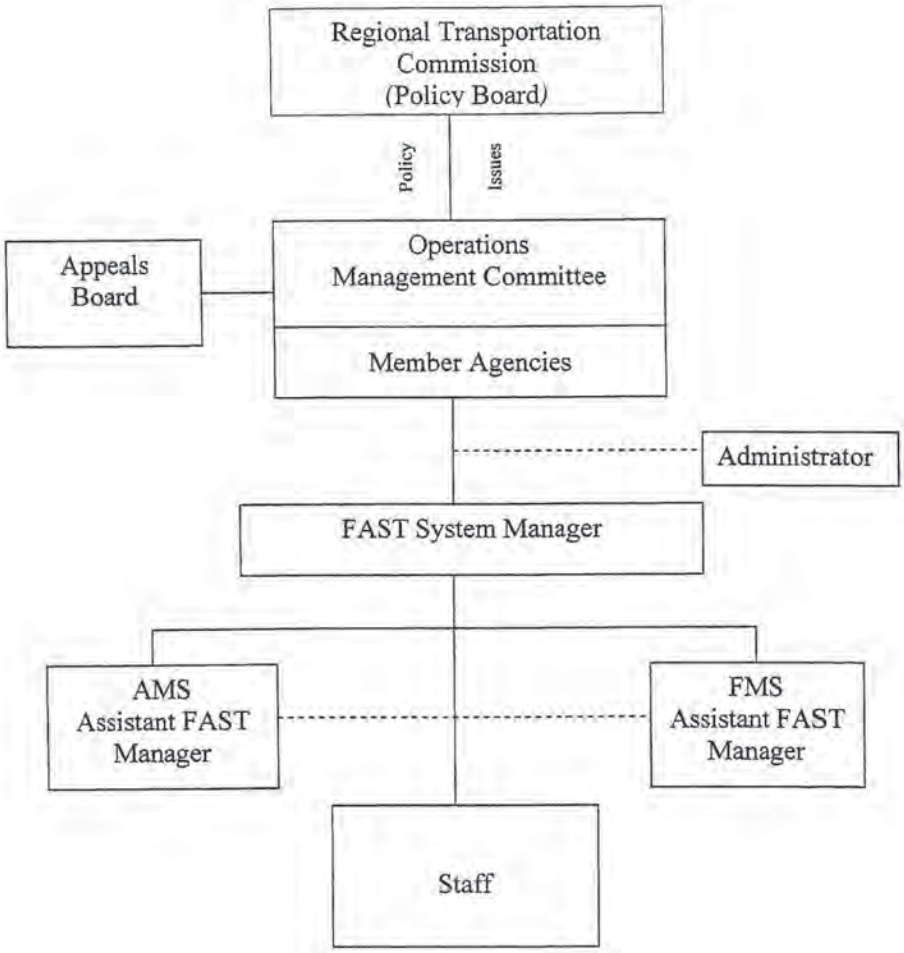
SECTION II: FAST ORGANIZATION

FAST is organized as shown below.

FAST ORGANIZATIONAL STRUCTURE



4

A. Operations Management Committee (OMC)

1) Committee Structure

The OMC membership shall consist of one (1) representative from each Member Agency, represented by the Director, Assistant Director, or Assistant Deputy Director(s) of Public Works, the Deputy Director(s), Assistant Director for Operations or District I Engineer of NDOT, and the General Manager of the RTC. Each representative shall have a designated first and second alternate at a minimum with full authority to act in absence of the representative.

Designation of the OMC Chairperson and Vice-Chairperson shall rotate alphabetically by Member Agency. The Chairperson shall serve a one-year term starting with the July OMC meeting. Upon completion of the term, the Vice-Chairperson shall become the Chairperson and the new Vice-Chairperson shall assume his/her office.

A majority of the Member Agencies of OMC shall constitute a quorum necessary to convene the meeting of the Committee. Unless stated elsewhere in this Agreement, all decisions of the OMC shall be determined by a majority vote of the quorum present.

The OMC shall meet on a monthly basis. Additional meetings may be held at the discretion of the Chairperson should such a need arise. All meetings shall comply with the notice requirements of the Open Meeting Law (NRS 241).

The OMC may be expanded to include additional Member Agencies. Additional Member Agencies must be approved by a unanimous vote of the OMC and become signatories to this Agreement and any subsequent amendment then in effect. The OMC may place conditions on new Member Agencies.

2) Roles and Responsibilities

The primary role of the OMC is to provide instructions and direction to the FAST System Manager to formulate policy, establish operational procedures and principles, (Transportation Management Strategies), and monitor the various aspects of the FAST System, so long as such instructions and directions are within the policies, procedures and budget established for FAST by the RTC acting as the Policy Board.

The OMC shall develop and recommend to the Policy Board a funding policy that achieves the funding requirements for the Operation and Maintenance of FAST. The OMC shall be responsible for providing recommendations to the FAST System Manager for the development, review and concurrence of the annual budget that achieves the funding requirements for the Operation and Maintenance of FAST. The OMC shall provide its recommendation at or prior to the scheduled OMC meeting in January of each year.

The OMC shall have the authority to appoint working groups to carry out the purpose and duties of this Agreement. These working groups shall make recommendations to the OMC for action.

The OMC shall assist with development, review and concurrence with the Transportation Management Strategies prior to their implementation in the FAST System. Exempted are non-regional special events and non-priority times. Transportation Management Strategies selected by the OMC may be implemented during Priority Times.

If a Member Agency desires to remove any portion of the Transportation Management Infrastructure or ITS Field Devices within its jurisdiction from control of FAST, notice of such intent shall be conveyed in writing to the OMC at a minimum of seven (7) months prior to the close

of the current fiscal year and in no event shall the proposed number of transportation management or ITS Field Devices exceed ten percent (10%) of the total number of transportation management or ITS devices within the member's jurisdiction. The OMC shall have the authority to approve or disapprove the recommended removal of any Transportation Management Infrastructure or ITS Field Devices from FAST.

The OMC shall participate in the selection of the FAST System Manager as further described in Section II D of this agreement, from a list of qualified applicants provided by the Administrator. The list of candidates shall be selected in accordance with the guidelines provided by the OMC and the policy and procedures of the Administrator.

The OMC shall recommend the salary and job responsibilities of the FAST System Manager which shall be referred to the Administrator for placement into the appropriate job classification of the Administrator's personnel classification system.

The Chairperson of the OMC shall prepare an annual review of the FAST System Manager's job performance. The evaluation will be forwarded to the General Manager of the Administrator.

The OMC shall recommend the job classifications, job descriptions, job status (appointive or classified), salaries and other related matters to the FAST System Manager and the Administrator. Such job classifications shall be filled in accordance with the personnel policies and procedures of the Administrator.

The OMC shall review monthly the budgetary needs and expenditures of the FAST System.

B. Members

1) Member Agency

Each Member Agency shall have one (1) vote on actions taken by the OMC.

The Member Agencies, in alphabetical order, are Clark County, City of Henderson, City of Las Vegas, NDOT, City of North Las Vegas, and the RTC.

2) Roles and Responsibilities

Member Agencies have identical roles and responsibilities as to the Operations and Maintenance of FAST except as may be defined within this Agreement.

The Member Agencies participating in the funding of FAST shall incorporate the proposed budget and funding share within each agency's budget approval process. If a Member Agency participating in the funding of FAST disapproves the proposed budget, then the basis of the disapproval shall be stated in writing to the FAST System Manager for consideration by the OMC. The budget, if revised, shall be resubmitted to the Member Agencies participating in the funding of FAST for incorporation into their respective budgets.

Through the OMC the Member Agencies shall make the final determination regarding which traffic control and/or ITS Field Devices will be operated and/or maintained by FAST.

Member Agencies are responsible for upgrades and expansions to the FAST infrastructure that are within their jurisdictional responsibility. Funding of FAST infrastructure may be funded by FAST as shown in the approved budget, by the RTC or NDOT through their Capital Improvement Program processes, or by the Member Agencies. FAST system upgrades including, but not limited to, central system equipment, and software that are of a mutual benefit to the Member Agencies

may be funded jointly or individually through FAST. Member Agencies shall pay for any upgrades not recommended by FAST.

Member Agencies may have a Jurisdictional Management Center(s) located within their jurisdiction that will allow them to operate and obtain information from or through the FAST system.

Member Agencies may elect to implement Transportation Management Strategies within their jurisdictional responsibility during special events of non-regional significance and during non-priority times. Each Member Entity and other agencies having jurisdiction over roadways or public safety shall retain the right for street closures or lane restrictions in situations pertaining to incident management, non-regional special events, or construction.

C. Appeals Board

1) Organization Structure

The three-member Appeals Board shall be made up of the Director of NDOT, General Manager of the Regional Transportation Commission of Southern Nevada and the Public Works Director for the Member Agency represented by the current OMC Chairperson. IF a representative of NDOT or the RTC is the current OMC Chairperson, then the OMC Chairperson membership on the Appeals Board will be replaced by the Public Works Director for the Member Agency of the current Vice-Chairperson. Representatives to the Board may appoint a designee, the designee may not have been involved in the decision under appeal.

2) Roles and Responsibilities

The Appeals Board shall meet when requested by a Member Agency to resolve a member's disagreement with a majority action of the OMC. The Member Agency shall submit to the FAST System Manager within sixty days of the action taken by the OMC their request for a hearing by the Appeals Board. The submittal by the Member Agency shall present the disagreement with the OMC action. The Appeals Board shall hear the matter and make a determination. The determination will be submitted to the OMC for action. The decision by the Appeals Board requires a majority vote, which is final.

The Appeals Board shall participate in the selection of the FAST System Manager as further described in Section II.D of this agreement.

3) Open Meeting Law

The Appeals Board shall conform to the Open Meeting Law (NRS 241).

D. Administrator

1) Designated Administrator

The Regional Transportation Commission shall serve as the FAST Administrator.

An Administrator shall have the right to withdraw as the FAST System Administrator provided notice of its intent is given in writing 24 months prior to the requested termination date pursuant to Section IX. Such withdrawal shall not affect its membership in FAST as a Member Agency.

2) Administrator Roles and Responsibilities

The Administrator is responsible for collecting the share of the operating funds from other member agencies as determined by the approved budget.

At the beginning of each quarter of the fiscal year the Administrator shall invoice the Member Agencies for the amount of their quarterly funding share in the cost of Operations and Maintenance of the FAST System.

The Administrator shall deposit funds received from Member Agencies into an account established solely for the purpose of paying the Operations and Maintenance expenses of the FAST System. The Administrator shall pay FAST expenses. Any interest which may accrue to the funds shall be credited by the Administrator to said account for the benefit of the FAST System.

The Administrator shall maintain detailed expenditure records for the Operation and Maintenance of the FAST System. These records will be used to establish the annual FAST budget, providing the OMC with adequate information to determine the cost for each type of equipment, function and location (freeway or arterials).

The Administrator shall notify other Member Agencies participating in the funding of the approved annual FAST budget and their proportionate share within thirty (30) days of OMC approval.

The Administrator shall maintain under generally acceptable accounting principles full, true and complete records and documents pertaining to this Agreement and present, at any reasonable time, such information for inspection, examination, review, audit and copying at any office where such records and documentation is maintained.

The Administrator shall maintain a record of all adopted policies according to the Public Records Law, NRS Chapter 239. All OMC records shall be maintained in accordance with NRS 239.010 on public records and retained at the location designated by the Administrator.

The Administrator shall implement the FAST organizational structure, job classifications, job descriptions, job status, and salary scale as determined by the OMC unless the determined organizational structure, job classifications, job descriptions, job status, and salary scale does not conform to existing Human Resource policies and procedures. Any actions must be approved by the Administrator before they become effective.

The Administrator agrees to hire the FAST System Manager. The OMC shall be requested to develop a short list of qualified candidates. The Member Agencies represented on the Appeals Board shall be requested to participate in the interview of the final candidates. The Administrator shall make the final hiring decision.

The Administrator shall be responsible for implementing the hiring, reassignment, demotion and termination decisions of the FAST System Manager.

The Administrator agrees to consider discipline or termination of the FAST System Manager, if so requested by the OMC provided, however, the Administrator reserves the right to separately and independently discipline or terminate the FAST System Manager for violations of the policies and procedures of the Administrator. Prior to termination by the Administrator, the Administrator shall suspend the FAST System Manager and shall meet with the OMC for the purpose of receiving input on the termination action; the Administrator retains the final decision.

The Administrator agrees to discipline or terminate administrative staff in accordance with existing Human Resource policies and procedures.

E. FAST System Manager

1) FAST System Manager Position

The FAST System Manager shall be an appointive employee of the Administrator assigned to FAST.

2) Roles and Responsibilities

The FAST System Manager is responsible for the daily operations of FAST, including, without limitation, the day to day supervision of the FAST staff, system Operation and Maintenance activities, approval of additions to the Transportation Management Infrastructure or ITS Field Devices, development of the Transportation Management Strategies, and preparation of the annual budget.

The FAST System Manager shall meet annually, or more frequently as required, with the Director of Public Works of each agency, the General Manager of the RTC and Director of the NDOT to discuss the operation of FAST.

The FAST System Manager shall prepare a FAST Strategic Plan and submit for recommendation of approval to the OMC. The Strategic Plan shall be revised at minimum of every five (5) years or as required. The Strategic Plan shall be considered a policy issue.

The FAST System Manager shall prepare an annual report detailing the performance of the freeway and arterial management systems and recommending any improvements to FAST.

The FAST System Manager shall recommend to the OMC the number of employees needed to carry out the day to day operations of FAST including without limitation, the job classifications, job descriptions, job status (appointive or classified), salaries and other related matters, based upon the Administrator's personnel classification system.

The OMC shall be informed of the termination of FAST employees.

The FAST System Manager shall provide those administrative functions required by the Appeals Board.

F. FAST Staff

1) Staff Positions

The professional, technical and administrative staff shall be employees of the Administrator assigned to the operations of FAST with all of the same rights and benefits of other employees of the Administrator (including the benefits and rights under any collective bargaining agreement, which may cover the employee's job classification).

SECTION III: FUNDING

RTC agrees to provide the necessary capital funding for the AMS established by the approved capital improvements budget. RTC also agrees to provide funding for the operations and maintenance of the AMS, which includes a proportionate share of the operations and maintenance of the TMC, as further described in Section III A.

On the effective date of this Agreement at which time the RTC assumes responsibility for contributing to the operations and maintenance of the AMS, all funding in the FAST Fund which had been contributed by the Member Agencies shall remain in the FAST Fund for its operation and maintenance.

NDOT agrees to provide the necessary capital funding for the FMS and administrative building. Capital funding for the FMS may also be funded by the RTC. NDOT also agrees to provide funding for the Operation and Maintenance of the FMS which includes a proportionate share of the operations and maintenance of the TMC.

The Member Entities shall within thirty (30) days from receipt of the notice from the Administrator remit their funding share in the cost of operating and maintaining FAST for the quarter.

The entering into and implementation of this Agreement by the Member Agencies is subject to the receipt of federal, state, and/or local funds, as applicable, adequate to carry out the provisions of this Agreement in full. The RTC, as Administrator, may reduce the budget if it determines that there will be a lack of adequate funding available for the continued operation of the FAST System. In such event, the RTC shall notify the Member Agencies in writing thirty (30) days in advance of the date that such reduction is to be effective. If the budget reductions by the RTC cannot solve the financial shortfall, then any Member Agency failing to receive adequate funding to satisfy their financial obligations, pursuant to this Agreement, may terminate or reduce its participation in the FAST System upon giving one hundred eighty (180) days written notice to all the Member Agencies.

If the Member Agency experiencing the financial deficiency is NDOT, then NDOT will enter into an agreement with FAST for its continued use of the TMC.

A. Operation and Maintenance Funding

Starting with the effective date of the Agreement, the Operation and Maintenance of the Freeway Management System component shall be funded by NDOT. NDOT's contribution to the FMS Operations and Maintenance budget shall be negotiated and stated in a Cooperative Agreement between the RTC and NDOT. All agreements and memorandums of understanding pertaining to NDOT's contributions to the FMS that are in effect on the effective date of this agreement shall remain in force.

RTC agrees to provide funding for the operations and maintenance of the AMS which includes a proportionate share of the operations and maintenance of the TMC in an equivalent amount not to exceed $3,518,606 in FY 2004-05 and increasing at a maximum amount of seven percent (7%) annually. Funding for the operations and maintenance of the AMS in excess of the RTC's contribution shall be funded by the other Member Agencies, excluding NDOT, subject to the other Member Agencies entering into an interlocal contract establishing the levels of contribution. The OMC shall determine the contributions of each Member Agency, if any, excluding NDOT and the RTC, based on the fair share formula as approved by the OMC, considering the number of its traffic signals and/or ITS Field Devices within each member's jurisdiction.

B. Funding Formula

The OMC shall determine the contributions of each Member Agency (excluding NDOT and the RTC) based on a fair share formula as approved by the OMC, considering the number of traffic signals and/or ITS Field Devices within each member's jurisdiction, the budget for the Arterial Management System component of FAST, and the contribution of the RTC.

C. Jurisdictional Management Center

Funding associated with the Operation and Maintenance of the JMC shall be the responsibility of the jurisdiction in which the JMC is located. Such costs may include, but are not limited to, computer and communication equipment, staffing, utilities, capital improvements, and consultant/contractor. Funding for the implementation of software and hardware changes at each JMC caused by the central operations of FAST shall be the responsibility of FAST.

SECTION IV: INDEMNITY

A. Each Member Agency agrees to be responsible for any and all liability (including, without limitation, all claims, demands, actions, damage, decrees, judgments, attorney fees, costs, and expenses) resulting from injury or damage to any person or property, which occurs within the Member Agency's jurisdictional boundary and which arises out of, or in connection with, the Operation and/or Maintenance of FAST, including the cost of any litigation, arbitration or other proceeding in defense thereof.

B. The Member Agencies agree to be responsible for any and all liability (including, without limitation, all claims, demands, actions, damages, decrees, judgments, attorney fees, costs and expenses) arising out of the hiring, firing or termination of the FAST System Manager, or the administrative staff, if such action has been performed at the request of the OMC, including the cost of any litigation, arbitration or other proceeding in defense thereof.

C. The Member Agencies, except NDOT, agree to be responsible to the same extent that the Administrator is responsible under NRS 41.0349 for any and all liability (including, without limitation, all claims, demands, actions, damages, decrees, judgments, attorney fees, costs and expenses) arising out of the acts or omissions, negligent or otherwise, of the FAST System Manager, or the administrative staff, committed during the course and scope of performing their duties for FAST, including the cost of any litigation, arbitration or other proceeding in defense thereof.

D. The Administrator agrees to be responsible for any and all liability (including, without limitation, all claims, demands, actions, damages, decrees, judgments, attorney fees, costs and expenses) arising out of the hiring, firing, or termination of the FAST System Manager, or the administrative staff, if such action was taken solely by the Administrator, and not at the request of the OMC, including the cost of any litigation, arbitration or other proceeding in defense thereof.

E. In cases of liability under Sections C or D, the cost thereof shall be considered an expense of FAST to be paid in accordance with the funding formula approved by the OMC.

F. Notwithstanding any other provision in this Agreement, this Agreement shall not be construed as a waiver of the immunities, limitations of damages and other restrictions of governmental liabilities contained in Nevada law and NRS Chapter 41.

SECTION V: DURATION OF AGREEMENT

This Agreement shall commence July 1, 2004 or the first day of the quarter following approval by the last Member Entity, whichever is later, and terminate on June 30, 2009 unless by a vote of 2/3 majority of the Member Agencies agree to an earlier date of termination. After June 30, 2009 the Agreement shall automatically be extended annually for one year intervals unless any Member Agency submits a request in writing a minimum of one hundred eighty (180) days prior to the current Agreement expiration date to both the OMC and the Administrator that the Agreement be renegotiated or terminated.

SECTION VI: TITLE TO FAST SYSTEM PROPERTY

A. Acquisition of Property other than with Funds Appropriated by NDOT

Title ownership of all property, which is acquired with funds appropriated by the Member Agencies other than NDOT under this Agreement, shall be determined in the following manner.

(1) Any and all property installed at the site of a traffic signal or ITS Field Device shall vest in title and ownership in the name of the Member Agency in whose jurisdiction the property is located;

(2) Any and all property installed at a JMC shall vest in title and ownership in the name of the jurisdictional operator;

(3) A Member Agency shall not take any action with regard to its property which will have an adverse impact on the FAST System, as determined by the FAST System Manager.

(4) The FAST System Manager shall not take any action with regard to a Member Agency property which will have an adverse impact on the Member Agency, as determined by the Member Agency Traffic Engineer.

B. Acquisition of Property with Funds Appropriated by NDOT

Title and ownership of all property which is acquired with funds appropriated by NDOT shall vest in the name of NDOT.

C. Traffic Management Center

NDOT agrees to provide the building in which the FAST Organization and System will be located.

SECTION VII: SEVERABILITY

It is understood and agreed by the Member Agencies hereto that if any part, term or provision of this Agreement is declined by a court of competent jurisdiction to be illegal or in conflict with any laws of this State, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the Member Agencies shall be construed and enforced as if the Agreement did not contain the particular part, term or provision held to be invalid.

SECTION VIII: AMENDMENTS

This Agreement may be amended from time to time as required and approved by all of the Member Agencies.

SECTION IX: NOTIFICATION

All notices or other communications required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been duly given if delivered by hand, telephonic facsimile transmission with simultaneous regular mail or mailed certified return receipt required, postage prepaid on the date postmarked and addressed to the Member Agencies at the following addresses:

FOR CLARK COUNTY:
Public Works Director
500 S. Grand Central Parkway
Las Vegas, NV 89155
(702) 455-6020

FOR CITY OF HENDERSON:
Public Works Director
240 Water Street
P.O. Box 95050
Henderson, NV 89009-5050
(702) 267-3030

FOR CITY OF LAS VEGAS:
Public Works Director
400 Stewart Ave
Las Vegas NV 89101
(702) 229-6276

FOR DEPARTMENT OF TRANSPORTATION STATE OF NEVADA:
Attn: Chief, Safety & Traffic Division
Nevada Department of Transportation
1263 S Stewart St
Carson City NV 89712
(775) 888-7440

FOR CITY OF NORTH LAS VEGAS:
Assistant Director Public Works
Transportation Services
2266 Civic Center Drive
North Ls Vegas, NV 89030
(702) 633-1200

REGIONAL TRANSPORTATION COMMISSION:
Attn: General Manager
600 S Grand Central Pkwy Ste 350
Las Vegas, NV 89106-4512
(702) 676-1500

SECTION X: NO THIRD PARTY BENEFICIARY

It is specifically agreed between the parties executing this Agreement that it is not intended by any of the provisions of any part of the Agreement to create in the public or any member thereof a third party beneficiary status hereunder, or to authorize anyone not a party to this Agreement to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Agreement.

SECTION XI: OPEN MEETING LAW

Pursuant to NRS 241, information or documents may be open to the public for inspection and copying. The parties will have the duty to disclose unless a particular record is confidential by law or a common law balancing of interest.

SECTION XII: ENTIRE AGREEMENT

This Agreement constitutes the entire agreement of the Member Agencies and as such is intended as a complete and exclusive statement of the promises, representations negotiations, discussions, and other agreements that may have been made in connection with the subject matter hereof. Unless an integrated attachment to this Agreement specifically displays a mutual intent to amend a particular part of this Agreement, general conflicts in language between any such attachment and this Agreement shall be construed consistent with the terms of this Agreement. Unless otherwise expressly authorized by the terms of this Agreement, no modification or amendment to this Agreement shall be binding upon the Member Agencies unless the same is in writing and signed by the respective parties hereto and approved by the Attorney General.

SECTION XIII: EXECUTION OF AGREEMENT

This agreement may be executed in multiple counterparts, each of which shall be deemed to be an original document. It is hereby acknowledged that each Member Agency will execute duplicates of its individual signature page so that each Member Agency may have an original of this Agreement.

IN WITNESS WHEREOF the Member Agencies have executed this Agreement on the day and year first above written.

Remainder of page intentionally left blank

Nevada Department of Transportation's signature page for:
Cooperative Agreement for the Las Vegas Freeway
and Arterial System of Transportation

The undersigned person executing the Agreement on behalf of the Nevada Department of Transportation represents and warrants that he/she has full power and authority to enter into this Agreement and that the Nevada Department of Transportation is authorized by law to perform the services set forth herein.

ATTEST:

Frederick Does
Chief, Safety & Traffic Division

Approved as to Legality and Form

Deputy Attorney General

DEPARTMENT OF TRANSPORTATION,
STATE OF NEVADA

Director

6-16-04
Date

~~District I Engineer~~ for the Department
of Transportation
Deputy Director So Nevada

County of Clark's signature page for:
Cooperative Agreement for the Las Vegas Freeway
and Arterial System for Transportation

The undersigned person executing the Agreement on behalf of County of Clark represents and warrants that he/she has full power and authority to enter into this Agreement and that County of Clark is authorized by law to perform the services set forth herein.

ATTEST

County Clerk

CLARK COUNTY BOARD OF COMMISSIONER

Chairman, Clark County Board of
County Commissioners

Approved as to legality and form:

District Attorney's Office
County of Clark

5-4-04
Date of Commission Action

Regional Transportation Commission's signature page for:
Cooperative Agreement for the Las Vegas Freeway
and Arterial System of Transportation

The undersigned person executing the Agreement on behalf of the Regional Transportation Commission of Southern Nevada represents and warrants that he/she has full power and authority to enter into this Agreement and that the Regional Transportation Commission of Southern Nevada is authorized by law to perform the services set forth herein.

ATTEST

Executive Assistant

REGIONAL TRANSPORTATION COMMISSION
OF SOUTHERN NEVADA

Chairman, Regional Transportation
Commission

April 8, 2004
Date of Commission Action

Approved as to legality and form:

General Counsel

City of Henderson's signature page for:
Cooperative Agreement for the Las Vegas Freeway
and Arterial System of Transportation

The undersigned person executing the Agreement on behalf of the City of Henderson represents and warrants that he/she has full power and authority to enter into this Agreement and that the City of Henderson is authorized by law to perform the services set forth herein.

ATTEST

City Clerk

CITY OF HENDERSON

Mayor

Approved as to legality and form:

City Attorney
City of Henderson

6/1/04
Date of Council Action

City of Las Vegas' signature page for:
Cooperative Agreement for the Las Vegas Freeway
and Arterial System of Transportation

The undersigned person executing the Agreement on behalf of the City of Las Vegas represents and warrants that he/she has full power and authority to enter into this Agreement and that the City of Las Vegas is authorized by law to perform the services set forth herein.

ATTEST

City Clerk

CITY OF LAS VEGAS

Mayor

6-2-04
Date

Approved as to legality and form:

5-10-04
City Attorney
City of Las Vegas

City of North Las Vegas' signature page for:
Cooperative Agreement for the Las Vegas Freeway
and Arterial System of Transportation

The undersigned person executing the Agreement on behalf of the City of North Las Vegas represents and warrants that he/she has full power and authority to enter into this Agreement and that the City of North Las Vegas is authorized by law to perform the services set forth herein.

ATTEST

City Clerk
Karen L. Storms, CMC

CITY OF NORTH LAS VEGAS

Mayor
Michael L. Montandon

Approved as to legality and form:

City Attorney
City of North Las Vegas
Sean T. McGowan

June 2, 2004
Date

Fast Agreement 4/7/2004

APPENDIX D4. SAMPLE COOPERATIVE AGREEMENT: OPERATION GREEN LIGHT (MID-AMERICA REGIONAL COUNCIL)

COOPERATIVE AGREEMENT
FOR FUNDING OPERATIONS OF OPERATION GREEN LIGHT
TRAFFIC CONTROL SYSTEM

THIS COOPERATIVE AGREEMENT FOR FUNDING OPERATIONS OF OPERATION GREEN LIGHT TRAFFIC CONTROLS SYSTEM (this "Agreement") is made and entered into this ___ day of _____, 2009 by and between Mid-America Regional Council (MARC) and the City of Overland Park, Kansas, a Constitutionally Chartered Municipal Corporation (City).

WHEREAS, the Mid-America Regional Council performed a feasibility study "*Operation Green Light Feasibility Report, June 2000"* (which can be located at http://www.marc.org/transportation/ogl/documents.htm) (hereafter, the "Feasibility Report"), which created a regional arterial traffic signal coordination system known as "Operation Green Light", for the Kansas City Urban Area including facilities under the jurisdiction of the Missouri Department of Transportation, the Cities of Gladstone, Independence, Kansas City, Lee's Summit, Liberty, North Kansas City, Raymore, Raytown in Missouri and the Cities of Fairway, Leawood, Lenexa, Merriam, Mission, Mission Woods, Olathe, Overland Park, Prairie Village, Shawnee, Westwood and the Unified Government of Wyandotte County/Kansas City in Kansas (collectively, the Member Agencies) ; and

WHEREAS, the Feasibility Report was prepared under review and supervision of each of the Member Agencies; and

WHEREAS, the Feasibility Report recommended that traffic signals within the Jurisdictional Boundaries of all of the Member Agencies be coordinated from a single Regional Traffic Management Center; and

WHEREAS, each of the Member Agencies have approved and accepted the findings of the report; and

WHEREAS, improvement in traffic operational efficiency, air quality and monetary savings to the Member Agencies and the public can be realized from consolidated management approach of coordinated traffic signal control along arterial corridors in the roadway systems of each Member Agency; and

WHEREAS, the Member Agencies and MARC desire to obtain a design for a Regional Traffic Control System, hereinafter defined, for the purpose of coordinating traffic signals within the Jurisdictional Boundaries of the Member Agencies from a single Regional Traffic Management Center; and

WHEREAS, the Member Agencies in Kansas are authorized pursuant to the provisions of Section 12-2901 et. seq. of the Kansas Statues Annotated, and the Member Agencies in Missouri are authorized pursuant to the provisions of Article VI, Section 9 of the Missouri Constitution and Sections 70.210 et. seq. of the Revised Statutes of Missouri to enter into cooperative agreements for the purpose of coordinating traffic signals between and within the Jurisdictional Boundaries of the Member Agencies; and

WHEREAS, each Member Agency has agreed to enter into an agreement to fund the cost of operating such a Regional Traffic Control System; and

NOW, THEREFORE, in consideration of the covenants and conditions herein set forth, MARC and the City (collectively, the "Parties") mutually agree as follows:

Sec. 1. STATUTORY AUTHORITY. Pursuant to the authority set forth in K.S.A. Section 12-2901 et. seq., the parties enter into this Agreement for the funding of the operations of the Regional Traffic Control System, hereinafter defined, which was designed for the purpose of coordinating traffic signals within the Jurisdictional Boundaries of the Member Agencies from a regional perspective. Pursuant to such authority, the City will file for recording an executed copy of this Agreement in Johnson County and file a copy with the Kansas Secretary of State.

Sec. 2. DEFINITIONS. As used in this Agreement, and Exhibit 1 through Exhibit 6, attached hereto and incorporated herein, the following words shall have the meanings set forth herein:

Exhibit 1 – Steering Committee Document

Exhibit 2 – Scope of Services

Exhibit 3 – Compensation

Exhibit 4 – Insurance Requirements

Exhibit 5 – Ownership Matrix

Exhibit 6 – Concept of Operations

Communications Network – All telecommunication infrastructure between Regional Traffic Management Center, Jurisdictional Control Centers, Jurisdictional Work Stations and Traffic Signal Controllers which are a part of the Regional Traffic Control System.

Jurisdictional Boundaries – the geographical boundaries of the governmental entities acting as political subdivisions of the states of Kansas and Missouri.

Jurisdictional Control Center – the site or location designated by the Member Agency containing various equipment, computer hardware and computer software capable of controlling and coordinating all Traffic Signals Controllers located within the Jurisdictional Boundaries of the Member Agency.

Jurisdictional Workstation – computer workstations, computer software and portable notebook computer for use by the City to be installed at City-owned facilities capable of controlling and coordinating Traffic Signal Controllers within the Jurisdictional Boundaries and a part of the Regional Traffic Control System.

Member Agencies – Agencies that have entered into an agreement with MARC to participate in funding cost of design, construction and operations of the Regional Traffic Control System by such dates determined by MARC. Agencies include Mid-America Regional Council and may include the Missouri Department of Transportation, the cities of Gladstone, Independence, Kansas City, Lee's Summit, Liberty, North Kansas City, Raymore, and Raytown in Missouri and the cities of Fairway, Leawood, Lenexa, Merriam, Mission, Mission Woods, Olathe, Overland Park, Prairie Village, Shawnee,

Westwood and the Unified Government of Wyandotte County/Kansas City in Kansas.

Private Firms – any private firm or firms engaged by MARC to perform or provide any services, directly or indirectly, related to the operations of the Regional Traffic Control System (including, without limitation, design services provided for on-going operations), as more particularly set forth in Exhibit 2, attached hereto and incorporated herein by this reference.

Regional Traffic Control System - an array of components including Traffic Signal Controllers, wireless and wireline telecommunications equipment, interface units, computer hardware and software, digital storage media, operator's console, peripherals, and other related devices designed to monitor, control, and coordinate traffic movements at signalized intersections according to a given or developed plan.

Regional Traffic Management Center – the site or location designated by the Steering Committee containing various equipment, computer hardware and computer software capable of controlling and coordinating the Regional Traffic Control System. The Regional Traffic Management Center is sometimes referred to herein and in the Exhibits as the "TOC".

Steering Committee – that committee created for the purpose of assisting and advising MARC with respect to the plans, specifications, construction and installation of the Regional Traffic Control System and consisting of voting representatives from the Member Agencies. The membership structure and policy are set forth in Exhibit 1, attached hereto and incorporated herein by this reference.

Technical Committee – that committee created for the purpose of assisting and advising the Steering Committee with respect to technical and engineering issues related to the plans, specifications, construction and installation of the Regional Traffic Control System. Membership on the Technical Committee is by appointment of the Steering Committee.

Traffic Signal Controller – a complete electrical mechanism and cabinet responsible for traffic signal control and operation at an individual intersection.

Sec. 3. RESPONSIBILITIES OF PARTIES.

(a) MARC. MARC shall perform or cause to be performed the services set forth in Exhibit 2, which is attached hereto and incorporated herein by this reference, and deploy the regional signal timing.

(b) City. In addition to the obligations set forth in this Agreement, City, in its capacity as a Member Agency, shall also perform all the obligations set forth in the document entitled "OGL Concept of Operations: Roles and Responsibilities," which is attached hereto as Exhibit 6 and incorporated herein by this reference. Furthermore, City shall not interfere with MARC's exercise of its obligations under this Agreement, including, but not limited to MARC's deployment of the of the regional signal timing and on-going operations of the Regional Traffic Control System.

Sec. 4. SHARE OF COSTS. Subject to the conditions set forth in this Agreement, the City will pay MARC an amount not to exceed **One Hundred Forty-Three Thousand, Five Hundred Forty-Six and 81/100 Dollars ($143,546.81)** (the "OGL Operating Costs") representing the City's share of the cost for the maintenance and operation of the Regional Traffic Control System, as set forth in Exhibit 3, attached and incorporated herein by this reference. The "Operation Green Light Location/ Ownership Matrix" set forth on Exhibit 5 attached hereto and incorporated into this Agreement, identifies the location and ownership of the software, hardware and other components comprising the Regional Traffic Control System.

Sec. 5. SHARING INFORMATION. MARC shall share information related to the maintenance and operation of the Regional Traffic Control System with the City, and the City shall share information with MARC and the Member Agencies necessary for the on-going maintenance and operation of the Regional Traffic Control System.

Sec. 6. SEVERABILITY. Should any provision hereof for any reason be deemed or ruled illegal, invalid or unconstitutional by any court of competent jurisdiction, no other provision of this Agreement shall be affected; and this Agreement shall then be construed and enforced as if such illegal or invalid or unconstitutional provision had not been contained herein.

Sec. 7. AUTONOMY. No provision of this Agreement shall be constructed to create any type of joint ownership of any property, any partnership or joint venture, or create any other rights or liabilities except as may be otherwise expressly set forth herein.

Sec. 8. EFFECTIVE DATE. The effective date of this Agreement shall be upon complete execution by the Parties and written approval by the Office of the Attorney General of Kansas. In accordance with K.S.A. Section 12-2905, after receiving such written approval, the City shall file for recording a fully executed copy of this Agreement with the Register of Deeds of Johnson County, Kansas and file a copy with the Kansas Secretary of State.

Sec. 9. TERMINATION FOR CONVENIENCE. Either party to this Agreement may terminate this Agreement by giving 120 days notice to the other Party. Financial obligations will be honored up to the effective date of termination.

Sec. 10. MERGER. This Agreement constitutes the entire agreement between City and MARC with respect to this subject matter.

Sec. 11. INDEPENDENT CONTRACTOR. MARC is an independent contractor and is not City's agent. MARC has no authority to take any action or execute any documents on behalf of City.

Sec. 12. COMPLIANCE WITH LAWS. MARC shall comply with and shall require its Private Firms to comply with all federal, state and local laws, ordinances and regulations applicable to the work and this Agreement.

Sec. 13. DEFAULT AND REMEDIES. If MARC shall be in default or breach of any provision of this Agreement, City may terminate this Agreement, suspend City's performance, withhold payment or invoke any other legal or equitable remedy after giving MARC written notice and opportunity to correct such default or breach within thirty (30) days of receipt of such

notice; provided, however, if such default or breach cannot be cured within thirty (30) days, then MARC shall commence to cure within thirty (30) days.

Sec. 14. WAIVER. Waiver by City of any term, covenant, or condition hereof shall not operate as a waiver of any subsequent breach of the same or of any other term, covenant or condition. No term, covenant, or condition of this Agreement can be waived except by written consent of City, and forbearance or indulgence by City in any regard whatsoever shall not constitute a waiver of same to be performed by MARC to which the same may apply and, until complete performance by MARC of the term, covenant or condition, City shall be entitled to invoke any remedy available to it under this Agreement or by law despite any such forbearance or indulgence.

Sec. 15. MODIFICATION. Unless stated otherwise in this Agreement, no provision of this Agreement may be waived, modified or amended except in writing signed by the parties.

Sec. 16. HEADINGS; CONSTRUCTION OF AGREEMENT. The headings of each section of this Agreement are for reference only. Unless the context of this Agreement clearly requires otherwise, all terms and words used herein, regardless of the number and gender in which used, shall be construed to include any other number, singular or plural, or any other gender, masculine, feminine or neuter, the same as if such words had been fully and properly written in that number or gender.

Sec. 17. AUDIT. The City shall have the right to audit this Agreement and all books, documents and records relating thereto. MARC shall maintain all its books, documents and records relating to this Agreement and any contract during the period of this Agreement and for three (3) years after the date of final payment of the contract or this Agreement, which ever expires last. The books, documents and records shall be made available for the City's review within ten (10) days after the written request is made.

Sec. 18. AFFIRMATIVE ACTION; NON-DISCRIMINATION.

(a) MARC shall require Private Firms to establish and maintain for the term of this Agreement an Affirmative Action Program in accordance with the provisions the Title VI of the Civil Rights Act of 1964, as amended. More specifically, any third party firm will comply with the applicable regulations of the U. S. Department of Transportation (USDOT) relative to non-discrimination in federally assisted programs of the USDOT, as contained in 49 CFR 21 through Appendix H and 23 CFR 710.405 which are herein incorporated by reference and made a part of this Agreement.

(b) During the performance of this Agreement or any subcontract resulting thereof, MARC, Private Firms and all subcontractors and vendors (the Private Firms, together with all subcontractors and vendors, shall for purposes of this Section 18 be collectively referred to as the "Other Contractor Parties") shall observe the provisions of the Kansas Acts Against Discrimination (K.S.A. 44-1001, et seq.) and Title VII of the Civil Rights Act of 1964 as amended and shall not discriminate against any person in the performance of work under the present Agreement because of race, religion, color, sex, national origin, age, disability, ancestry, veteran status, or low income. In all solicitations or advertisements for employees the MARC

and the Other Contractor Parties shall include the phrase "equal opportunity employer" or a similar phrase to be approved by the Kansas Human Rights Commission ("Commission"). If MARC fails to comply with the manner in which MARC reports to the Commission in accordance with the provisions of K.S.A. 44-1031 and amendments thereto, or if MARC is found guilty of a violation of the Kansas Act Against Discrimination under a decision or order of the Commission which has become final, MARC shall be deemed to have breached this Agreement, and this Agreement may be canceled, terminated or suspended, in whole or in part, by the City.

(c) MARC shall abide by the Kansas Age Discrimination In Employment Act (K.S.A. 44-1111 et seq.) and the applicable provision of the Americans With Disabilities Act (42 U.S.C. 1201 et seq.), as well as all other federal, state and local laws, ordinances and regulations applicable to this project, and shall furnish any certification required by any federal, state or local laws, ordinances and regulations applicable to this project and shall furnish any certification required by any federal, state or local governmental agency in connection therewith.

(d) MARC shall include the provisions of paragraphs (b) through (c) above in every subcontract or purchase order so that such provisions will be binding upon such subcontractor or vendor.

Sec. 19. ASSIGNABILITY OR SUBCONTRACTING. MARC shall not subcontract, assign or transfer any part or all of MARC's obligations or interests without City's prior approval which shall not be unreasonably delayed or withheld. If MARC shall subcontract, assign, or transfer any part of MARC's interests or obligations under this Agreement without the prior approval of City, it shall constitute a material breach of this Agreement.

Sec. 20. CONFLICTS OF INTEREST. MARC shall require its Private Firms to certify that no officer or employee of City, or no spouse of such officer or employee, has or will have a direct or indirect financial or personal interest in this Agreement or any other related agreement, and that no officer or employee of City, or member of such officer's or employee's immediate family, either has negotiated, or has or will have an arrangement, concerning employment to perform services on behalf of MARC or its Private Firms in this Agreement or any other related agreement.

Sec. 21. RULES OF CONSTRUCTION. The judicial rule of construction requiring or allowing an instrument to be construed to the detriment of or against the interests of the maker thereof shall not apply to this Agreement.

Sec. 22. NOTICE: Any notice to a party in connection with this Agreement shall be made in writing at the following address or such other address, as the party shall designate in writing:

City of Overland Park
Attention: Public Works Director
8500 Santé Fe Drive
Overland Park, Kansas 66212-2866

MARC
Attention: Director, Mid-America Regional Council
600 Broadway, Suite 200
Kansas City, Missouri 64105

Sec. 23. GOVERNING LAW. This Agreement shall be construed and governed in accordance with the law of the State of Kansas. Any action in regard to this Agreement or arising out of its terms and conditions must be instituted and litigated in the courts of the State of Kansas within Johnson County, Kansas, and in no other. The parties submit to the jurisdiction of the courts of the State of Kansas and waive venue.

Sec. 24. GENERAL INDEMNIFICATION.

(a) To the extent allowed by law and subject to the immunity and maximum liability provisions of the Kansas Tort Claims Act, MARC shall defend, indemnify, and hold harmless the City and any of its agents, officials, officers and employees from and against all claims, damages, liability, losses, costs and expenses, including reasonable attorney fees, arising out of or resulting from any negligent acts or omissions in connection with the services performed by MARC under this Agreement, caused by MARC, its employees, agents, subcontractors, or caused by others for whom MARC is liable. Notwithstanding the foregoing, MARC is not required under this section to indemnify the City for the negligent acts of the City or any of its agencies, officials, officers, or employees.

(b) To the extent allowed by law and subject to the immunity and maximum liability provisions of the Kansas Tort Claims Act, City shall defend, indemnify, and hold harmless MARC and any of its agents, officials, officers and employees from and against all claims, damages, liability, losses, costs and expenses, including reasonable attorney fees, arising out of or resulting from any negligent acts or omissions in connection with the services performed by City under this Agreement, caused by the City, its employees, agents, subcontractors, or caused by others for whom the City is liable. Notwithstanding the foregoing, the City is not required under this section to indemnify MARC for the negligent acts of MARC or any of its agencies, officials, officers, or employees

Sec. 25. INDEMNIFICATION BY PRIVATE FIRMS. MARC shall require its Private Firms (including, without limitation, any design professionals) to defend, indemnify, and hold harmless the City and any of its agencies, officials, officers, or employees from and against all claims, damages, liability, losses, costs, and expenses, including reasonable attorneys' fees, arising out of any negligent acts or omissions in connection with the services preformed pursuant to this Agreement (including, without limitation, professional negligence), caused by a Private Firm, its employees, agents, contractors, or caused by others for whom the Private Firm is liable. Notwithstanding the foregoing, the Private Firm is not required under this section to indemnify the City for the negligent acts of the City or any of its agencies, officials, officers, or employees.

Sec. 26. INSURANCE. MARC and any Private Firms retained by MARC shall maintain the types and amounts of insurance set forth in Exhibit 4, which is incorporated herein by this reference; provided, however, the limits set forth in Exhibit 4 are the minimum limits and

MARC may carry higher limits as it may deem necessary, in its discretion, or as may be required by other Member Agencies.

Sec. 27 INITIAL TERM; RENEWAL OF TERM. The initial term of this Agreement shall be five (5) years ("Term") unless sooner terminated in accordance Section 9 of this Agreement. The Term of this Agreement shall automatically renew for one additional five (5) year period (the "Renewal Term") on the same terms and conditions as set forth herein; provided, the Term shall not automatically renew if City provides written notice to MARC of its intention not to renew within 120 days prior to the expiration of the Term. During the Renewal Period, the OGL Operating Costs shall increase annually by an amount not to exceed five percent (5%) from the previous year. The annual increases will be based on an estimate of anticipated costs to be incurred by MARC and any necessary reserves required for the ongoing operations and maintenance of the Regional Traffic Control System. During the Renewal Terms, MARC shall provide written notice of said increases to the City within thirty (30) days of the anniversary of the Effective Date.

Sec. 28. NON-APPROPRIATIONS. Notwithstanding anything to the contrary in this Agreement, in accordance with the Kansas Cash-Basis Law, specifically K.S.A. Section 10-1116b, the City is obligated only to pay the OGL Operating Costs required under this Agreement as may lawfully be made from (a) funds budgeted and appropriated for that purpose during the City's current budget year (which is based on a _____ to _____ fiscal year), or (b) funds made available from any lawfully operated revenue-producing source. City represents and warrants that each year during the term of this Agreement, its chief administration office will submit to and advocate for approval by its governing body a budget that includes amounts sufficient to pay the OGL Operating Costs required under this Agreement. City also represents and warrants that each budget year during the term of this Agreement, its governing body will fully consider and make all good faith and reasonable efforts to adopt a budget that specifically identifies amounts sufficient to permit City to discharge all of its obligations under this Agreement.

IN WITNESS WHEREOF, each party hereto has executed this Agreement on the day and year herein written.

MID-AMERICA REGIONAL COUNCIL

By: _____
Title: _____
Date: _____
(Affix Corporate Seal)

CITY OF OVERLAND PARK

By: _____
Title: _____
Date: _____

Attest:

_____
City Clerk

Approved pursuant to K.S.A. §12-2904(g):

_____
Office of the Attorney General of Kansas

ACKNOWLEDGMENT

STATE OF KANSAS)
) ss
COUNTY OF JOHNSON)

On this _____ day of _____, 2009, before me, the undersigned, a Notary Public, appeared _____, to me personally known, or proved to me on the basis of satisfactory evidence, who, being by me duly sworn, did say that he is the Mayor of the City of Overland Park, Kansas, and that the foregoing instrument was signed and sealed in behalf of the City of Overland Park Kansas, and said officer acknowledged said instrument to be executed for the purposes therein stated and as the free act and deed of said City.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal the day and year last above written.

_____
Printed Name _____
Notary Public - State of Kansas
Commissioned in Johnson County

My commission expires:
_____

ACKNOWLEDGMENT

STATE OF MISSOURI)
) ss
COUNTY OF JACKSON)

On this _____ day of _____, 2009, before me, the undersigned, a Notary Public, appeared _____, to me personally known, or proved to me on the basis of satisfactory evidence, who, being by me duly sworn, did say that he is the Executive Director of Mid-America Regional Council (MARC) and that this foregoing instrument was signed and sealed in behalf of MARC by authority of its Board, and said officer acknowledged said instrument to be executed for the purposes therein stated and as the free act and deed of MARC.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal the day and year last above written.

_____
Printed Name _____
Notary Public - State of Missouri
Commissioned in Jackson County

My commission expires:

_____

EXHIBIT 1

OPERATION GREEN LIGHT STEERING COMMITTEE

1.1 Responsibilities: The Operation Green Light Steering Committee shall serve to make budget, procurement and staffing recommendations to the Mid-America Regional Council Board of Directors and to make other technical and policy decisions concerning the development, deployment and operation of the Operation Green Light regional traffic signal coordination project and Advanced Traffic Management System (ATMS), including:

1.1.1 Develop project requirements and scopes of work;

1.1.2 Recommend project budgets, revenues and expenses;

1.1.3 Recommend selection of professional consulting firms and other private contractors to perform work for the project;

1.1.4 Recommend project staffing levels and job descriptions;

1.1.5 Participate in project decision-making at key points in the design process by reviewing and providing comments on project deliverables and by approving or rejecting technical and policy recommendations for the design of the regional traffic signal coordination system including detailed plans for traffic signal equipment and traffic signal timing plans; and

1.1.6 Participate in the development of subsequent inter-jurisdictional agreements for the construction, operation, maintenance and other project development activities of a regional traffic signal coordination system.

1.2 Membership and Meetings: The Steering Committee shall be composed of representatives from participating agencies in the following manner:

Participating Agency	Membership
Fairway	1
FHWA	1
Gladstone	1
Independence	1
Kansas City	2
KCATA	1
KDOT	1
Leawood	1
Lee's Summit	1
Lenexa	1
Liberty	1
MARC	1
Merriam	1
Mission	1
Mission Woods	1
MoDOT	2

North Kansas City	1
Olathe	1
Overland Park	2
Prairie Village	1
Raymore	1
Raytown	1
Shawnee	1
Unified Government	1
Westwood	1

Each representative shall have a designated alternate with full authority to act in the absence of the representative. The Steering Committee may be expanded to include other additional members as approved by majority vote of the members of the existing Steering Committee.

The Steering Committee shall meet minimally on a quarterly basis but may meet more frequently if the problems or business of the Steering Committee necessitates such additional meetings. The chairperson of the Steering Committee shall have the authority to call a meeting of the Committee with a minimum of seven (7) calendar days' notice to all the members. Notice is deemed to have occurred from the date that it is deposited with the United States Postal Service, postage prepaid; distributed via Facsimile; OR distributed vie E-mail addressed to the members of the Steering Committee.

1.3 Chairperson and Vice-Chairperson: In the first meeting of the Steering Committee, the members shall proceed to elect by majority vote of all of the voting members of the Committee, from amongst the members of the Committee, a chairperson and vice-chairperson who will serve a term of one year. Thereafter, a chairperson and vice-chairperson will be elected by a majority vote of all the voting members of the Committee on an annual basis. Said election will occur at the last regularly scheduled meeting of the Steering Committee prior to the expiration of the chairperson and vice chairperson's one-year term. The chairperson shall keep all Committee records.

1.4 Quorum and Voting: All members of the Steering Committee shall be entitled to one vote on all matters submitted to the Committee for vote.

Any six of the voting members of the Steering Committee, including at least one member from Kansas City, Missouri, the Missouri Department of Transportation or Overland Park, Kansas, shall constitute the quorum necessary to convene the meeting of the Committee. All official actions by the Steering Committee shall require a majority vote of the members present at the meeting.

Each member shall have the power to recall any matter voted upon during his absence at a regularly scheduled meeting if prior to the next regularly scheduled meeting said member informs the Chairperson in writing in sufficient time to comply with all the notice requirements of the MARC Public Participation Plan and at least ten (10) days prior to the date of the next regularly scheduled meeting of his intent to subject the previously approved or disapproved matter to revote of the then present members. If a previously voting member is not present for the revote, then said member is deemed to cast his or her vote in the same manner as previously voted on the matter.

EXHIBIT 2

SCOPE OF WORK (OPERATIONS PHASE)

1. Project Management

For the Operation Green Light Priority Corridors project, the Mid-America Regional Council (MARC) will provide staff time, equipment and materials, and contract services necessary to accomplish the following project management services:

- Arrange and conduct project Steering Committee meetings to discuss and develop policies and procedures governing the development, implementation and on-going operation of the project;
- Arrange and conduct Technical Committee meetings to discuss and develop recommendations concerning technical issues associated with the development, implementation and on-going operation of the project;
- Arrange and conduct other meetings with project participants as necessary to develop, implement and operate the project;
- Negotiate, execute and administer agreements with state and local governments to provide federal, state and local funding for the development, implementation and ongoing operation of the project;
- Develop and publish requests for proposals, consultant agreements and other procurement documents necessary to select and hire contractors to provide system integration services, telecommunications and traffic engineering design services, computer software, computer hardware, Communications Network, traffic signal equipment and other items necessary for the development, implementation and ongoing operation of the project;
- Negotiate, execute and administer agreements with private firms to provide system integration services, telecommunications and traffic engineering design services, computer software, computer hardware, Communications Network, traffic signal equipment and other items necessary for the development, implementation and ongoing operation of the project;
- Develop and maintain project budgets and schedules;
- Develop and maintain project databases;
- Publish and distribute project documents and other deliverables to participating state and local governments; and
- Perform other tasks necessary to manage and administer the project.

2. Traffic Signal Timing

MARC shall coordinate with agency staff or their delegates to develop and implement, with agency approval, the requisite signal timing plans for OGL intersections. (Please refer to Concept of Operations for details of this process.)

3. Operations and Maintenance

3.1. Computer Software and Databases

MARC will procure all required software and may engage a private firm or firms selected by the project Steering Committee to provide technical support and maintain computer software and databases at the Operation Green Light Traffic Operations Center. MARC staff shall be responsible for providing day-to-day maintenance of the computer software and databases including but not limited to data entry, backups, upgrades, etc., at the Operation Green Light Traffic Operations Center.

3.2. Computer Network

MARC will procure all required hardware and software. Any equipment (e.g. switches, routers, hubs, etc.) that is used for the field communication backbone will be considered part of the computer network. MARC may engage a private firm or firms selected by the project Steering Committee to provide technical support and maintain the Operation Green Light computer network.

3.3. Field Communications System

All field communications equipment purchased by MARC will be maintained by MARC, or as specified differently in Exhibit 5. The city will maintain any pre-existing, city-owned equipment that is utilized as part of the OGL field communication system. MARC staff will monitor the field communication system through monitoring software that is purchased by MARC. MARC may engage a private firm or firms selected by the project Steering Committee to maintain the regional field communications system. The scope of services for this work will be developed with and approved by the project Steering Committee.

3.4. Traffic Signal Controllers

Each member agency shall be responsible for all maintenance to the traffic signal controllers. MARC responsibility will be limited to maintaining the regional field communication system and will terminate at the traffic controller. Traffic signal controllers and cabinets that have been purchased and/or installed as part of the OGL controller upgrade project will also be owned and maintained by the local jurisdiction once they have been received and/or accepted, and the local jurisdiction will be responsible for purchasing and installing replacement controllers that are compatible with the OGL system, should the MARC-purchased controller fail.

EXHIBIT 3

COMPENSATION

A. The amount the City of Overland Park, Kansas will pay MARC under this contract will not exceed **One Hundred Forty-Three Thousand, Five Hundred Forty-Six and 81/100th Dollars ($143,546.81)** This amount represents the City share of the total project cost as shown in Table 1 of this Exhibit. City shall pay MARC, upon invoice, no less than annually.

Operation Green Light Program
Table 1
Annual Operations Costs

	Total Cost
Operation Green Light Project Annual Operations Costs (includes 3% annual inflation)	$1,100,000
Total signals in OGL	606
Annual Operating Cost per Signal	1833
Total Agency Signals in OGL	44.75
Total Agency Unsubsidized Annual Cost	$82,026.75

Cost per Year at Decreasing Subsidies

Year	Federal Percentage	Annual Cost	Local Agency Cost
2009	80.00%	$82,026.75	$16,405.35
2010	72.50%	$82,026.75	$22,557.36
2011	65.00%	$82,026.75	$28,709.36
2012	57.50%	$82,026.75	$34,861.37
2013	50.00%	$82,026.75	$41,013.38
		Total Contract Amount:	**$143,546.81**

B. It shall be a condition precedent to payment of any invoice from MARC that MARC is in compliance with, and not in breach or default of, all terms, covenants and conditions of this Contract. If damages are sustained by City as a result of breach or default by MARC, City may withhold payment(s) to MARC for the purpose of set off until such time as the exact amount of damages due City from MARC may be determined.

C. No request for payment will be processed unless the request is in proper form, correctly computed, and is approved as payable under the terms of this Contract.

D. City is not liable for any obligation incurred by MARC except as approved under the provisions of this Contract.

EXHIBIT 4

INSURANCE REQUIREMENTS

A. MARC shall procure and maintain in effect throughout the duration of this Agreement, and for a period of two (2) years thereafter, insurance coverage not less than the types and amounts specified below. In the event that additional insurance, not specified herein, is required by the City during the term of this Agreement, MARC shall obtain such additional insurance; provided, however, the cost of the additional insurance shall be paid by the City.

1. Commercial General Liability Insurance: with limits of $500,000 per occurrence and $2,000,000 aggregate, written on an "occurrence" basis. The policy shall be written or endorsed to include the following provisions:

a. Severability of Interests Coverage applying to Additional Insureds

b. Contractual Liability

c. Per Project Aggregate Liability Limit or, where not available, the aggregate limit shall be $2,000,000

d. No Contractual Liability Limitation Endorsement

e. Additional Insured Endorsement, ISO form CG20 10, current edition, or its equivalent

2. Workers' Compensation Insurance: as required by statute, including Employers Liability with limits of:

Workers Compensation Statutory
Employers Liability
$100,000 accident with limits of:
$500,000 disease-policy limit
$100,000 disease-each employee

3. Commercial Automobile Liability Insurance: with $100,000 per claim up to $2,000,000 per occurrence, covering owned, hired, and non-owned automobiles. Coverage provided shall be on an "any auto" basis and written on an "occurrence" basis. The insurance will be written on a Commercial Business Auto form, or an acceptable equivalent, and will protect against claims arising out of the operation of motor vehicles, as to acts done in connection with the Agreement

B. MARC shall cause Private Firm to secure and maintain, throughout the duration of this Agreement, insurance (on an occurrence basis unless otherwise agreed to) of such types and in at least such amounts as required herein.

MARC shall cause Private Firm, upon receipt of notice of any claim in connection with the contract, to promptly notify the City and MARC, providing full details thereof, including an estimate of the amount of loss or liability.

MARC shall cause Private Firm to monitor and promptly notify the City and MARC of any reduction in limits of protection afforded under any policy listed in the Certificate (or otherwise required by the contract) if the Private Firm's limits of protection shall have been impaired or reduced to such extent that the limits fall below the minimum amounts required herein. The Private Firm shall promptly reinstate the original limits of liability required hereunder and shall furnish evidence thereof to the City and MARC.

1. Professional Liability
If Private Firm is to provide professional services as determined by the City or MARC, MARC shall cause Private Firm to maintain insurance coverage for two (2) years beyond the term of this Agreement, Professional Liability Insurance in an amount not less than One Million Dollars ($1,000,000), each claim/aggregate.

2. Commercial General Liability -

General Aggregate:	$ 2,000,000
Products-Completed Operations Aggregate:	$ 2,000,000
Personal & Advertising Injury:	$ 1,000,000
Each Occurrence:	$ 1,000,000

Policy must include the following conditions:

i) Broad Form Contractual/Contractually Assumed Liability
ii) Broad Form Property Damage

3. Automobile Liability -
Policy shall protect Private Firm against claims for bodily injury and/or property damage arising from the ownership or use of all owned, hired and/or non-owned vehicles.

Limits of liability protection required are no less than $1,000,000 bodily injury and property damage, combined single limit including a $1.000,000 uninsured/underinsured limit.

4. Umbrella / Excess Liability -

Each Occurrence:	$ 1,000,000
Annual Aggregate:	$ 1,000,000

The minimum required coverage limit may be satisfied by adding any combination of primary and umbrella/excess per occurrence and aggregate limits so that the sum of both equals the sum of the limits required.

5. Workers' Compensation and Employer's Liability -
This insurance shall protect Private Firm against all claims under applicable state Workers' Compensation laws. Private Firm shall also be protected against claims for injury, disease or death of employees that, for any reason, may not fall within the provisions of a Workers' Compensation law. The policy shall include liability limits not less than the following:

Workers' Compensation:	Statutory
Employer's Liability:	
Bodily Injury by Accident	$500,000 each accident
Bodily Injury by Disease	$500,000 policy limit
Bodily Injury by Disease	$500,000 each employee

C. The policies listed above may not be canceled until after thirty (30) days written notice of cancellation to MARC and the City, ten (10) days in the event of nonpayment of premium. The Commercial General and Automobile Liability Insurance specified above shall provide that MARC and the City and their agencies, officials, officers, and employees, while acting within the scope of their authority, will be named as additional insureds for the services performed under this Agreement. Private Firms engaged by MARC shall provide to MARC and the City at execution of this Agreement a certificate of insurance showing all required endorsements and additional insureds.

D. All insurance coverage must be written by companies that have an A.M. Best's rating of "A-:VII" or better, and are licensed or approved by the State of Kansas to do business in Kansas and by the State of Missouri to do business in Missouri.

E. Regardless of any approval by MARC or the City, it is the responsibility of the Private Firms to maintain the required insurance coverage in force at all times; its failure to do so will not relieve it of any contractual obligation or responsibility. In the event of a Private Firm's failure to maintain the required insurance in effect, MARC may order the Private Firm to immediately stop work, and upon ten (10) days notice and an opportunity to cure, may pursue its remedies for breach of this Agreement as provided for herein and by law.

EXHIBIT 5

Operation Green Light Location/Ownership Matrix

Component	Location	Purchased By	Owned By	Maintained By	Comments
Software/Firmware					
TranSuite & Associated Software	OGL TOC	MARC	MARC	MARC	To be maintained by joint-funded service agreement
Econolite 2070	Field	MARC	Local Agency	Local Agency	
Computer Hardware					
OGL TOC Servers	OGL TOC	MARC	MARC	MARC	To be maintained by joint-funded service agreement
OGL TOC Workstations	OGL TOC	MARC	MARC	MARC	To be maintained by joint-funded service agreement
Agency OGL Workstations	Local Agency	MARC	MARC	MARC	To be maintained by joint-funded service agreement
Wide Area Network	OGL TOC	MARC	MARC	MARC	To be maintained by joint-funded service agreement
Agency TOC Servers	Local Agency	Local Agency	Local Agency	Local Agency	
Agency TOC Workstations	Local Agency	Local Agency	Local Agency	Local Agency	
Field Hardware					
New Communications Equipment	Field	MARC	MARC	MARC	To be maintained by joint-funded service agreement
Existing Communications Equipment	Field	Local Agency	Local Agency	Local Agency	
Traffic Signal Controllers	Field	MARC	Local Agency	Local Agency	
Serial to IP Converters	Field	MARC	Local Agency	Local Agency	
Miscellaneous					
OGL TOC Office	MoDOT D4	MoDOT	MoDOT	MoDOT	MARC will lease space from MoDOT
OGL TOC Phone System	OGL TOC	MoDOT	MoDOT	MoDOT	
OGL TOC Office Furniture & Equipment	OGL TOC	MARC	MARC	MARC	
OGL Vehicles & Mobile Equipment	OGL TOC	MARC	MARC	MARC	

EXHIBIT 6
OGL Concept of Operations: Roles and Responsibilities
(Approved 4/27/05)

Introduction

Operation Green Light (OGL) is a regional initiative to improve traffic flow and reduce vehicle emissions by coordinating traffic signals on major roadways in the Kansas City metropolitan area. OGL is a cooperative effort of the Mid-America Regional Council (MARC), state departments of transportation and local agencies working together to coordinate traffic signal timing plans and communication between traffic signal equipment across jurisdictional boundaries.

The concept of operations provides a high-level overview of the roles and responsibilities of the agencies participating in the operation and management of OGL. The concept of operations is intended to balance the need for standardization and uniformity of operations on OGL routes with the need to be responsive to the unique needs and circumstances of the agencies participating in OGL.

Signal Timing

Initial Deployment of Regional Timing Plans

The member agencies will cooperate with MARC and each other in developing regional traffic signal timing plans. In order to facilitate this work each member agency will provide MARC traffic counts and other relevant, available data for traffic signals that are part of regionally significant traffic corridors that pass through adjacent cities. This information may include:

- Existing timing plans and data in the existing traffic controller (controller data sheets)
- Intersection geometry via aerial mapping
- Signal phasing information (or policy)
- Historical traffic count information available
- Approved yellow and all-red clearance intervals (or policy)
- Pedestrian timing (or policy)
- Signal phasing policy (lead only/lead-lag/vary lead-lag by time-of-day)
- Historical citizen complaints on the intersection operation as needed

After providing data to MARC, each member agency will then work with MARC to cooperatively develop regionally optimized timing plans. The member agency will continue to be responsible for maintenance of timing plans for traffic signals that lie wholly within the member agency's jurisdictional boundaries and are not on OGL corridors unless the member agency decides to contract this work to MARC. The steps involved in the development of regional timing plans are:

- The member agency will either collect traffic counts on the arterials for signals maintained by the member agency and provide this information to MARC OR will contract with MARC to collect traffic counts as needed.
- In conjunction with member agency staff, MARC will conduct travel-time studies and speed profile studies on the arterial prior to implementation of the timing plans
- MARC will hold two design meetings with representatives from the member agencies and other impacted agencies. At the first of these meetings the following items will be established
  - Number of timing plans and time of use (i.e., am, noon, pm, off-peaks, etc.)
  - Critical intersections of a corridor
  - An initial common corridor cycle length for each of the plans identified (i.e. am, pm, etc.) [Note: this cycle length may need to be revisited after developing the regional timing plan.]
- The member agency will then develop the following initial parameters for individual signals maintained by the member agency for each of the timing plans to be developed, and submit them to MARC for review and incorporation into regional plans for the OGL corridor;
  - phase sequencing
  - splits
  - offsets
- MARC will develop initial splits and offsets for any remaining signals and incorporate member agency developed timing plans into regional plans for the OGL corridor.
- MARC may then incorporate the regional plans into mutually agreed upon software as needed for review by the member agencies.
- At the second meeting, MARC and the member agencies will;
  - Review the regional timing plans developed
  - Review any software models developed
  - Determine if any changes to initial timings need to be made to optimize the operation of the corridor
- Once the member agencies have agreed on the different timing plans developed, they will download the timing plans into signal controllers maintained by each member agency OR will request MARC to provide signal timing plans and download to local controllers.
- In conjunction with member agency staff, MARC will field-monitor each arterial after a timing plan has been downloaded and will work with the member agency to make any additional changes to further optimize the flow of traffic if necessary.
- In conjunction with member agency staff, MARC will conduct travel-time and speed profile studies on arterials after implementation of the optimized signal timing plans

Providing Maintenance Timing Plans

As part of a regional effort, MARC will annually, or as requested, examine the operations of signals that are part of regionally significant traffic corridors that pass through the

member agency and adjacent cities and determine if optimization is necessary. If minor changes to splits and offsets are to be made to individual signals along an OGL corridor the following steps will be followed:

- In conjunction with MARC, member agency staff will field-monitor the affected corridor or intersection(s)
- MARC will meet with affected member agencies if needed
- MARC will collect traffic counts as necessary OR the member agency will collect traffic counts at member agency maintained traffic signals
- The member agency will develop timing plans for member agency maintained signals and download them to controllers as necessary in coordination with MARC OR MARC will develop and provide revised arterial timing plans as needed
- In conjunction with member agency staff, MARC will field-monitor each arterial after timing plan download and provide further optimization if necessary by submitting updated timing plans for agency consideration and download

If major changes, such as changes to cycle lengths, phase sequencing and major changes to splits, are to be made along an OGL corridor, the process described above for initial deployment of regional timing plans shall be used.

Incident Management

The member agency will work with MARC and other member agencies to identify locations along the regionally significant arterials and interstate highways where incidents are prone to happen and have major impact on traffic flow. These locations may be manually forced to run special plans when an incident is observed at the TOC. The following steps shall be followed for planned, recurring, and anticipated incident response:

- MARC and member agencies will identify incident-prone locations
- MARC will meet with affected member agencies to discuss solutions
- MARC will develop signal timing plans for the incident
- MARC will submit such plans for review by member agencies
- MARC and member agencies will jointly determine the parameters required for invoking such a plan by the TOC
- Once the plan has been invoked (when the required parameters are met) MARC will inform the affected agencies immediately
- After the incident has been cleared, MARC will put signals back on their regular plans and inform member agencies

The member agency will inform MARC about construction and roadway closures and may request signal timing plan adjustments. MARC will provide special timing plans when requested to optimize traffic flow for agency consideration and download.

Citizen Complaints

Member agencies will route/report citizen complaints/requests on OGL signals to the TOC and MARC, in cooperation with the member agency, will respond to the complaint/request in a timely manner. MARC will also route/report received citizen complaints to the member agencies and maintain a response log.

Dispute Resolution

In the event that satisfactory agreement cannot be reached between member agencies on timing plans or incident plans developed for OGL, the dispute will be referred to the OGL Technical Committee, which will provide recommendations to the OGL Steering Committee for resolution. Unless the responsible engineer for a member agency determines that such plans will create an unsafe condition within their jurisdiction, the member agency will implement the plans recommended by the Technical Committee and approved by the Steering Committee

Emergency Provisions

In the event of an emergency not already covered under a pre-arranged incident-management plan, the member agency will take any steps it considers necessary to manage traffic signals within its jurisdiction to ensure the safety of the traveling public. The member agency will notify MARC of any emergency changes made to OGL traffic signal timing plans in a timely manner and will work expeditiously with MARC to restore all OGL corridors within its jurisdiction to normal operation when the emergency subsides.

Field Communication Operation and Maintenance

MARC will be responsible for maintenance and replacement of all wireless communication infrastructure that is installed as a result of OGL initiated construction projects. Member agencies that have the capability to maintain their own communication infrastructure may do by separate agreement with MARC.

Controller Upgrades and Work inside the Traffic Controller Cabinet

MARC will, with the applicable member agencies, upgrade traffic controllers that are incapable of communicating with the central system software. When work is performed that involves the opening of a traffic controller cabinet, the member agency will coordinate with the contractor and have a representative in the field. The member agency will test and approve/disapprove the work performed by the contractor and inform MARC of the fact. MARC will be responsible for administration and final approval of all OGL initiated construction projects. Member agencies are responsible for notifying and coordinating with OGL when undertaking traffic signal system construction projects on OGL corridors.

Technical Support for OGL Computer Network

MARC will provide technical support for the central system software. MARC will also maintain the computer network hardware along with all network components such as network hubs, routers, modems etc.

The Traffic Operations Center

MARC will staff OGL operations at the Traffic Operations Center (TOC). The TOC is currently expected to be co-located with the KC Scout project.

The TOC will be staffed as determined by MARC. MARC expects to coordinate with Kansas City Scout and use the video monitoring capabilities available at the KC Scout TOC to alleviate congestion along arterials. It is recommended that member agencies with traffic management centers, at a minimum, staff their centers to operate on a schedule concurrent with OGL.

The staff will interact with citizens and the media and provide answers to traffic signal timing questions on OGL signals.

APPENDIX D5. SAMPLE PROJECT AGREEMENT: NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

INTERLOCAL COOPERATION AGREEMENT
Between
THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS
and
THE CITY OF CARROLLTON
for
IMPLEMENTATION OF THE THOROUGHFARE ASSESSMENT PROGRAM

WHEREAS, the North Central Texas Council of Governments (NCTCOG) has been designated as the Metropolitan Planning Organization for the Dallas-Fort Worth Metropolitan Area by the Governor of Texas in accordance with federal law; and,

WHEREAS, the Regional Transportation Council (RTC), comprised primarily of local elected officials, is the regional transportation policy body associated with NCTCOG and has been and continues to be a forum for cooperative decisions on transportation; and,

WHEREAS, it is the goal of the RTC to offer a transportation system that is accessible, integrated, efficient, and provides for a diverse and flexible set of transportation options; and,

WHEREAS, on October 9, 2003, the RTC approved funding for implementation of Phase 3 of the Thoroughfare Assessment Program in the Dallas-Fort Worth Metropolitan Area for the implementation of low-cost operational improvements at signalized intersections; and,

WHEREAS, the Interlocal Cooperation Act, Chapter 791 of the Texas Government Code provides authority for the North Central Texas Council of Governments, and the City of Carrollton to enter into this agreement for the provision of governmental functions and services of mutual interest.

NOW, THEREFORE, for and in consideration of the mutual covenants and conditions contained herein, the parties agree as follows:

1. Parties

1.1 This Interlocal Agreement, hereinafter referred to as the "Agreement", is made and entered into by and between the North Central Texas Council of Governments, hereinafter referred to as "NCTCOG", and the City of Carrollton, hereinafter referred to as the "City". NCTCOG and the City may each be referred to as a "Party", and may be collectively referred to as "Parties" to this agreement.

1.2 NCTCOG shall serve as the Contract Manager and Procurement Administrator for the Project.

2. Purpose

2.1 This Agreement defines the terms and conditions for the disbursement of Congestion Mitigation and Air Quality Improvement Program (CMAQ) and Surface Transportation Program-Metropolitan Mobility (STP-MM) funds and associated state and local

matching funds collected by NCTCOG for the implementation of traffic flow improvements.

2.2 Improvements under this Agreement, implemented through the Thoroughfare Assessment Program as authorized by the Regional Transportation Council, shall be employed at signalized intersections in the City of Carrollton.

2.3 Improvements shall be made to approximately 16 off-system locations and approximately 3 on-system locations under this Agreement.

3. Duties

3.1 NCTCOG shall be responsible for project monitoring; Geographical Information Systems (GIS) database integration; and air quality benefit calculations and documentation.

3.2 NCTCOG's engineering consultant(s) will provide signal-timing improvements at the intersection locations identified in Attachment A.

3.3 The consultant(s) will be responsible for the following: field data collection; development, implementation, and fine-tuning of new coordinated signal timing plans; and any and all required documentation of "Before" and "After" conditions.

3.4 The City will work with NCTCOG's engineering consultant(s) to identify relevant signal timing elements/requirements at and related to the project intersections; review the developed new signal timing plan(s); approve all timing plans prior to implementation; and assist with fine tuning.

3.5 Under a separate agreement between the City and the Texas Department of Transportation (TxDOT), the City shall implement in-house low-cost improvements as identified in Attachment A.

4. Funding

4.1 The total project cost estimate for this Agreement is $102,600. CMAQ and/or STP-MM programs will fund 80 percent of the project cost.

4.2 Attachment A includes a project cost estimate summary.

4.3 Under a separate agreement between TxDOT and NCTCOG, the Texas Department of Transportation will provide the 20 percent local match required for the three intersections located on the state highway system.

4.4 The City shall provide the 20 percent local match required for the off-system locations. The City shall provide a warrant check payable to the North Central Texas Council of Governments in the amount of $17,280.

4.5 The City shall remit additional local match payments to NCTCOG in the event that the actual cost of implementation of the Thoroughfare Assessment Program is greater than the estimated cost identified in this Agreement.

4.6 Upon completion of the project, any excess local match funds for off-system locations shall be reimbursed by NCTCOG to the City.

5. Term

5.1 This agreement shall take effect on the date executed by the Parties and shall remain in effect until it is terminated.

5.2 Either Party may terminate this Agreement by giving 30 days written notice to the other Party. The Parties may terminate this Agreement by mutual written concurrence.

5.3 This Agreement shall automatically terminate upon completion of the project.

6. Modification, Waiver and Severability

6.1 This Agreement and any exhibits, which may be attached, constitute the entire agreement among the Parties. No waiver or modification of this Agreement shall be valid unless in writing and signed by both Parties. Failure of the Parties to enforce or insist upon compliance with any of the terms and conditions of this Agreement shall not constitute a waiver or relinquishment of any such terms and conditions.

6.2 In the event that any one or more or the provisions of this Agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provisions thereof, and this Agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

6.3 This Agreement may be executed in any number of counterparts, each of which shall be deemed an original.

IN WITNESS HEREOF, the parties have executed this Agreement in duplicate originals on the _____ day of _____ 20____.

CITY OF CARROLLTON

_____
Signature

_____
Printed Name

_____
Title

ATTEST:

_____

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

_____
R. Michael Eastland
Executive Director

APPROVED AS TO FORM:

_____
General Counsel

APPENDIX D6. SAMPLE PROJECT AGREEMENT: SOUTHWESTERN PENNSYLVANIA COMMISSION (SPC) FOR SINC-UP PROJECTS

AGREEMENT FOR *PROJECT NAME* SINC-UP PROJECT
REGIONAL TRAFFIC SIGNAL PROGRAM
SOUTHWESTERN PENNSYLVANIA CORPORATION

THIS AGREEMENT is made by and between the Southwestern Pennsylvania Corporation ("SPC"),

And

the _____, a political subdivision in the County of _____, of the Commonwealth of Pennsylvania, acting through its proper officials ("MUNICIPALITY")

RECITALS:

WHEREAS, the SPC has initiated the Regional Traffic Signal Program consistent with the goals and objectives of the Region's 2035 Long Range Plan and the 2007 Regional Operations Plan; and

WHEREAS, the goals and objectives of the Regional Traffic Signal Program are to facilitate optimized traffic signal operations along key corridors in the region that will result in reduced congestion, improved safety, improved mobility, reduced vehicle stops, reduced fuel and energy consumption, reduced vehicle emissions, and reduced impacts to our environment; and

WHEREAS, SPC will enter into agreements and coordinate with local governments to implement signal retiming projects (Signals In Coordination or "SINC" projects-no construction) and signal equipment upgrade projects with retiming ('SINC-UP" projects-includes construction) in order to achieve the above goals and objectives; and

WHEREAS, SPC will be utilizing federal-aid Congestion Management Air Quality funding from the Federal Highway Administration ("FHWA") for the above named project; and

WHEREAS, SPC and the MUNICIPALITY has signified its willingness to participate in the Program by undertaking the improvements described in Paragraph 2(a) in accordance with the terms, conditions and provisions contained in this Agreement and the terms, conditions and provisions of the Reimbursement Agreement between the Pennsylvania Department of Transportation ("PENNDOT") and SPC attached as Exhibit "A".

NOW, THEREFORE, the parties, intending to be legally bound, agree to the following:

1. INCORPORATION BY REFERENCE
The recitals set forth above are incorporated by reference as a material part of this Agreement.

2. GENERAL CONDITIONS
SPC and the MUNICIPALITY shall participate in the preliminary engineering, final design, and construction of improvements (collectively, "Project") at the following locations in accordance with policies, procedures and specifications prepared or approved by the PENNDOT and the FHWA, where applicable.

Page 1 of 9

(a) *Project Name* Project ("Project")
Project Limits and Description of upgrades and retiming
____To be determined_____

(b) SPC and MUNICIPALITY shall participate in the administration of the Project in accordance with the provisions of this Agreement and more specifically with the most current version of PENNDOT Publication No. 39, *Procedures for the Administration of Municipal Projects*, incorporated into this Agreement as though physically attached to it.

(c) The Project Cost Estimate, attached to and made a part of this Agreement as Exhibit "B," sets forth the total cost for the Project which are $_____.

3. OBLIGATIONS

(a) The SPC, by contract with engineering consultant, shall complete the signal retiming study, design, and contract development, including preparation of all plans, specifications, estimates and bid proposal documents required to bid the Project. The signal retiming study and design shall be in accordance with policies, procedures and specifications prepared or approved by PENNDOT and the FHWA. If available, MUNICIPALITY shall provide SPC with any recent traffic data (traffic counts, accident records) that would facilitate completion of the signal retiming study and design.

(b) The SPC, by contract with engineering consultant, shall secure all necessary approvals, permits and licenses from all other governmental agencies as may be required to complete the Project. Unless otherwise determined by PENNDOT or FHWA, it is anticipated that all projects would be classified "Categorical Exclusion 1A, no Evaluation required". In addition, it is anticipated that only a revised traffic signal permit will be required to be issued for SINC-UP projects. This permit shall be signed by the MUNICIPALITY without delay and issued by PENNDOT after design approval.

(c) The SPC, upon completion of design phase, shall submit all required bid documents to PENNDOT and the MUNICPALITY for review and approval. By Agreement with SPC, PENNDOT shall prepare the bid proposal documents required to bid the Project and issue an authorization to advertise for bid. All bid documents shall require that the contractor be prequalified by the PENNDOT pursuant to 67 Pa. Code Chapter 457, *Prequalification of Bidders*.

(d) The SPC, by contract with a consulting firm, shall inspect and supervise adequately all construction work in accordance with the approved plans and specifications, including, but not limited to, the most current version of PENNDOT Publication No. 408, and its supplements and amendments. Periodic

progress meetings will be held as necessary between SPC, its contractors, and MUNICIPALITY representatives to discuss project progress, schedule, and budget and resolve any field issues.

(e) MUNICIPALITY shall provide 20% of total Project costs, an amount of ($_____) as local match funding prior to SPC commencing any work on the project. This amount shall be provided to SPC upon execution of this agreement.

(f) MUNICIPALITY agrees to provide SPC and its contractors unlimited access to the existing traffic signals and related equipment listed in Paragraph 2(a) during the duration of the Project. This access is required to perform the described signal improvements. MUNICIPALITY shall grant this access to SPC upon SPC's request, without delay.

(g) The Projects under the Regional Traffic Signal Program involve only signal retiming and minor traffic signal equipment upgrades. Projects involving known utility considerations will not be accepted into this Program. It is anticipated that the Project will not require relocation or adjustment of any existing utility facilities. In addition, Projects involving known right-of-way considerations will not be accepted into this Program. It is anticipated that the Project will not require new right-of-way acquisition. MUNICIPALITY shall also be responsible for any and all costs incurred in excess of those eligible for federal-aid participation including, but not limited to, the following:

(i) Time delays and extensions of time or termination of construction work caused by MUNICIPALITY;

(ii) Unforeseen right-of-way and other property damages and costs resulting from the acquisition or condemnation, or both, of lands for the Project or the construction of the improvements;

(iii) Unforeseen utility relocations costs;

(iv) Unforeseen costs for environmental litigation and reports; and

(v) All other unforeseen costs and expenses not included in the estimates of preliminary engineering, final design, utility relocation, right-of-way acquisition and construction costs, but which are directly related to or caused by the planning, design or construction of the Project.

(h) SPC will determine when the Project is completed and provide written Notification of Project Completion to MUNICIPALITY. Upon receiving the Notification of Project Completion from SPC, the MUNICIPALITY, at their sole cost and expense, shall own, operate and maintain all of the completed

improvements financed under this Agreement that fall under its jurisdiction. The MUNICIPALITY shall certify that it shall make available sufficient funds to provide for the described maintenance program. Exhibit "C," attached to and made a part of this Agreement, lists the minimum maintenance requirements that MUNICIPALITY must perform. This agreement does not supersede any existing maintenance agreements between PENNDOT and MUNICIPALITY. Also see Paragraph 4 below.

(i) The Project will include new signal timings per Paragraph 2(a) that will be implemented by SPC's contractor. Adjustments in signal timings may be made by SPC's contractor prior to completion of the Project to facilitate optimized operations. The MUNICIPALITY agrees that no further adjustments in signal timing will occur within one year after receipt of the Notification of Project Completion unless authorized by SPC.

4. MAINTENANCE AND OPERATION OF THE FACILITY

(a) This agreement does not supercede any existing maintenance agreements between PENNDOT and MUNICIPALITY. Any and all existing maintenance agreements between PENNDOT and MUNICIPALITY shall remain in effect. This agreement does not supercede any existing multi-municipal maintenance agreements. PENNDOT, in concurrence with the FHWA, when applicable, shall determine the existence of acceptable methods of operation and maintenance. These operation and maintenance services shall include, but not be limited to, the following:

(i) Periodic inspections;
(ii) Functional review of traffic operations;
(iii) Appropriate preventative maintenance, which shall include cleaning, lubrication and refurbishing of all electrical equipment;
(iv) A systematic record-keeping system; and
(v) A means to handle the notification and implementation of emergency repairs.

(b) The existence of functioning maintenance and operation services shall not exempt the MUNICIPALITY from complying with the provisions of the Vehicle Code (75 Pa. C.S. § 101 *et seq.)*, as amended, pertaining to traffic control devices, or with applicable provisions of the State Highway Law (36 P.S. § 670-101 *et seq.*), as amended.

(c) The MUNICIPALITY agrees that each party shall administer, enforce and maintain any statutes, regulations or ordinances within its jurisdiction necessary for the operation of the improvements. The parties further agree that the enforcement obligations relating to the regulations are governed by the statutes of the Commonwealth of Pennsylvania, and more particularly by those statutes relating to municipalities; the Vehicle Code, as amended; and the State Highway

Law, as amended; as well as those ordinances, rules and regulations issued by appropriate governmental agencies in implementation of these statutes.

(d) The MUNICIPALITY acknowledges that the traffic controls and parking regulations necessary to be maintained on these improvements are shown on Exhibit "D," attached to and made a part of this Agreement.

(e) MUNICIPALITY acknowledges that PENNDOT may disqualify the MUNICIPALITY from future federal-aid or state participation on MUNICIPALITY maintained projects if the MUNICIPALITY fails to:

(i) Provide for the proper maintenance and operation of the completed improvements; or

(ii) Maintain and enforce compliance with any statutes, regulations or ordinances under its jurisdiction necessary for the operation of the improvements.

(f) The MUNICIPALITY agrees that PENNDOT shall withhold federal-aid or state funds, or both, until one or both of the following (as applicable) have taken place:

(i) The MUNICIPALITY has corrected the operation and maintenance services.

(ii) The MUNICIPALITY has brought traffic operations on the improvements, including enforcement of statutes, regulations or ordinances, up to a level satisfactory to the PENNDOT.

5. ABANDONMENT OR POSTPONEMENT OF PROJECT

(a) If MUNICIPALITY abandons or indefinitely postpones the Project for any reason whatsoever, MUNICIPALITY may terminate this Agreement by sending to SPC a thirty- (30-) day written notice of termination. By sending the written notice of termination. MUNICIPALITY acknowledges that the SPC, PENNDOT, and FHWA will not participate in any costs of a project that is not completed and that the MUNICIPALITY must reimburse the SPC for all costs incurred by SPC, PENNDOT, and FHWA for the Project. The MUNICIPALITY shall reimburse SPC, within forty-five (45) days of receipt of a statement from the SPC, in an amount equal to the sum of all PENNDOT and FHWA funds received by SPC for return to PENNDOT and FHWA. Statement shall include information on any balance remaining after utilizing funds already received from MUNICIPALITY.

(b) If MUNICIPALITY fails to reimburse SPC within the time period set forth in subparagraph (a) above, MUNICIPALITY shall be in default pursuant to Paragraph 7 of this Agreement.

6. SAVE HARMLESS

The MUNICIPALITY shall indemnify, save harmless and defend (if requested) the SPC, FHWA (if applicable), the Commonwealth of Pennsylvania, PENNDOT, and all of their officers, agents and employees, from all suits, actions or claims of any character, name or description, relating to personal injury, including death, or property damage, arising out of the preliminary engineering, final design, right-of-way acquisition, utility relocation, construction, or operation of the Project improvements, by the SPC, its consultant(s) or contractor(s), their officers, agents and employees, whether the same be due to the use of defective materials, defective workmanship, neglect in safeguarding the work, or by or on account of any act, omission, neglect or misconduct of the SPC, its consultant(s) or contractor(s), their officers, agents and employees, during the performance of said work or thereafter, or to any other cause whatever.

7. DEFAULT CLAUSE

If the MUNICIPALITY fails to perform any of the terms, conditions or provisions of this Agreement, including, but not limited to, any default of payment for a period of forty-five (45) days, the MUNICIPALITY authorizes PENNDOT to withhold so much of the MUNICIPALITY's Liquid Fuels Tax Fund allocations as may be necessary to complete the Project or reimburse the SPC, PENNDOT and FHWA, in full for all costs due under this Agreement; and MUNICIPALITY authorizes the DEPARTMENT to withhold such amount and to apply such funds, or portion thereof, to remedy such default.

8. DISPUTE RESOLUTION

The parties agree to abide by the dispute resolution processes described in Exhibit "E".

9. FHWA APPROVAL

The parties agree that their responsibilities under this Agreement shall be made contingent upon the approval, prior to commencement of work, of the Project's eligibility for participation in federal funds to the extent of the proportionate share detailed in Exhibit "A," limited to the maximum dollar amount shown there; and, if this approval is not obtained, neither of the parties shall be further obligated by the terms of this Agreement.

10. REQUIRED CONTRACT PROVISION

The parties agree, and the SPC shall also provide in its contracts for the Project, that all designs, plans, specifications, estimates of cost, construction, utility relocation work, right-of-way acquisition procedures, acceptance of the work and procedures in general shall at all times

conform to all applicable federal and state laws, rules, regulations, orders and approvals, including specifically the procedures and requirements relating to labor standards, equal employment opportunity, non-discrimination, anti-solicitation, information, auditing and reporting provisions. The SPC shall comply, and shall cause its consultant(s) and contractor(s) to comply, with the conditions set forth in the *Federal Nondiscrimination and Equal Employment Opportunity Clause*, dated January 1976, and the *Commonwealth Nondiscrimination/Sexual Harassment Clause*, dated June 30, 1999, which are attached as Exhibits "F" and "G," respectively, and made a part of this Agreement. As used in these clauses, the term "Contractor" means SPC.

11. CONTRACTOR INTEGRITY PROVISIONS

The SPC shall comply, and shall cause its consultant(s) and contractor(s) to comply, with the *Contractor Integrity Provisions*, dated December 20, 1991, which are attached as Exhibit "H" and made a part of this Agreement. As used in these provisions, the term "Contractor" means the SPC.

12. TERMINATION OF AGREEMENT FOR LACK OF FUNDS

The SPC may terminate this Agreement if the SPC does not receive the necessary federal or state funds allocated for the purpose stated in this Agreement. Termination shall become effective as of the termination date specified in PENNDOT's written notice of termination to the SPC specifying the reason for termination. To the extent that SPC is reimbursed by PENNDOT, SPC shall reimburse MUNICIPALITY the local share amount shown in paragraph 3(e) within sixty (60) days of PENNDOT's written notice of termination.

13. EFFECTIVE DATE

This Agreement will not be effective until it has been executed by all necessary SPC officials as required by law. This Agreement shall remain in effect until the Project is abandoned or completed, whichever occurs first.

IN WITNESS WHEREOF, the parties have executed this Agreement the date first above written.

ATTEST: MUNICIPALITY*

_____ BY _____

Title: Date Title Date

ATTEST: MUNICIPALITY*

_____ BY _____

Title: Date Title Date

ATTEST: MUNICIPALITY*

_____ BY _____

Title: Date Title Date

ATTEST: MUNICIPALITY*

_____ BY _____

Title: Date Title Date

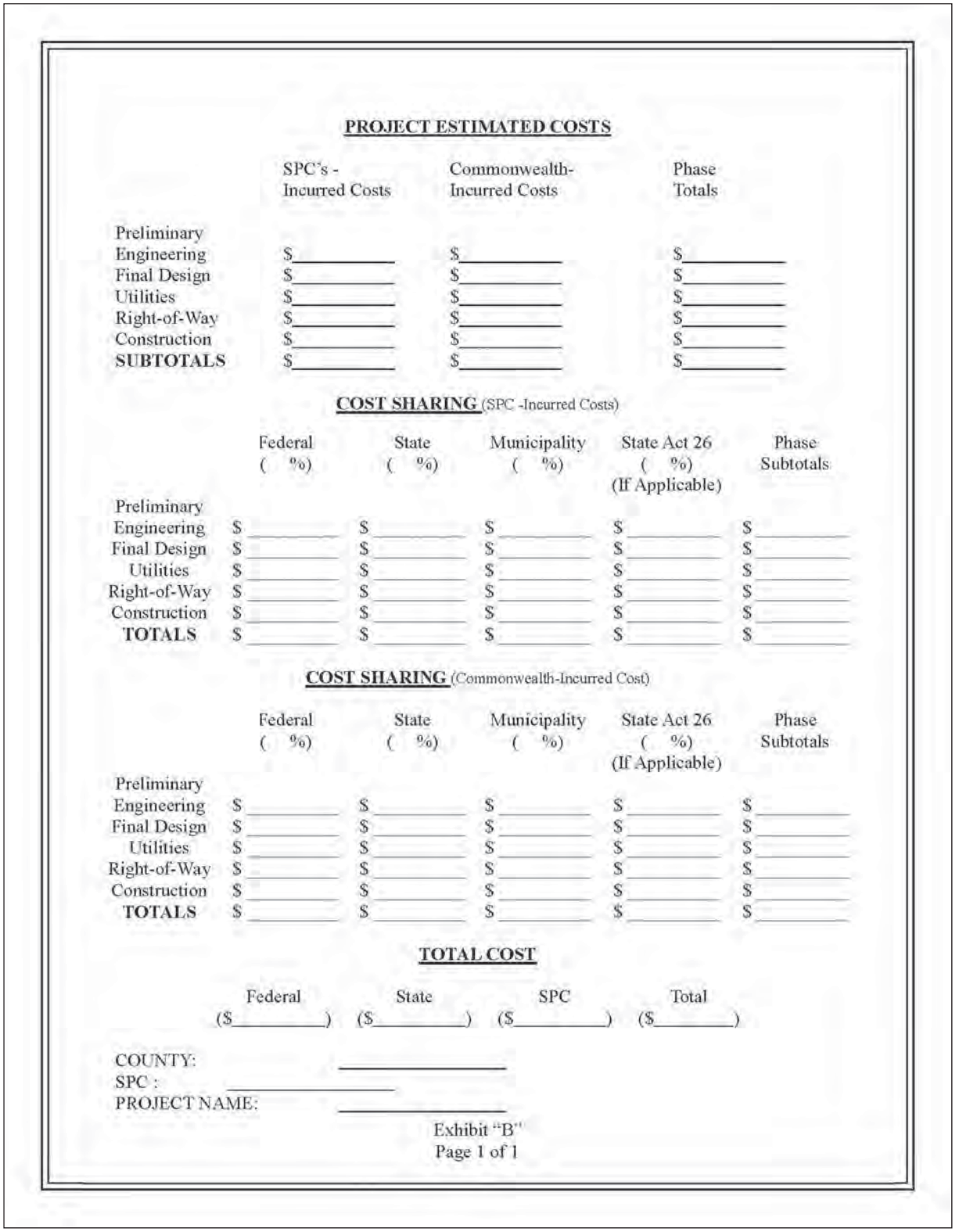
ATTEST: Southwestern Pennsylvania Corporation*

_____ BY _____

Title: Date Title Date

***MUNICIPALITY's resolution authorizing execution and attestation must accompany this Agreement; please indicate the signers' titles in the blanks provided and date all signatures.**

APPENDIX A-REIMBURSEMENT AGREEMENT BETWEEN COMMONWEALTH OF PA AND SOUTHWESTERN PENNSYLVANIA CORPORATION



PROJECT ESTIMATED COSTS

	SPC's - Incurred Costs	Commonwealth-Incurred Costs	Phase Totals
Preliminary Engineering	$_____	$_____	$_____
Final Design	$_____	$_____	$_____
Utilities	$_____	$_____	$_____
Right-of-Way	$_____	$_____	$_____
Construction	$_____	$_____	$_____
SUBTOTALS	$_____	$_____	$_____

COST SHARING (SPC -Incurred Costs)

	Federal (%)	State (%)	Municipality (%)	State Act 26 (%) (If Applicable)	Phase Subtotals
Preliminary Engineering	$_____	$_____	$_____	$_____	$_____
Final Design	$_____	$_____	$_____	$_____	$_____
Utilities	$_____	$_____	$_____	$_____	$_____
Right-of-Way	$_____	$_____	$_____	$_____	$_____
Construction	$_____	$_____	$_____	$_____	$_____
TOTALS	$_____	$_____	$_____	$_____	$_____

COST SHARING (Commonwealth-Incurred Cost)

	Federal (%)	State (%)	Municipality (%)	State Act 26 (%) (If Applicable)	Phase Subtotals
Preliminary Engineering	$_____	$_____	$_____	$_____	$_____
Final Design	$_____	$_____	$_____	$_____	$_____
Utilities	$_____	$_____	$_____	$_____	$_____
Right-of-Way	$_____	$_____	$_____	$_____	$_____
Construction	$_____	$_____	$_____	$_____	$_____
TOTALS	$_____	$_____	$_____	$_____	$_____

TOTAL COST

Federal	State	SPC	Total
($_____)	($_____)	($_____)	($_____)

COUNTY: _____
SPC : _____
PROJECT NAME: _____

Exhibit "B"
Page 1 of 1

GUIDELINES TO PREPARING
MUNICIPAL METHOD OF
MAINTENANCE OPERATION AND SERVICES

1. The MUNICIPALITY must provide for the proper maintenance of all completed projects under its jurisdiction. To comply with this federal requirement, the MUNICIPALITY shall establish or maintain a functional traffic engineering unit throughout the design life of all projects.

2. A functional traffic engineering unit consists of, at a minimum:

   (a) A competent and qualified traffic engineer; and

   (b) A maintenance staff with at least one licensed electrician skilled in the operation and repair of traffic signal equipment.

3. To be considered capable of effectively maintaining completed projects, the MUNICIPALITY'S maintenance staff must be provided with the proper equipment and materials necessary, at a minimum, to:

   (a) Repair and replace worn out or damaged signal equipment;

   (b) Install new and replace damaged or obsolete traffic signs; and

   (c) Install or replace paint and thermoplastic pavement markings.

4. The MUNICIPALITY should evaluate its present and proposed organizational charts to determine if the MUNICIPALITY is capable of providing a functional traffic engineering unit within its government. Guidelines for considering the inclusion of a functional traffic engineering unit have been published by the Institute of Traffic Engineers ("ITE"), and should be reviewed by MUNICIPALITY in evaluating their organizational chart. The ITE guidelines make reference to the Model Traffic Ordinance (*Uniform Vehicle Code and Model Traffic Ordinance*, published by the National Committee on Uniform Traffic Laws and Ordinances) as being the best method of providing the legal basis for establishing a traffic engineering function.

5. If the MUNICIPALITY is unwilling or unable to provide the traffic engineering function from within its organization, the MUNICIPALITY has the option of contracting with an outside agent or agency for the required traffic engineering expertise and maintenance.

Exhibit "C"
1 of 3

6. Functional Traffic Engineering Unit Method.

(a) In preparing to comply with this Exhibit, the MUNICIPALITY must select one of the following methods for providing a functional traffic engineering unit:

(i) Municipal Traffic Engineer and Municipal Maintenance Staff;

(ii) Contractual Traffic Engineer and Municipal Maintenance Staff;

(iii) Contractual Traffic Engineer and Contractual Maintenance Staff; and

(iv) Municipal Traffic Engineer and Contractual Maintenance Staff.

(b) Depending on which method is chosen, the guidelines for the functional traffic engineering unit shall include, but not be limited to, the following:

(i) **Municipal Traffic Engineer**:

(1) A brief description of educational background and work experience, including length of employment as Municipal Traffic Engineer;

(2) A description of duties assigned and powers delegated to the Municipal Traffic Engineer under municipal ordinance; and

(3) A municipal organizational chart showing the Traffic Engineer's position in the hierarchy of municipal government.

(ii) **Municipal Maintenance Staff**:

(1) The number of employees permanently assigned to this function and the number which may be assigned on a temporary basis;

(2) A brief description of the organization of the staff, including the length of time that it has been in existence; and

(1) A clear demonstration of the maintenance staff's ability to properly maintain and repair traffic signal equipment.

Exhibit "C"
2 of 3

(iii) **Contractual Traffic Engineer**:

(1) The MUNICIPALITY's assurance that the Contractual Traffic Engineer hired is qualified and competent in all aspects of traffic engineering; and

(2) It will not be necessary to include the name and professional background of the individual or organization.

(iv) **Contractual Maintenance Staff**:

(1) A brief description of the organization to be hired, including a history of its experience in this field;

(2) The MUNICIPALITY's assurance that the organization is capable of properly maintaining and repairing traffic signal equipment and that it has adequate staff available in case of emergency.

Exhibit "C"
3 of 3

Required Traffic Controls and Parking Regulations

1. The traffic controls and parking regulations necessary to be maintained on each project must be clearly outlined by PENNDOT and SPC and agreed upon by MUNICIPALITY prior to physical construction.

2. The MUNICIPALITY agrees to maintain and enforce the traffic controls and parking regulations set forth below and to adopt any resolutions necessary for the accomplishment of the same. If MUNICIPALITY fails to provide a functional traffic engineering unit within its own organization, it is understood that prior COMMONWEALTH or FHWA approval will be required for changes to the controls and regulations listed. Prior approval will not be required for the following:

   (a) Expansion of the time restriction for "No Parking" beyond that which is specified; and

   (b) Erection of warning sign, painted crosswalks and other traffic control devices not specified below as long as they conform to the requirements in the 1971 edition of the Manual on Uniform Traffic Control Devices and do not require the Secretary's approval as specified in the Vehicle Code.

3. The traffic controls and parking regulations that must be maintained by the MUNICIPALITY are as follows:

(See attached for format)

Exhibit "D"
Page 1 of 2

PROJECT LIMITS	PARKING RESTRICTIONS (use station numbers if feasible)	LOADING RESTRICTIONS	BUS STOP LOCATIONS	TURN PROHIBITION	Signalized Intersection (specify #. of phases and of operation)

Exhibit "D"
2 of 2

DISPUTE RESOLUTION

MEDIATION

The parties may elect to resolve their disputes by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Agreement and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration or the institution of legal or equitable proceedings but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

ARBITRATION

All controversies, claims, disputes or other matters in question between the parties to this Agreement arising out of or relating to this Agreement or breach thereof, including, but not limited to, Claims in contract, tort and/or equity, shall be subject to and decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association. Any claim arising out of or related to the Agreement. Prior to arbitration, the parties may endeavor to resolve disputes by mediation.

Arbitration shall be commenced within the time limits when institution of legal or equitable proceedings based on such claims would be barred by the applicable statute of limitations.

Arbitration arising out of or relating to this Agreement shall include, by consolidation, joinder, or joint filing, any additional person or entity not a party to this Agreement to the extent necessary to the final resolution of the matter in controversy. MUNICIPALITY shall include a similar arbitration, litigation and consolidation provision in all Subcontractor, Material and Supplier Agreements. The agreement to arbitrate as contained and specified herein as well as any agreement to arbitrate with any additional persons duly consented to by the parties to this Agreement shall be specifically enforceable under the laws of the Commonwealth of Pennsylvania.

Judgment on Final Award: Any award rendered by the arbitrator(s) shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof. Unless otherwise agreed by the parties, the exclusive locale for settlement and/or resolution of any and all claims, controversies or disputes arising out of or related to this Agreement or any breach thereof shall be Allegheny County, Pennsylvania.

Exhibit "E"
1 of 1

FEDERAL NONDISCRIMINATION AND EQUAL EMPLOYMENT OPPORTUNITY CLAUSES (All Federal Aid Contracts)* (1-76)

1. **Selection of Labor:** During the performance of this contract, the contractor shall not discriminate against labor from any other State, possession or territory of the United States.

2. **Employment Practices:** During the performance of this contract, the contractor agrees as follows:

   a. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notice to be provided by the State highway department setting forth the provisions of this nondiscrimination clause.

   b. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

   c. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the State highway department advising the said labor union or workers' representative of the contractors commitments under section 2 and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

   d. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations (41 CFR, Part 60) and relevant orders of the Secretary of Labor.

   e. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the Federal Highway Administration and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

   f. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations or orders, this contract may be canceled, terminated or suspended in whole or part and the contractor may be declared ineligible for further Government contracts or Federally-assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

   g. The contractor will include the provisions of Section 2 in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the State highway department or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with litigation with a subcontractor or vendor as a result of such direction by the Federal Highway

Exhibit "F"
1 of 2

Administration, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

3. **Selection of Subcontractors, Procurement of Materials, and Leasing of Equipment:** During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in federally-assisted programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations) which are herein incorporated by reference and made a part of this contract.

b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, sex or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in the Regulations.

c. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontract or supplier shall be notified by the contract of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, sex or national origin.

d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information and its facilities as may be determined by the State highway department or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the State highway department, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the State highway department shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:

(1) withholding of payments to the contractor under the contract until the contractor complies, and/or
(2) cancellation, termination or suspension of the contract, in whole or in part.

f. Incorporation of Provisions: The contractor shall include the provisions of this paragraph 3 in every subcontract, including procurements of materials and leases of equipment, unless except by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontractor or procurement as the State highway department or the Federal Highway Administration my direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the State highway department or enter into such litigation to protect the interest of the State, and , in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

Wherever hereinabove the word "contractor" is used, it shall also include the word engineer, consultant, researcher, or other entity (governmental, corporate, or otherwise), its successors and assigns as may be appropriate.

*Not to be used if otherwise included in Construction or Appalachian Contract Provisions.

Exhibit "F"
2 of 2

June 30, 1999

COMMONWEALTH NONDISCRIMINATION/SEXUAL HARASSMENT CLAUSE

Each contract entered into by a governmental agency shall contain the following provisions by which the contractor agrees:

1. In the hiring of any employees(s) for the manufacture of supplies, performance of work, or any other activity required under the contract or any subcontract, the contractor, subcontractor, or any person acting on behalf of the contractor or subcontractor shall not, by reason of gender, race, creed, or color, discriminate against any citizen of this Commonwealth who is qualified and available to perform the work to which the employment relates.

2. Neither the contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate against or intimidate any employee involved in the manufacture of supplies, the performance of work, or any other activity required under the contract on account of gender, race, creed, or color.

3. Contractors and subcontractors establish and maintain a written sexual harassment policy and shall inform their employees of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined.

4. Contractors shall not discriminate by reason of gender, race, creed, or color against any subcontractor or supplier who is qualified to perform the work to which the contracts relates.

5. The contractor and each subcontractor shall furnish all necessary employment documents and records to and permit access to their books, records, and accounts by the contracting agency and the Bureau of Contract Administration and Business Development, for purposes of investigations, to ascertain compliance with provisions of this Nondiscrimination/Sexual Harassment Clause. If the contractor or any subcontractor does not possess documents or records reflecting the necessary information requested, the contractor or subcontractor shall furnish such information on reporting forms supplied by the contracting agency or the Bureau of Contract Administration and Business Development.

6. The contractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subcontractor so that such provisions will be binding upon each subcontractor.

7. The Commonwealth may cancel or terminate the contract and all money due or to become due under the contract may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the agency may proceed with debarment or suspension and may place the contractor in the Contractor Responsibility File.

APPENDIX D7. SAMPLE PROJECT AGREEMENT: LOS ANGELES COUNTY—TRAFFIC SIGNAL TIMING ONLY

AGREEMENT

This AGREEMENT, made and entered into by and between the CITY OF LYNWOOD, a municipal corporation in the County of Los Angeles, hereinafter referred to as CITY, and the COUNTY OF LOS ANGELES, a political subdivision of the State of California, hereinafter referred to as COUNTY:

WITNESSETH

WHEREAS, Long Beach Boulevard from Tweedy Boulevard to Orchard Avenue, Imperial Highway from Mona Boulevard to Atlantic Avenue, and Atlantic Avenue from Abbott Road Mcmillan Street, hereinafter referred to as ARTERIALS, are roadways that are or will soon become a part of the County's Traffic Signal Synchronization Program (hereinafter referred to as TSSP); and

WHEREAS, CITY and COUNTY are each responsible for their jurisdictional portion of the operation and maintenance of the traffic signals and signal systems along each of the ARTERIALS;

WHEREAS, CITY and COUNTY have previously cooperated, in carrying out traffic signal synchronization projects on ARTERIALS; and

WHEREAS, COUNTY and CITY desire to memorialize their understanding regarding their relative rights, obligations, and duties with respect to the TSSP.

NOW, THEREFORE, in consideration of the mutual benefits to be derived by CITY and COUNTY and of the promises herein contained, it is hereby agreed as follows:

(1) CITY AGREES:

a. Nothing in this AGREEMENT shall be construed as changing the role of CITY in operating and maintaining the traffic signals within CITY's jurisdiction.

b. To be responsible for maintaining the basic traffic signal timing for the intersections within the jurisdictional boundary of CITY.

c. To maintain the traffic signal coordination timing along ARTERIALS to promote coordinated traffic operations, multi jurisdictional cooperation and improve arterial traffic conditions and to make the COUNTY aware of any changes implemented to the coordination timing that may impact the coordination of the traffic signals along the ARTERIALS.

d. To accept full and complete ownership of, responsibility for, and to maintain in good condition and at CITY expense all improvements constructed through individual TSSP Projects within CITY'S JURISDICTION, including the timing of traffic signals on ARTERIALS that supports coordination timing and

optimum synchronization of traffic signals on ARTERIALS.

e. To cooperate with COUNTY and provide requested information in a reasonable and timely fashion in connection with COUNTY'S preparation of an annual report for the MTA as referred to in Paragraph (2)c. below.

(2) COUNTY AGREES:

a. Nothing in this AGREEMENT shall be construed as changing the role of COUNTY in operating and maintaining the traffic signals and signal systems within CITY'S jurisdiction.

b. As a part of construction of individual TSSP Projects, to develop and implement the traffic signal coordination timing along the ARTERIALS that will improve arterial traffic conditions and traffic flow thereby saving motorists time and improving air quality.

c. To file routine reports with the MTA on the efficiency of these Traffic Signal Synchronization Projects by compiling an operational status from individual cities along the ARTERIALS.

(3) IT IS MUTUALLY UNDERSTOOD AND AGREED AS FOLLOWS:

a. This AGREEMENT does not constitute any financial commitment between the CITY and COUNTY.

b. The term of this AGREEMENT shall commence on the date it is approved by the Board of Supervisors and shall continue until any party terminates it upon thirty (30) days prior written notice.

c. Any correspondence, communication, or contact concerning this AGREEMENT shall be directed to the following:

CITY:

COUNTY: Mr. William Winter
Assistant Deputy Director
Traffic and Lighting Division
County of Los Angeles, Department of Public Works
P.O. Box 1460
Alhambra, CA 91802-1460

d. Neither COUNTY nor any officer or employee of COUNTY shall be responsible for any damage or liability occurring by reason of any act or omission on the part of CITY under or in connection with any work, authority, or jurisdiction delegated to, assumed by, or determined to be the responsibility of CITY under this AGREEMENT. It is also understood and agreed that, pursuant to Government Code, Section 895.4, CITY shall fully indemnify, defend, and hold COUNTY harmless from any liability imposed for injury (as defined by Government Code, Section 810.8) occurring by reason of any act or omission on the part of CITY under or in connection with any work, authority, or jurisdiction delegated to or determined to be the responsibility of CITY under this AGREEMENT.

e. Neither CITY nor any officer or employee of CITY shall be responsible for any damage or liability occurring by reason of any act or omission on the part of COUNTY under or in connection with any work, authority, or jurisdiction delegated to or determined to be the responsibility of COUNTY under this AGREEMENT. It is also understood and agreed that, pursuant to Government Code, Section 895.4, COUNTY shall fully indemnify, defend, and hold CITY harmless from any liability imposed for injury (as defined by Government Code, Section 810.8) occurring by reason of any act or omission on the part of COUNTY under or in connection with any work, authority, or jurisdiction delegated to or determined to be the responsibility of COUNTY under this AGREEMENT.

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IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by the CITY OF LYNWOOD on_____, 2007, and by the COUNTY OF LOS ANGELES on _____, 2007.

ATTEST:

COUNTY OF LOS ANGELES

By_____
Director of Public Works

APPROVED AS TO FORM

RAYMOND G. FORTNER, JR.
County Counsel

By_____
Deputy

CITY OF LYNWOOD

By_____
City Manager

ATTEST:

By_____
City Clerk

By_____
City Attorney

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APPENDIX D8. SAMPLE PROJECT AGREEMENT: LOS ANGELES COUNTY—CENTRAL MONITORING

AGREEMENT

This AGREEMENT is made and entered into by and between the CITY OF EL MONTE, a municipal corporation in the County of Los Angeles (hereinafter referred to as CITY) and the COUNTY OF LOS ANGELES, a political subdivision of the State of California (hereinafter referred to as COUNTY):

WITNESSETH

WHEREAS, on October 19, 2004, COUNTY entered into an agreement with Kimley-Horn and Associates, Inc. for the procurement of a traffic control system; and

WHEREAS, the traffic control system is known as the Kimley Horn Integrated Transportation System (herein after referred to as KITS); and

WHEREAS, CITY has indicated their desire to connect their traffic signals to the COUNTY's KITS; and

WHEREAS, on September 18, 2007, COUNTY executed an amendment with Systems Analysis & Integration, Inc. for the expansion of a wireless communication system (herein after referred to as "WIRELESS COMMUNICATION"); and

WHEREAS, COUNTY's agreement for WIRELESS COMMUNICATION includes a provision for placement at specified CITY TRAFFIC SIGNALS as denoted in Attachment A; and

WHEREAS, use of KITS requires that a communication link be established between a remote location and the CITY's traffic signals listed in Attachment A (herein after referred to as CITY TRAFFIC SIGNALS); and

WHEREAS, a KITS workstation is required in order for CITY to monitor and control their TRAFFIC SIGNALS from a remote location (herein after referred to as "WORKSTATION");

WHEREAS, basic traffic signal timing involves the timing parameters for the general operation of a traffic signal, which typically include, but is not limited to, defining the phases, attributes and timing values for each permitted phase, pedestrian movement and assigning detection;

WHEREAS, coordination traffic signal timing involves the timing parameters that allow multiple traffic signals to be synchronized with each other, which typically include defining coordination cycle lengths, offsets and time of day operations for each traffic signal coordination plan: and,

WHEREAS, COUNTY has developed LACO-4E traffic signal controller firmware to enable basic and coordination timing for traffic signals connected to KITS: and;

WHEREAS, COUNTY will upgrade traffic signal controllers as necessary and install LACO-4E at CITY TRAFFIC SIGNALS listed in Attachment A; and

WHEREAS, COUNTY and CITY desire to memorialize their understanding regarding their relative rights, obligations, and duties with respect to connecting CITY TRAFFIC SIGNALS to KITS.

NOW, THEREFORE, in consideration of the mutual benefits to be derived by COUNTY and CITY and of the promises herein contained, it is hereby agreed as follows:

(1) COUNTY AGREES:

a. To convert and install LACO4-E basic and coordination traffic signal timing at CITY TRAFFIC SIGNALS to enable operations with KITS, at no cost to CITY;

b. To install WIRELESS COMMUNICATION at CITY TRAFFIC SIGNALS at no cost to CITY, unless another form of communication is denoted on Attachment A;

c. To install WORKSTATION in CITY for their use to monitor and control CITY TRAFFIC SIGNALS, with the installation to be completed at no cost to CITY;

d. To not alter basic or coordination traffic signal timing at CITY TRAFFIC SIGNALS without prior approval from CITY. In the event that COUNTY alters basic or coordination traffic signal timing at CITY TRAFFIC SIGNALS following prior approval by the CITY, COUNTY shall provide CITY with updated traffic signal timing sheets reflecting the changes made. If CITY believes COUNTY improperly or negligently altered basic or coordination traffic signal timing at CITY TRAFFIC SIGNALS, CITY shall notify COUNTY in writing within 30 days of the completion of COUNTY's work on the CITY TRAFFIC SIGNALS. Should CITY fail to so notify COUNTY, CITY shall be deemed to have accepted and approved the timing alterations performed by COUNTY.

e. Subsequent to CITY's approval in 1 (d). above, and upon receipt of a Service Request from CITY pursuant to the terms and conditions of the County/City General Service Agreement no. 74938, to review, observe, and if necessary, recommend revisions to and/or modify basic and/or coordination traffic signal timing at CITY TRAFFIC SIGNALS. Upon approval from CITY, to download basic and/or coordination traffic signal timing at CITY TRAFFIC SIGNALS from COUNTY's KITS workstation to improve traffic signal operations. If revisions are required, COUNTY will provide CITY with updated traffic signal timing sheets to enable CITY to maintain a current copy.

(2) CITY AGREES:

a. To be solely responsible for maintaining the basic and coordination traffic signal timing for CITY TRAFFIC SIGNALS to promote coordinated traffic operations, multi jurisdictional cooperation, and improve arterial traffic conditions;

b. To inform the COUNTY of any changes implemented to the basic and coordination timing that may impact the coordination of CITY TRAFFIC SIGNALS;

c. If CITY believes COUNTY improperly or negligently revised CITY TRAFFIC SIGNALS pursuant to section 1(d) hereinabove, CITY shall notify COUNTY in writing within 30 days of the completion of COUNTY's work on the CITY TRAFFIC SIGNALS. Should CITY fail to so notify COUNTY, CITY shall be deemed to have accepted and approved the timing revisions performed by COUNTY;

d. To inform the COUNTY of new traffic signal installations and any traffic signal modifications which would affect coordination timing;

e. To accept full and complete ownership of, responsibility for, and to maintain in good condition and at CITY expense WORKSTATION and WIRELESS COMMUNICATION (or other communication if denoted on Attachment A) that is installed at CITY TRAFFIC SIGNALS;

f. If requested by the COUNTY, to issue a Service Request pursuant to the terms and conditions of the County/City General Service Agreement no. 74938, pursuant to which the CITY will reimburse the COUNTY for the annual costs incurred by COUNTY to operate and maintain CITY TRAFFIC SIGNALS on the COUNTY's KITS system. Said cost is currently estimated to be $2,000 per year;

g. If CITY desires COUNTY to observe, recommend revisions to, and/or modify the traffic signal timing at CITY TRAFFIC SIGNALS, to submit to COUNTY a Service Request pursuant to the terms and conditions of the County/City General Service Agreement no. 74938;

h. To ensure the traffic signal timing sheets located in the cabinet for CITY TRAFFIC SIGNALS at each intersection contain the most recently installed version of the traffic signal timing and accurately reflect all changes made to CITY TRAFFIC SIGNALS;

i. To allow COUNTY to monitor the operation of CITY TRAFFIC SIGNALS.

(3) IT IS MUTUALLY UNDERSTOOD AND AGREED AS FOLLOWS:

a. The terms and provisions of Agreement No. 74938 regarding the COUNTY and CITY's roles and responsibilities in carrying out traffic signal synchronization projects shall remain in full force and effect.

b. Nothing in this AGREEMENT shall be construed as changing the role of CITY in operating and maintaining CITY TRAFFIC SIGNALS.

c. CITY shall be solely responsible for detecting and correcting malfunctions of CITY TRAFFIC SIGNALS and COUNTY shall not be required to notify CITY of or correct any traffic signal malfunctions detected by KITS.

d. The term of this AGREEMENT shall commence on the date it is approved by the Board of Supervisors and shall continue until any party terminates it upon thirty (30) days prior written notice.

e. Any correspondence, communication, or contact concerning this AGREEMENT shall be directed to the following:

CITY:

COUNTY: Mr. William J. Winter
Assistant Deputy Director
Traffic and Lighting Division
County of Los Angeles, Department of Public Works
P.O. Box 1460
Alhambra, CA 91802-1460

f. COUNTY and CITY acknowledge and recognize that the improvements contemplated by this AGREEMENT provide significant regional and local benefits with respect to reducing traffic congestion. COUNTY and CITY further acknowledge and recognize that the cost of defending claims and lawsuit arising from the improvements contemplated by this AGREEMENT is paid for by public monies and both parties share an interest in reducing the amount of public monies spent on defending claims and lawsuits where possible without prejudicing their respective defenses.

g. In the event that a claim or lawsuit is brought against COUNTY and CITY based on the allegation that the design, construction, maintenance, or operation of the improvements constructed under this AGREEMENT proximately caused injuries or damage, COUNTY and CITY agree to cooperate as much as possible with respect to defending the claim or lawsuit without causing prejudice to their respective defenses to the claim or lawsuit. Upon receipt of the claim or lawsuit, the COUNTY and CITY, through their respective agents if appropriate, shall promptly investigate the matter. COUNTY and CITY shall then meet and confer promptly regarding whether a joint defense is appropriate or if one party should tender its defense and indemnification to the other party.

h. In the event that COUNTY and CITY cannot agree regarding a joint defense or a tender of defense and indemnification, COUNTY and CITY agree to meet and confer promptly with respect to 1) entering into a tolling agreement with respect to any claims they may have against each other, and 2) submitting to mediation regarding any claims they may have against each other, which mediation will take place before a third party neutral selected by a fair process. COUNTY and CITY agree to meet and confer as set forth in the preceding sentence prior to presenting claims or filing cross-complaints for indemnity against each other. COUNTY and CITY agree to toll all applicable statutes of limitations for a reasonable period of time if necessary for COUNTY and CITY to meet and confer prior to the time to present a claim or file a cross-complaint for indemnity.

i. Neither COUNTY nor any officer or employee of COUNTY shall be responsible for any damage or liability occurring by reason of any act or omission on the part of CITY under or in connection with any work, authority, or jurisdiction delegated to, assumed by, or determined to be the responsibility of CITY under this AGREEMENT. It is also understood and agreed that, pursuant to Government Code, Section 895.4, CITY shall fully indemnify, defend, and hold COUNTY harmless from any liability imposed for injury (as defined by Government Code, Section 810.8) occurring by reason of any act or omission on the part of CITY under or in connection with any work, authority, or jurisdiction delegated to or determined to be the responsibility of CITY under this AGREEMENT. Where liability for injury (as defined by Government Code, Section 810.8) is sought to be imposed under Section 830, et seq., of the Government Code for a dangerous condition of property owned by or under the control of CITY, CITY shall fully defend, indemnify, and hold COUNTY harmless from any and all liability arising from such dangerous condition.

j. Neither CITY nor any officer or employee of CITY shall be responsible for any damage or liability occurring by reason of any act or omission on the part of COUNTY under or in connection with any work, authority, or jurisdiction delegated to or determined to be the responsibility of COUNTY under this AGREEMENT. It is also understood and agreed that, pursuant to Government Code, Section 895.4, COUNTY shall fully indemnify, defend, and hold CITY harmless from any liability imposed for injury (as defined by Government Code, Section 810.8) occurring by reason of any act or omission on the part of COUNTY under or in connection with any work, authority, or jurisdiction delegated to or determined to be the responsibility of COUNTY under this AGREEMENT.

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IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by the CITY OF EL MONTE on_____, 2009, and by the COUNTY OF LOS ANGELES on _____, 2009.

ATTEST:

COUNTY OF LOS ANGELES

By_____
Director of Public Works

APPROVED AS TO FORM:

RAYMOND G. FORTNER, JR.
County Counsel

By_____
Deputy

CITY OF EL MONTE

By_____
City Manager

ATTEST:

By_____
City Clerk

By_____
City Attorney

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ATTACHMENT A

CITY OF EL MONTE
City Hall: 11333 Valley Boulevard, 91732
Central System Location: 900 South Fremont Ave, Alhambra, 91803

Number	Arterial Street Name	Cross Street Name
1	Garvey Ave.	Central Ave.
2	Garvey Ave.	Chico Ave.
3	Garvey Ave.	Durfee Ave.
4	Garvey Ave.	Lashbrook Ave.
5	Garvey Ave.	Lexington Ave.
6	Garvey Ave.	Meeker Ave.
7	Garvey Ave.	Merced Ave.
8	Garvey Ave.	Mountain View Rd.
9	Garvey Ave.	Peck Rd.
10	Garvey Ave.	Potrero Ave.
11	Garvey Ave.	Santa Anita Ave.
12	Garvey Ave.	Tyler Ave.
13	Garvey Ave.	Valley Blvd.
14	Peck Rd.	Alloway St.
15	Peck Rd.	Bryant Rd.
16	Peck Rd.	Emery St.
17	Peck Rd.	Federal Dr.
18	Peck Rd.	Forest Grove St.
19	Peck Rd.	Hemlock St.
20	Peck Rd.	Lambert Ave.
21	Peck Rd.	Lower Azusa Rd.
22	Peck Rd.	Meeker Ave.
23	Peck Rd.	Ramona Blvd.
24	Peck Rd.	Stewart St.
25	Peck Rd.	Valley Blvd.
26	Ramona Blvd.	Cogswell Rd.
27	Ramona Blvd.	Gilman Rd.
28	Ramona Blvd.	La Madera Ave.
29	Ramona Blvd.	Maxson Rd.
30	Santa Anita Ave.	Amador St.
31	Santa Anita Ave.	Asher St.
32	Santa Anita Ave.	Bodger St.
33	Santa Anita Ave.	Bryant Rd.
34	Santa Anita Ave.	Kings Row
35	Santa Anita Ave.	Lower Azusa Rd.
36	Santa Anita Ave.	Mildred St.
37	Santa Anita Ave.	Mulhall St.
38	Santa Anita Ave.	Ramona Blvd.
39	Santa Anita Ave.	Tyler Ave.
40	Santa Anita Ave.	West Hondo Pkwy.

41	Tyler Ave.	Valley Blvd.
42	Valley Blvd.	Arden Dr.
43	Valley Blvd.	Baldwin Ave.
44	Valley Blvd.	Between Arden Dr. & Santa Anita Ave.
45	Valley Blvd.	Center Ave.
46	Valley Blvd.	Durfee Ave.
47	Valley Blvd.	Gibson Rd.
48	Valley Blvd.	Mountain View Rd.
49	Valley Blvd.	Ramona Blvd.
50	Valley Blvd.	Santa Anita Ave.

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APPENDIX D9. SAMPLE PROJECT AGREEMENT: ORANGE COUNTY—COUNTY AS LEAD

MODEL AGREEMENT – OPTION 1

(LOCAL AGENCIES LEAD)

AGREEMENT _____

BETWEEN

ORANGE COUNTY TRANSPORTATION AUTHORITY

AND

THE CITIES OF _____

AND

THE COUNTY OF ORANGE

AND

THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

FOR

REGIONAL TRAFFIC LIGHT SYNCHRONIZATION PROGRAM

THIS AGREEMENT is effective this__ day of _____, 2010, by and between the Orange County Transportation Authority (hereinafter, "AUTHORITY"), the City of _____, the City of _____, the City of _____, [etc.], the County of Orange, and the State of California Department of Transportation (Caltrans) hereinafter referred to as the "AGENCIES" or "AGENCY".

RECITALS:

WHEREAS, Voters approved Renewed Measure M (M2) on November 7, 2006 whereby the AUTHORITY and AGENCIES are required to work together and prepare a common Regional Traffic Signal Synchronization Master Plan and necessary governance and legal arrangements before receiving funds; and

WHEREAS, the Master Plan of Arterial Highways ("MPAH) is a countywide transportation plan administered by the AUTHORITY defining the ultimate number of through lanes for arterial streets, and designating the traffic signal synchronization street routes in Orange County; and

WHEREAS, the Regional Traffic Signal Synchronization Master Plan is defined as an element of the MPAH, and cities must adopt and maintain a circulation element that is consistent with the MPAH; and

WHEREAS, coordinating traffic signals across cities' boundaries is a major component in enhancing countywide traffic flow and reducing congestion; and

WHEREAS, Renewed Measure M provides competitive funding for regional traffic signal synchronization through Project P;

WHEREAS, AGENCIES successfully competed for Project P funds from Renewed Measure M through a competitive call for projects approved by the AUTHORITY on _____, 2010 (hereinafter, the "PROJECT"); and

WHEREAS, AUTHORITY and AGENCIES agree to the implementation of the PROJECT Scope of Work including traffic control elements which is attached herein as Attachment A; and

WHEREAS, AGENCIES shall utilize a combination of Project P funds from Renewed Measure M provided by AUTHORITY with 20 percent matching funds in accordance with Ordinance No. 3 to be provided by AGENCIES for the PROJECT; and

WHEREAS, AGENCIES' PROJECT(s) may be amended to include new projects with each competitive call for projects and will be incorporated by letter approval executed by both parties and incorporated herein; and

WHEREAS, AUTHORITY and AGENCIES desire to enter into this AGREEMENT to demonstrate their commitment to improving transportation opportunities for Orange County and to develop and implement the PROJECT.

NOW, THEREFORE, it is mutually understood and agreed by AUTHORITY and CITY as follows:

ARTICLE 1. COMPLETE AGREEMENT:

A. This Agreement, including any exhibits and documents incorporated herein and made applicable by reference, constitute the complete and exclusive statement of the terms and conditions of this Agreement between AUTHORITY and AGENCIES concerning funding of regional traffic signal synchronization PROJECT(s). The above-referenced Recitals are true and correct and are incorporated by reference herein.

B. AUTHORITY'S failure to insist on any instance(s) of AGENCIES performance of any term(s) or condition(s) of this Agreement shall not be construed as a waiver or relinquishment of AUTHORITY's right to such performance or to future performance of such term(s) or condition(s), and AGENCIES obligation in respect thereto shall continue in full force and effect. Changes to any portion of this Agreement shall not be binding upon AUTHORITY except when specifically confirmed in writing by an authorized representative of AUTHORITY by way of a written amendment to this Agreement and issued in accordance with the provisions of this Agreement.

ARTICLE 2. RESPONSIBILITIES OF AGENCIES:

AGENCIES agree to the following responsibilities for implementation and funding of PROJECT:

A. To prepare a Local Traffic Signal Synchronization Program greater or consistent with the Regional Traffic Signal Synchronization Master Plan (as required by Renewed Measure M) by [insert date] consistent with the PROJECT prior to funds expenditure.

B. To participate in Traffic Forums.

C. To designate (insert name) as lead AGENCY for receipt of Project P funds and related matching funds.

D. To provide $_____ in local match or in-kind services for the PROJECT.

E. To authorize the lead AGENCY to procure and implement all aspects of the PROJECT.

F. To oversee PROJECT implementation and establish PROJECT milestones.

G. To interface with the AUTHORITY and coordinate outreach for the PROJECT.

H. To collect manual intersection movement and automated machine traffic counts.

I. To develop new timing plans optimized for signal synchronization, and provide updated timing plans and turning movements to the AUTHORITY in Synchro format upon request.

J. To prepare "before" and "after" studies of the PROJECT conditions. The "before" studies shall be completed by _____, and the "after" studies shall be completed by _____. These studies shall be provided to the AUTHORITY in draft and final formats, and comments from the AUTHORITY shall be noted in the final studies.

K. To provide AUTHORITY and lead Agency all current intersection, local field master, and/or central control system timing plans and related data upon request.

L. To provide Plans, Specifications and Estimates (PS&E) to the AUTHORITY or its representative upon request..

M. To give PROJECT related signal and telecommunications equipment a high maintenance priority during the PROJECT.

N. To take reasonable steps to keep signal control systems, inter–tie, detection systems and related equipment in proper working order during the PROJECT.

O. To provide all plan check, permit, and construction inspection functions for facilities within their ownership or control.

P. To maintain and repair their own signal control systems inter–tie, detection systems and related equipment located within each of their respective jurisdiction.

Q. To provide on-site support, if needed, for timing plan changes and the construction and/or installation of traffic control elements as specified in the PROJECT scope of work.

R. To authorize an AGENCIES Traffic Engineer or other designee to make changes or adjustments to the signal timing plans, when required.

S. To perform the changes required at central or field control locations and/or intersection controller assemblies.

T. Provide a representative from each agency including elected official to meet annually and participate as a member of the Regional Traffic Signal Synchronization Program Policy Committee

U. To provide AUTHORITY with a Project Final Report as required by Measure M Ordinance No. 3, Section (B)(III)(9), and further described in Renewed Measure M Eligibility Guidelines separately prepared and adopted by AUTHORITY.

ARTICLE 3. RESPONSIBILITES OF AUTHORITY:

AUTHORITY agrees to the following responsibilities for the PROJECT:

A. To provide up to $_____ in Project P funds to designated lead AGENCY on a reimbursement basis, and subject to separate payment and audit guidelines prepared and approved by AUTHORITY.

B. To perform web-based public outreach activities for the PROJECT to communicate major project milestones and results.

C. To provide project oversight in order to maintain inter-jurisdictional traffic signal operational integrity between existing/legacy and new projects and operations.

D. To provide project audit for allowable expenditures and exceptions.

ARTICLE 4. DELEGATED AUTHORITY

The actions required to be taken by AGENCY in the implementation of this Agreement are delegated to its _____ or his designee and the actions required to be taken by AUTHORITY in the implementation of this Agreement are delegated to its Chief Executive Officer.

ARTICLE 5. AUDIT AND INSPECTION

AGENCY shall maintain a complete set of records in accordance with generally accepted accounting principles. Upon reasonable notice, AGENCY shall permit the authorized representatives of AUTHORITY to inspect and audit all work, materials, payroll, books, accounts and other data and records of AGENCY for a period of four (4) years after final report, or until any on-going audit is completed. AUTHORITY shall also have the right to reproduce any such books, records and accounts. Contracts with AGENCY's contractors shall include the above provision with respect to audits.

ARTICLE 6. MUTUAL RESPONSIBILITES OF ALL PARTIES:

All parties agree to the following mutual responsibilities regarding PROJECT:

A. PROJECT signal timing efforts shall focus on the time periods identified by collection of current traffic data as defined in the PROJECT scope of work.

B. To attend and participate in all joint agencies related PROJECT meetings.

C. To cooperate and coordinate with all other agencies, their staff, contractors, consultants, and vendors in providing the services and responsibilities required under this AGREEMENT to the

extent practicable with respect to the performance of the PROJECT.

D. The owning AGENCY shall be responsible for coordinating the construction and/or installation of traffic control elements that are not included in the PROJECT Scope of Work.

E. To work together in good faith, using reasonable efforts to resolve any unforeseen issues and disputes arising out of the performance of this AGREEMENT.

F. This Agreement may be terminated by either party after giving thirty (30) days written notice. This Agreement shall not be terminated without mutual agreement of both parties.

G. This Agreement may be amended in writing at any time by the mutual consent of both parties. No amendment shall have any force or effect unless executed in writing by both parties.

H. The persons executing this Agreement on behalf of the parties hereto warrant that they are duly authorized to execute this Agreement on behalf of said parties and that, by so executing this Agreement, the parties hereto are formally bound to the provisions of this Agreement.

I. All notices hereunder and communications regarding the interpretation of the terms of this Agreement, or changes thereto, shall be effected by delivery of said notices in person or by depositing said notices in the U.S. mail, registered, or certified mail and addressed as follows:

To CITY:	To AUTHORITY:
	Orange County Transportation Authority
	550 South Main Street P. O. Box 14184 Orange, CA 92863-1584
Attention:	Attention: Senior Contract Administrator cc:
Tel:	Tel: (714) 560-; Fax: (714) 560-

Email:	Email:

J. The headings of all sections of this Agreement are inserted solely for the convenience of reference and are not part of and not intended to govern, limit or aid in the construction or interpretation of any terms or provision thereof.

K. The provision of this Agreement shall bind and inure to the benefit of each of the parties hereto and all successors or assigns of the parties hereto.

L. If any term, provision, covenant or condition of this Agreement is held to be invalid, void or otherwise unenforceable, to any extent, by any court of competent jurisdiction, the remainder to this Agreement shall not be affected thereby, and each term, provision, covenant or condition of this Agreement shall be valid and enforceable to the fullest extent permitted by law.

M. This Agreement may be executed and delivered in any number of counterparts, each of which, when executed and delivered shall be deemed an original and all of which together shall constitute the same agreement. Facsimile signatures will be permitted.

N. Either party shall be excused from performing its obligations under this Agreement during the time and to the extent that it is prevented from performing by an unforeseeable cause beyond its control, including but not limited to: any incidence of fire, flood; acts of God; commandeering of material, products, plants or facilities by the federal, state or local government; national fuel shortage; or a material act or omission by the other party; when satisfactory evidence of such cause is presented to the other party, and provided further that such nonperformance is unforeseeable, beyond the control and is not due to the fault or negligence of the party not performing.

O. This AGREEMENT shall be governed by all applicable federal, state and local laws. The AGENCIES warrant that in the performance of this AGREEMENT, each shall comply with all applicable federal, state and local laws, statutes and ordinances and all lawful orders, rules and regulations promulgated there under

P. Each Agency shall be excused from performing its obligations under this AGREEMENT during the

time and to the extent that it is prevented from performing by an unforeseeable cause beyond its control, including but not limited to: any incidence of fire, flood; acts of God; commandeering of material, products, plants or facilities by federal, state or local government; national fuel shortage; or a material act or omission by any other agency; when satisfactory evidence of such cause is presented to the other agencies, and provided further such nonperformance is unforeseeable, beyond the control and is not due to the fault or negligence of the agency not performing.

Q. This AGREEMENT shall continue in full force and effect through June 30, 2013, unless terminated earlier by AUTHORITY.

This Agreement shall be effective upon execution by both parties.

IN WITNESS WHEREOF, the AGENCIES hereto have caused this AGREEMENT No. _____ to be executed on the date first above written.

[signature blocks to follow]

APPENDIX D10. SAMPLE PROJECT AGREEMENT: ORANGE COUNTY—LOCAL AGENCY AS LEAD

MODEL AGREEMENT – OPTION 2

(ORANGE COUNTY TRANSPORTATION AUTHORITY LEAD)

AGREEMENT _____

BETWEEN

ORANGE COUNTY TRANSPORTATION AUTHORITY

AND

THE CITIES OF _____

AND

THE COUNTY OF ORANGE

AND

THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

FOR

REGIONAL TRAFFIC LIGHT SYNCHRONIZATION PROGRAM

THIS AGREEMENT is effective this__ day of _____, 2010, by and between the Orange County Transportation Authority (hereinafter, "AUTHORITY"), the City of _____, the City of _____, the City of _____, [etc.], the County of Orange, and the State of California Department of Transportation (Caltrans) hereinafter referred to as the "AGENCIES" or "AGENCY".

RECITALS:

WHEREAS, Voters approved Renewed Measure M (M2) on November 7, 2006 whereby the AUTHORITY and AGENCIES are required to work together and prepare a common Regional Traffic Signal Synchronization Master Plan and necessary governance and legal arrangements before receiving funds; and

WHEREAS, the Master Plan of Arterial Highways ("MPAH") is a countywide transportation plan administered by the AUTHORITY defining the ultimate number of through lanes for arterial streets, and designating the traffic signal synchronization street routes in Orange County; and

WHEREAS, the Regional Traffic Signal Synchronization Master Plan is defined as an element of the MPAH, and cities must adopt and maintain a circulation element that is consistent with the MPAH; and

WHEREAS, coordinating traffic signals across cities' boundaries is a major component in enhancing countywide traffic flow and reducing congestion; and

WHEREAS, Renewed Measure M provides competitive funding for regional traffic signal synchronization through Project P;

WHEREAS, AGENCIES successfully competed for Project P funds from Renewed Measure M through a competitive call for projects approved by the AUTHORITY on _____, 2010 (hereinafter, the "PROJECT"); and

WHEREAS, AUTHORITY and AGENCIES agree to the implementation of the PROJECT Scope of Work including traffic control elements which is attached herein as Attachment A; and

WHEREAS, AGENCIES shall utilize a combination of Project P funds from Renewed Measure M provided by AUTHORITY with a 20 percent match in accordance with Ordinance No. 3 to be provided by AGENCIES for the PROJECT; and

WHEREAS, AGENCIES' PROJECT(s) may be amended to include new projects with each competitive call for projects and will be incorporated by letter approval executed by both parties and incorporated herein; and

WHEREAS, AUTHORITY and AGENCIES desire to enter into this AGREEMENT to demonstrate their commitment to improving transportation opportunities for Orange County and to develop and implement the PROJECT.

NOW, THEREFORE, it is mutually understood and agreed by AUTHORITY and CITY as follows:

ARTICLE 1. COMPLETE AGREEMENT:

A. This Agreement, including any exhibits and documents incorporated herein and made applicable by reference, constitute the complete and exclusive statement of the terms and conditions of this Agreement between AUTHORITY and AGENCIES concerning funding of regional traffic signal synchronization PROJECT(s). The above-referenced Recitals are true and correct and are incorporated by reference herein.

B. AUTHORITY'S failure to insist on any instance(s) of AGENCIES performance of any term(s) or condition(s) of this Agreement shall not be construed as a waiver or relinquishment of AUTHORITY's right to such performance or to future performance of such term(s) or condition(s), and AGENCIES obligation in respect thereto shall continue in full force and effect. Changes to any portion of this Agreement shall not be binding upon AUTHORITY except when specifically confirmed in writing by an authorized representative of AUTHORITY by way of a written amendment to this Agreement and issued in accordance with the provisions of this Agreement.

ARTICLE 2. RESPONSIBILITES OF AUTHORITY:

AUTHORITY agrees to the following responsibilities for the PROJECT:

A. To provide up to $_____ in Project P funds for the PROJECT.

B. To oversee PROJECT implementation and establish PROJECT milestones.

C. To interface with the AGENCIES and coordinate outreach for the PROJECT.

D. To collect manual intersection movement and automated machine traffic counts.

E. To develop new timing plans optimized for signal synchronization, and provide updated timing plans and turning movements to the AUTHORITY in Synchro format upon request.

F. To prepare "before" and "after" studies of the PROJECT conditions. The "before" studies shall be completed by _____, and the "after" studies shall be completed by _____. These studies shall be provided to the AUTHORITY in draft and final formats, and comments from the AUTHORITY shall be noted in the final studies.

G. To perform web-based public outreach activities for the PROJECT to communicate major project milestones and results.

H. To provide project oversight in order to maintain inter-jurisdictional traffic signal operational integrity between existing/legacy and new projects and operations.

I. To provide project audit for allowable expenditures and exceptions.

ARTICLE 3. RESPONSIBILITIES OF AGENCIES:

AGENCIES agree to the following responsibilities for implementation and funding of PROJECT:

MODEL SIGNAL SYNCHRONIZATION AGREEMENT – OPTION 2

A. To prepare a Local Traffic Signal Synchronization Program greater or consistent with the Regional Traffic Signal Synchronization Master Plan (as required by Renewed Measure M) by [insert date] consistent with the PROJECT prior to funds expenditure.

B. To participate in Traffic Forums.

C. To designate the AUTHRORITY as lead AGENCY for receipt of Project P funds and related matching funds.

D. To provide $_____ in local match or in-kind services for the PROJECT.

E. To authorize the AUTHRORITY to procure and implement all aspects of the PROJECT.

F. To provide AUTHORITY all current intersection, local field master, and/or central control system timing plans and related data upon request.

G. To provide Plans, Specifications and Estimates (PS&E) to the AUTHORITY or its representative upon request.

H. To give PROJECT related signal and telecommunications equipment a high maintenance priority during the PROJECT.

I. To take reasonable steps to keep signal control systems, inter–tie, detection systems and related equipment in proper working order during the PROJECT.

J. To provide all plan check, permit, and construction inspection functions for facilities within their ownership or control.

K. To maintain and repair their own signal control systems inter–tie, detection systems and related equipment located within each of their respective jurisdiction.

L. To provide on-site support, if needed, for timing plan changes and the construction and/or installation of traffic control elements as specified in the PROJECT scope of work.

M. To authorize an AGENCY Traffic Engineer or other designee to make changes or adjustments to the signal timing plans, when required.

N. To perform the changes required at central or field control locations and/or intersection controller assemblies.

O. Provide a representative from each agency including elected official to meet annually and participate as a member of the Regional Traffic Signal Synchronization Program Policy Committee.

To provide AUTHORITY with a Project Final Report as required by Measure M Ordinance No. 3, Section (B)(III)(9), and further described in Renewed Measure M Eligibility Guidelines separately prepared and adopted by AUTHORITY.

ARTICLE 4. DELEGATED AUTHORITY

The actions required to be taken by AGENCY in the implementation of this Agreement are delegated to its _____ or his designee and the actions required to be taken by AUTHORITY in the implementation of this Agreement are delegated to its Chief Executive Officer.

ARTICLE 5. AUDIT AND INSPECTION

AGENCY shall maintain a complete set of records in accordance with generally accepted accounting principles. Upon reasonable notice, AGENCY shall permit the authorized representatives of AUTHORITY to inspect and audit all work, materials, payroll, books, accounts and other data and records of AGENCY for a period of four (4) years after final report, or until any on-going audit is completed. AUTHORITY shall also have the right to reproduce any such books, records and accounts. Contracts with AGENCY's contractors shall include the above provision with respect to audits.

ARTICLE 6. MUTUAL RESPONSIBILITES OF ALL PARTIES:

All parties agree to the following mutual responsibilities regarding PROJECT:

A. PROJECT signal timing efforts shall focus on the time periods identified by collection of current traffic data as defined in the PROJECT scope of work.

B. To attend and participate in all joint agencies related PROJECT meetings.

C. To cooperate and coordinate with all other agencies, their staff, contractors, consultants, and vendors in providing the services and responsibilities required under this AGREEMENT to the extent practicable with respect to the performance of the PROJECT.

D. The owning AGENCY shall be responsible for coordinating the construction and/or installation of

traffic control elements that are not included in the PROJECT Scope of Work.

E. To work together in good faith, using reasonable efforts to resolve any unforeseen issues and disputes arising out of the performance of this AGREEMENT.

F. This Agreement may be terminated by either party after giving thirty (30) days written notice. This Agreement shall not be terminated without mutual agreement of both parties.

G. This Agreement may be amended in writing at any time by the mutual consent of both parties. No amendment shall have any force or effect unless executed in writing by both parties.

H. The persons executing this Agreement on behalf of the parties hereto warrant that they are duly authorized to execute this Agreement on behalf of said parties and that, by so executing this Agreement, the parties hereto are formally bound to the provisions of this Agreement.

I. All notices hereunder and communications regarding the interpretation of the terms of this Agreement, or changes thereto, shall be effected by delivery of said notices in person or by depositing said notices in the U.S. mail, registered, or certified mail and addressed as follows:

To CITY:	To AUTHORITY:
	Orange County Transportation Authority
	550 South Main Street P. O. Box 14184 Orange, CA 92863-1584
Attention:	Attention: Senior Contract Administrator cc:
Tel:	Tel: (714) 560-; Fax: (714) 560-
Email:	Email:

J. The headings of all sections of this Agreement are inserted solely for the convenience of reference and are not part of and not intended to govern, limit or aid in the construction or interpretation of any terms or provision thereof.

K. The provision of this Agreement shall bind and inure to the benefit of each of the parties hereto and all successors or assigns of the parties hereto.

L. If any term, provision, covenant or condition of this Agreement is held to be invalid, void or otherwise unenforceable, to any extent, by any court of competent jurisdiction, the remainder to this Agreement shall not be affected thereby, and each term, provision, covenant or condition of this Agreement shall be valid and enforceable to the fullest extent permitted by law.

M. This Agreement may be executed and delivered in any number of counterparts, each of which, when executed and delivered shall be deemed an original and all of which together shall constitute the same agreement. Facsimile signatures will be permitted.

N. Either party shall be excused from performing its obligations under this Agreement during the time and to the extent that it is prevented from performing by an unforeseeable cause beyond its control, including but not limited to: any incidence of fire, flood; acts of God; commandeering of material, products, plants or facilities by the federal, state or local government; national fuel shortage; or a material act or omission by the other party; when satisfactory evidence of such cause is presented to the other party, and provided further that such nonperformance is unforeseeable, beyond the control and is not due to the fault or negligence of the party not performing.

O. This AGREEMENT shall be governed by all applicable federal, state and local laws. The AGENCIES warrant that in the performance of this AGREEMENT, each shall comply with all applicable federal, state and local laws, statutes and ordinances and all lawful orders, rules and regulations promulgated there under

P. Each Agency shall be excused from performing its obligations under this AGREEMENT during the time and to the extent that it is prevented from performing by an unforeseeable cause beyond its

control, including but not limited to: any incidence of fire, flood; acts of God; commandeering of material, products, plants or facilities by federal, state or local government; national fuel shortage; or a material act or omission by any other agency; when satisfactory evidence of such cause is presented to the other agencies, and provided further such nonperformance is unforeseeable, beyond the control and is not due to the fault or negligence of the agency not performing.

Q. This AGREEMENT shall continue in full force and effect through June 30, 2013, unless terminated earlier by AUTHORITY.

This Agreement shall be effective upon execution by both parties.

IN WITNESS WHEREOF, the AGENCIES hereto have caused this AGREEMENT No. _____ to be executed on the date first above written.

/

[signature blocks to follow]

APPENDIX D11. SAMPLE COOPERATIVE AGREEMENT: PIMA COUNTY, ARIZONA

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: RJL
DEPUTY RECORDER
9544 PE1

RTAUT
REGIONAL TRANSPORTATION AUTHORITY
177 N CHURCH AVE 405
TUCSON AZ 85701
ATTN: JACKI ONTIVEROS

DOCKET: 13337
PAGE: 1605
NO. OF PAGES: 20
SEQUENCE: 20081250474
06/27/2008
RES 15:31

PICKUP
AMOUNT PAID $ 14.50

RESOLUTION AND ORDER NO. 2008 - 152

RESOLUTION OF THE PIMA COUNTY BOARD OF SUPERVISORS APPROVING AND AUTHORIZING THE EXECUTION OF AN AGREEMENT BETWEEN PIMA COUNTY, THE TOWN OF MARANA AND THE REGIONAL TRANSPORTATION AUTHORITY FOR THE DEVELOPMENT AND IMPLEMENTATION OF A COORDINATED TRAFFIC SIGNAL CORRIDOR ALONG WEST INA ROAD BETWEEN ORACLE ROAD AND SILVERBELL ROAD.
(DISTRICTS 1 & 3)

WHEREAS, Pima County ("County & RTA designated Lead Agency") wishes to implement and monitor coordinated timing plans for traffic signals on west Ina Road and install four wireless communication devices on intersections located within the Town of Marana ("Project"), and

WHEREAS, the addition of the coordinated timing plans for traffic signals and a high-speed wireless communication system will provide valuable traffic signal timing analysis along this corridor in order to improve traffic flow and safety, and

WHEREAS, the Town of Marana shall grant right-of-way access to the County and its consultants and contractors for the duration of the project, and

WHEREAS, the Regional Transportation Authority of Pima County (RTA or the "Authority") accepted the County's application as the Lead Agency for RTA funding of this Project, and

WHEREAS, the Pima County Board of Supervisors has determined it to be in the best interest of the County to enter into the Agreement with the Town of Marana and the RTA for implementation, coordination and monitoring of the Project,

NOW, THEREFORE, UPON MOTION DULY MADE, SECONDED AND CARRIED, BE RESOLVED THAT:

1. The intergovernmental agreement with the Regional Transportation Authority of Pima County and the Town of Marana for the addition of the coordinated timing plans for traffic signals and a high-speed wireless communication system on West Ina Road is hereby approved.
2. The Chair of the Board is hereby authorized and directed to sign the agreement on behalf of the Pima County Board of Supervisors.
3. The various officers and employees are hereby authorized and directed to perform all acts necessary and desirable to give effect to this Resolution.

PASSED, ADOPTED AND APPROVED this 17th day of June 2008.

PIMA COUNTY BOARD OF SUPERVISORS:

Chairman of the Board 6/17/08

ATTEST:

Clerk of the Board

Approved as to form:

Deputy County Attorney

19

MARANA RESOLUTION NO. 2008-76

RELATING TO PUBLIC WORKS; APPROVING AND AUTHORIZING AN INTERGOVERNMENTAL AGREEMENT BETWEEN THE REGIONAL TRANSPORTATION AUTHORITY, THE PIMA COUNTY DEPARTMENT OF TRANSPORTATION, AND THE TOWN OF MARANA FOR THE DEVELOPMENT AND IMPLEMENTATION OF A COORDINATED TRAFFIC SIGNAL CORRIDOR ALONG WEST INA ROAD BETWEEN ORACLE ROAD AND SILVERBELL ROAD (THE INA ROAD CORRIDOR REGIONAL TRAFFIC SIGNAL TIMING PROJECT).

WHEREAS A.R.S.§ 48-5301, et seq., authorizes the Regional Transportation Authority to act as a regional taxing authority for the purpose of funding multi-modal transportation operations and improvements identified in the Regional Transportation Plan approved on May 16, 2006; and

WHEREAS the Authority is authorized by A.R.S. §§ 48-5304 (16) and 48-5308 to administer and distribute the regional transportation funds to the members of the Authority and to sell bonds in furtherance of that purpose to fund those projects or programs identified in the Plan; and

WHEREAS the Authority, the Town of Marana, and the Pima County Department of Transportation wish to cooperate in the development and implementation of coordinated traffic signals on West Ina Road; and

WHEREAS the Mayor and Council of the Town of Marana feel it is in the best interests of the Authority, the Town, and Pima County to enter into this intergovernmental agreement.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE TOWN OF MARANA, that the intergovernmental agreement between the Town of Marana, the Pima County Department of Transportation, and the Pima County Regional Transportation Authority attached to and incorporated by this reference in this resolution as Exhibit A is hereby approved, and the Mayor is hereby authorized to execute it for and on behalf of the Town of Marana.

IT IS FURTHER RESOLVED that the Town's Manager and staff are hereby directed and authorized to undertake all other and further tasks required or beneficial to carry out the terms, obligations, and objectives of the intergovernmental agreement.

PASSED and ADOPTED by the Mayor and Council of the Town of Marana, Arizona, this 3rd day of June, 2008.

TOWN OF MARANA CORPORATE SEAL 1977

ATTEST:

Jocelyn C. Bronson, Town Clerk

Hank Kai for
Mayor Ed Honea

APPROVED AS TO FORM:

Frank Cassidy, Town Attorney

RTA PCDOT TOM IGA Resolution-Ina Road Corridor Regional Traffic Signal Timing

RESOLUTION No. 2008-18

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE PIMA COUNTY REGIONAL TRANSPORTATION AUTHORITY ADOPTING AN INTERGOVERNMENTAL AGREEMENT WITH PIMA COUNTY FOR INA ROAD SIGNAL COORDINATION (RTA#40), A TRANSPORTATION IMPROVEMENT PROJECT

WHEREAS, the Pima County Regional Transportation Authority (the "RTA") is an Arizona special taxing district, duly formed and existing, pursuant to A.R.S. 48-5302, et seq., for the purposes of coordinating multi-jurisdictional cooperation in transportation planning, improvements and fund-raising as a municipal corporation through taxation and bonding, with the public's input and voter approval; and

WHEREAS, Pima County ("Lead Agency") is a body politic and corporate of the State of Arizona; and

WHEREAS, pursuant to A.R.S. 48-5309 (A), the RTA adopted, and the voters approved, a twenty-year, comprehensive, multi-modal regional transportation plan (the "Plan"); and

WHEREAS, the Lead Agency and the RTA wish to cooperate in the Ina Road Signal Coordination (RTA#40) ("the Project"); and

WHEREAS, the Project is one of the transportation improvement projects included in the Plan or is eligible for funding as part of a categorical program included in the Plan; and

WHEREAS, the RTA and the Lead Agency wish to clarify their respective responsibilities in the Project, and wish to jointly exercise their powers pursuant to A.R.S. 11-952; and

WHEREAS, pursuant to A.R.S. 48-5304 (18), the RTA has the authority to enter into agreements to exercise its powers and carry out its responsibilities; and

WHEREAS, staff from the RTA and the Lead Agency have drafted an intergovernmental agreement, attached hereto as Exhibit A and incorporated herein by this reference (the "IGA"); and

WHEREAS, the Board of Directors of the RTA has reviewed the provisions of the IGA and finds that adopting it is in the best interests of the RTA and is in furtherance of the Plan.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the RTA that the IGA, attached hereto as Exhibit A, is hereby approved and adopted.

BE IT FURTHER RESOLVED that the Executive Director of the RTA is hereby authorized and directed to take all steps necessary and proper to cooperate with the Lead Agency on the Project and comply with the IGA.

PASSED AND ADOPTED by the Board of Directors of the Regional Transportation Authority this 26th of June, 2008.

Paul H. Loomis, Board Chair

Certification:

Gary Hayes, the Executive Director of the RTA, hereby certifies and attests that he has access to the official records of the Board of the RTA, that the foregoing Resolution was duly adopted by the Board of the RTA, at a duly noticed and public meeting, and that this Resolution has not been altered or amended and remains in full force and effect on the date stated below.

Gary Hayes, Executive Director

Date: 6/27/08

Approved as to form:

Thomas Benavidez, Esq.

EXHIBIT A
[Intergovernmental Agreement]

CONTRACT
NO. 01-04-R-140989-0708
AMENDMENT NO. _____
This number must appear on all invoices, correspondence and documents pertaining to this contract.

INTERGOVERNMENTAL TRANSPORTATION FUNDING AGREEMENT
BETWEEN
THE REGIONAL TRANSPORTATION AUTHORITY OF PIMA COUNTY
AND
PIMA COUNTY
AND
THE TOWN OF MARANA
FOR
THE REGIONAL COORDINATION OF
TRAFFIC SIGNALS ON WEST INA ROAD

This Agreement (hereinafter "the Agreement") is entered into by and between the Regional Transportation Authority of Pima County ("RTA" or "the Authority"), a special taxing district formed pursuant to Title 48 Chapter 30 of the Arizona Revised Statutes (A.R.S.), Pima County, a body politic and corporate of the State of Arizona ("the Lead Agency"), and the Town of Marana, an Arizona municipal corporation ("the Town") pursuant to A.R.S. § 11-952.

RECITALS

A. A.R.S.§ 48-5301, et seq., authorizes the Authority to act as a regional taxing authority for the purpose of funding multi-modal transportation operations and improvements identified in the Regional Transportation Plan ("the Plan") approved by the voters at the special election held in Pima County, Arizona, on May 16, 2006.

B. The governing board of the Authority is composed of representatives of each member of the regional council of governments in accordance with A.R.S. § 48-5303.

C. Pursuant to A.R.S. § 48-5304 (12), the governing board of the Authority has sole authority to implement the elements of the Plan.

D. Pursuant to A.R.S. § 48-5304 (13), the governing board of the Authority shall coordinate the implementation of the Plan among the local jurisdictions.

E. A Regional Transportation Fund was established by the Arizona Legislature per A.R.S. § 48-5307 to be the repository for those funds collected for the purpose of funding the transportation projects identified in the Plan.

F. The Authority is authorized by A.R.S. § 48-5308 to distribute the regional transportation funds to the members of the Authority and to sell bonds in furtherance of that purpose to fund those projects or programs identified in the Plan.

G. The Lead Agency is authorized by A.R.S. § 11-251 (4) to design, maintain, control and manage public roads within the Lead Agency's jurisdictional boundaries.

H. The Lead Agency may contract with one or more jurisdictions empowering the Lead Agency to perform roadway and other improvements for other jurisdictions within the Lead Agency's jurisdictional boundaries.

I. The Lead Agency, the Town and the Authority wish to cooperate in the development and implementation of coordinated traffic signals on West Ina Road ("The Project").

J. The Project is one of the transportation projects included in the Plan or is eligible for funding as part of a categorical program included in the Plan.

K. The Authority intends to fund the Project under the terms and conditions contained in this Agreement and has entered into this Agreement for that purpose. The funding allocated for the Project by the Authority is currently estimated to be sufficient to cover the full costs of the Project.

L. It is the policy of the Authority to require that a Lead Agency be identified and an intergovernmental agreement (IGA) be approved and entered into by the Authority and the Lead Agency before requests for funding reimbursement or payment can be processed by the Authority.

M. Pima County has been identified as the Lead Agency for the Project and will be responsible for all aspects of project implementation including, but not limited to, planning, project management, data collection, analysis, risk management, design, advertisement, award, execution and administration of the design, construction, and implementation contracts for the Project.

N. The Authority's Administrative Code will control all payments and other procedures unless otherwise specified herein.

O. The Authority, the Lead Agency and the Partner may contract for services and enter into agreements with one another for joint and cooperative action pursuant to A.R.S. § 11-952, et seq.

NOW, THEREFORE, the Lead Agency, the Town and the Authority, pursuant to the above and in consideration of the matters and things set forth herein, do mutually agree as follows:

AGREEMENT

1. Purpose. The purpose of this Agreement is to set forth the responsibilities of the parties for the design, construction, maintenance and operation of the Project and to address the legal and administrative matters among the parties.

2. Project. The Project consists of the collection of data, engineering analysis, plan development and implementation and monitoring of coordinated timing plans for traffic signals on West Ina Road, as more fully depicted in the attached Exhibit A, including the following:

a) Detailed project scope and schedule.
b) Project budget and cost breakdown of items eligible for reimbursement by the Authority including any proposed billing of staff time directly attributable to Project.
c) Total amount of RTA funding allowed for the Project plus a breakdown of any other regional, local, federal or state funding available.
d) Designation of Project phases if applicable and any additional related agreements.
e) Estimated implementation start date and duration of implementation.
f) Projected cost reimbursement timeline.
g) Identification of the Lead Agency's duly authorized representative for signing and submitting payment requests.

3. Effective Date; Term. This Agreement shall be effective upon filing a fully executed original with the office of the Pima County Recorder and shall continue in effect until all elements of the Project pursuant to this Agreement are completed, all eligible reimbursement payments to the Lead Agency are concluded and all warranties applicable to the Project have expired.

4. Responsibilities of the Lead Agency.

a. The Lead Agency shall be responsible for the design, construction and/or implementation of the Project in accordance with this Agreement and all applicable public roadway, traffic signal, and street lighting design and construction standards. Design Standards are federal, state, county or municipal standards for engineering, traffic, safety or public works facilities design. Examples of Design Standards include the American Association of State Highway and Transportation Officials and Federal Highway Administration standards for highway engineering and construction, the Pima County/City of Tucson Standard Specifications for Public Improvements, the Pima County Roadway Design Manual, October 2002 revision, the Pima County Department of Transportation /City of Tucson Department of Transportation Pavement Marking Design Manual, Pima County Traffic Signal Design Manual, January 2008 revision, and Pima County and municipal design guidelines for roadway lane widths and level of drainage protection.

b. If consultants or contractors are employed to perform any portion of the Project, the Lead Agency shall be responsible for the contracts for design and construction of the Project and shall select the consultants and contractors to be used on the Project. The Lead Agency shall immediately provide to the Authority copies of any and all contract documents and related materials upon request by the Authority. The Lead Agency shall retain the usual rights of the owner of a public contract including the authority to approve changes and make payments. However, any changes to the Project which would result in the final project cost deviating, by ten or more percent, from the Authority's budget amount for the Project, must be

approved by the Authority in advance of those changes being made, regardless of the fact that the Authority will not be paying for them.

c. The Lead Agency shall be responsible for any necessary traffic management, including public notification, in the event that performance of the Lead Agency's responsibilities requires the Lead Agency's contractor to work within a public right of way owned and controlled by the Lead Agency or the Town.

d. The final cost of the Project shall be that amount necessary to complete the Project including any unanticipated work incorporated into the Project by change orders and amendments executed by the Lead Agency. The Lead Agency shall be responsible for all Project costs in excess of the RTA funds contributed to the Project.

e. The Lead Agency shall exercise its power of eminent domain if necessary, to acquire property needed for the Project.

f. The Lead Agency will be responsible for assuming all risks associated with the Project except those that are assigned to another agency or jurisdiction that has agreed to that assumption.

g. The Lead Agency shall require its contractors performing any portion of the Project to name the Authority and the Town as additional insureds and additional indemnitees in all of the Lead Agency's contracts for the Project. Specifically, the RTA and the Town shall be identified as an additional insured with respect to insurance policies for general liability, automobile liability and defects in design. The Lead Agency shall also require its contractors to name the Authority and the Town as additional beneficiaries in any performance and payment related assurances posted for the Project.

h. The Lead Agency shall be responsible for preparing and submitting to the Authority, within the first week of each month or as otherwise specified herein, invoices for payment signed by a duly authorized representative of the Lead Agency and which include sufficient background information documenting payments made to contractors, vendors or any other eligible costs identified in this Agreement or the RTA's Administrative Code. The Lead Agency must retain and certify all vendor receipts, invoices and any related Project records as needed and ensure that they are available for review for a minimum of five (5) years after final payment is made unless otherwise specified herein.

i. The Lead Agency shall be responsible for submitting a status report describing its progress and adherence to the Project scope, schedule and budget with each request for payment.

5. Responsibilities of Authority.

a. Upon receipt of authorized payment requests, the Authority shall convey to the Lead Agency RTA funds in the amount specified in Exhibit A on a reimbursement basis unless otherwise specified herein. All payments and reimbursements shall follow the policies outlined in the RTA's Administrative Code.

b. Reimbursements will generally be based on the Project schedules established by the Lead Agency and contained in Exhibit A.

c. The RTA staff will review all payment requests to confirm that the request is for reimbursement of costs incurred by the Lead Agency for the Project. If the Authority determines that additional information is needed, the Lead Agency will be notified of the request for additional information within five days of the receipt of the invoice by RTA.

d. Upon approval of the request by RTA, the invoice will be processed for payment within ten working days of the invoice submittal.

e. RTA shall provide all necessary cooperation and assistance to its fiscal agent to process all payment requests from the Lead Agency.

6. Responsibilities of Town.

a. Town shall grant right-of-way access to Lead Agency's consultants and contractors for the purpose of data collection, studies and plan implantation for the duration of the Project.

b. Town shall commit to participation and implementation of coordinated traffic signals for a period of no less than 2 years following completion of the Project by Lead Agency.

7. Termination. Any party to this Agreement may terminate this Agreement for material breach of the Agreement by any other party. Prior to any termination under this paragraph, the party alleging the default shall give written notice to the other parties of the alleged default. The party alleged to be in default shall have forty-five days to cure the default and provide written notice to the other parties of the cure. If the default is not cured to the satisfaction of the other parties within the forty-five days, this Agreement shall be deemed terminated. Any such termination shall not relieve any party from liabilities or costs already incurred under this Agreement.

8. Non-assignment. No party to this Agreement shall assign its rights under this Agreement to any other party without first acquiring written permission from the other parties to this Agreement of such assignment.

9. Construction of Agreement.

a. Entire agreement. This instrument constitutes the entire agreement between the parties pertaining to the subject matter hereof, and all prior or contemporaneous agreements and understandings, oral or written, are hereby superseded and merged herein. Any exhibits to this Agreement are incorporated herein by this reference.

b. Amendment. This Agreement may be modified, amended, altered or changed only by written agreement signed by both parties.

c. Construction and interpretation. All provisions of this Agreement shall be construed to be consistent with the intention of the parties as expressed in the recitals hereof.

d. Captions and headings. The headings used in this Agreement are for convenience only and are not intended to affect the meaning of any provision of this Agreement.

e. Severability. In the event that any provision of this Agreement or the application thereof is declared invalid or void by statute or judicial decision, such action shall have no effect on other provisions and their application, which can be given effect without the invalid or void provision or application, and to this extent the provisions of the Agreement are severable. In the event that any provision of this Agreement is declared invalid or void, the parties agree to meet promptly upon request of the other party in an attempt to reach an agreement on a substitute provision.

f. This Agreement is subject to the provisions of A.R.S. § 38-511, which provides for cancellation in certain circumstances involving conflict of interest.

10. Ownership of Improvements. Ownership and title to all materials, equipment and appurtenances installed pursuant to this Agreement shall automatically vest in the jurisdiction in which it is located upon completion of the Project.

11. Legal Jurisdiction. Nothing in this Agreement shall be construed as either limiting or extending the legal jurisdiction of the Lead Agency, the Town or the Authority.

12. No Joint Venture It is not intended by this Agreement to, and nothing contained in this Agreement shall be construed to, create any partnership, joint venture or employment relationship between the parties or create any employer-employee relationship between any party and the employees of any other party. Further, no party shall be liable for the debts, accounts, obligations or other liabilities of any other party, including (without limitation) the a party's obligation to withhold Social Security and income taxes for itself or any of its employees.

13. No Third Party Beneficiaries. Nothing in the provisions of this Agreement is intended to create duties or obligations to or rights in third parties not parties to this Agreement or effect the legal liability of either party to the Agreement by imposing any standard of care different from the standard of care imposed by law.

14. Compliance with Laws. The parties shall comply with all applicable federal, state and local laws, rules, regulations, standards and executive orders, without limitation to those designated within this Agreement.

a. Anti-Discrimination. The provisions of A.R.S. § 41-1463 and Executive Order Number 99-4 issued by the Governor of the State of Arizona are incorporated by this reference as a part of this Agreement.

b. Americans with Disabilities Act. This Agreement is subject to all applicable provisions of the Americans with Disabilities Act (Public Law 101-336, 42 U.S.C. §§ 12101-12213) and all applicable federal regulations under the Act, including 28 CFR Parts 35 and 36.

c. Workers' Compensation. An employee of either party shall be deemed to be an "employee" of both public agencies, while performing pursuant to this Agreement, for purposes of A.R.S. § 23-1022 and the Arizona Workers' Compensation laws. The primary employer shall be

solely liable for any worker's compensation benefits, which may accrue. Each party shall post a notice pursuant to the provisions of A.R.S. § 23-906 in substantially the following form:

> All employees are hereby further notified that they may be required to work under the jurisdiction or control or within the jurisdictional boundaries of another public agency pursuant to an intergovernmental agreement or contract, and under such circumstances they are deemed by the laws of Arizona to be employees of both public agencies for the purposes of workers' compensation.

15. Waiver. Waiver by either party of any breach of any term, covenant or condition herein contained shall not be deemed a waiver of any other term, covenant or condition, or any subsequent breach of the same or any other term, covenant, or condition herein contained.

16. Force Majeure. A party shall not be in default under this Agreement if it does not fulfill any of its obligations under this Agreement because it is prevented or delayed in doing so by reason of uncontrollable forces. The term "uncontrollable forces" shall mean, for the purpose of this Agreement, any cause beyond the control of the party affected, including but not limited to failure of facilities, breakage or accident to machinery or transmission facilities, weather conditions, flood, earthquake, lightning, fire, epidemic, war, riot, civil disturbance, sabotage, strike, lockout, labor dispute, boycott, material or energy shortage, casualty loss, acts of God, or action or non-action by governmental bodies in approving or failing to act upon applications for approvals or permits which are not due to the negligence or willful action of the parties, order of any government officer or court (excluding orders promulgated by the parties themselves), and declared local, state or national emergency, which, by exercise of due diligence and foresight, such party could not reasonably have been expected to avoid. Either party rendered unable to fulfill any obligations by reason of uncontrollable forces shall exercise due diligence to remove such inability with all reasonable dispatch.

17. Notification. All notices or demands upon any party to this Agreement shall be in writing, unless other forms are designated elsewhere, and shall be delivered in person or sent by mail addressed as follows:

The Authority:	Pima County:	Town of Marana
Gary G. Hayes, Executive Director	Priscilla Cornelio, Director	Keith Brann, Town Engineer
Regional Transportation Authority	Pima County Dept. of Transportation	11555 W. Civic Center Dr.
177 N. Church Ave. Suite 405	201 N. Stone, 3rd Floor	Bldg. A2
Tucson, AZ 85701	Tucson, AZ 85701	Marana, AZ 85653-7003

18. Remedies. Any party to this Agreement may pursue any remedies provided by law for the breach of this Agreement. No right or remedy is intended to be exclusive of any other right or remedy and each shall be cumulative and in addition to any other right or remedy existing at law or in equity or by virtue of this Agreement.

19. Counterparts. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. The signature pages from one or more counterpart may be removed from such counterpart and attached to a single instrument.

As indicated below, Pima County has caused this Agreement to be executed by the Chairman of the Pima County Board of Supervisors upon resolution of the Board and attested to by the Clerk of the Board, the Town of Marana has caused this Agreement to be executed by the Mayor of the Town upon resolution of its Town Council, and the Authority has caused this Agreement to be executed by its Chairman of the Board.

PIMA COUNTY:

Chairman, Board of Supervisors — Date: JUN 17 2008

ATTEST:

Lori Godoshian, Clerk of the Board — Date: JUN 17 2008

The foregoing Agreement between Pima County and the Authority and Town of Marana has been approved as to content and is hereby recommended by the undersigned.

Priscilla Cornelio, P.E., Director
Pima County Dept. of Transportation — Date: 6/12/08

TOWN OF MARANA:

Ed Honea, Mayor for — Date:

ATTEST:

Jocelyn Bronson, Town Clerk — Date: 6/3/08

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REGIONAL TRANSPORTATION AUTHORITY OF PIMA COUNTY:

Paul H. Loomis, Board Chair — Date: 6/26/08

ATTEST:

Gary D. Hayes, Executive Director — Date: 6/27/08

ATTORNEY CERTIFICATION

The foregoing Agreement by and between the Regional Transportation Authority of Pima County, the Town of Marana, and Pima County has been reviewed pursuant to A.R.S. § 11-952 by the undersigned who have determined that it is in proper form and is within the powers and authority granted under the laws of the State of Arizona to each respective party to the Agreement represented by each of the undersigned attorneys.

Regional Transportation Authority of Pima County:

Thomas Benavidez, Attorney for the Authority — Date: 6-26-08

Pima County:

Deputy County Attorney — Date: 6.10.08

Town of Marana:

Frank Cassidy, Attorney for Town of Marana — Date: 6-3-08

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Exhibit A – Ina Road Corridor Regional Traffic Signal Timing Project

RTA Ballot Project Number: 40

TIP Project Number: 4RTICS

Project Name: Ina Road Corridor Regional Traffic Signal Timing Project

Project Type: Professional Services and Construction

Type of Work (Pre-design, Design, Right-of-way, Construction, other, etc.): Traffic data collection, signal timing analysis and recommendations, installation of wireless communications devices at the road intersections.

Project Manager for Status Reports: Tom Kelley, P.E., 1313 S Mission Road, Tucson, AZ 85713, (520) 740-2854

Authorized representative for signing and submitting payment requests: Tom Kelley, P.E., 1313 S Mission Road, Tucson, AZ 85713, (520) 740-2854

Map of Project Limits and Municipal Boundaries: A list and map of the intersections to be analyzed are included below.

Narrative description of scope of project, what improvements are included and intent of project (problem and how project addresses same).

Ina Road from Silverbell Road to Oracle Road is a major traffic corridor serving the traveling public in the NW region of Tucson. The corridor contains traffic signals owned and operated by three jurisdictions: Pima County, Town of Marana, and ADOT. The project area includes the Interstate 10 interchange, and the Southern Pacific Railroad crossing on Ina Road. This project will provide valuable traffic signal timing analysis along this corridor in order to improve traffic flow and safety.

The project consultant shall acquire current traffic flow data in the field, then analyze the data and provide recommendations for traffic signal timing. Once the respective agencies have implemented the signal timing changes, traffic data will once again be gathered, and a report containing both pre- and post-implementation data for each signalized intersection along the corridor, as well as travel times along the length of the corridor will be submitted.

In addition, wireless communications devices shall be installed at the four signalized intersections on Ina Road located in the Town of Marana. The installation of video cameras, with electronic hardware and software necessary to bring the video images to the computer server located in the City/County Public Works Building from all of the intersections within the project scope, will also be performed under this agreement.

Total maximum amount of Authority funding allowed for the project or project component under this agreement. $225,000.

Total project cost and breakdown of any other regional, local funding and federal and/or state funding, if applicable, to meet that cost.

Detailed project budget and cost breakdown identifying total cost of eligible items sought for reimbursement from the Authority, including any proposed billing of staff time directly attributable to Project.

1. Consulting Services : $60,000
2. Construction (Installation of Wireless: Communications Devices): $142,500
3. Project Administration: $22,500

Identification of project phases or components not covered by this agreement and the need for future agreements, if any, to cover those items.

Estimated construction start date and duration of construction.

Estimated Start Date: The construction project will begin in March, 2008.

Estimated Duration of Construction: It is estimated that the Traffic Engineering Consultant can complete the study and prepare its report in 3 months, with all work being completed by December 1, 2008. The following table is an estimate of the costs on a monthly basis.

Month	Planning	Design	Construction	Total
April, 2008			$6,500	$6,500
May, 2008	$10,000	$30,000		$40,000
June, 2008	$2,500	$20,000		$22,500
July, 2008			$50,000	$50,000
Aug, 2008			$50,000	$50,000
October, 2008			$36,000	$36,000
November, 2008			20,000	$20,000
Total:	**$12,500**	**$50,000**	**$162,500**	**$225,000**

Project Schedule	Start	End
Initial Data Acquisition	Apr, 2008	Apr, 2008
Signal Timing Analysis using Synchro	May, 2008	Jun, 2008
Installation of Wireless Communications	Jun, 2008	Sep, 2008
Field Input of Signal Timing Parameters	Jun, 2008	Jul, 2008
Post-Implementation Data Acquisition	Oct, 2008	Nov, 2008
Report Preparation and Submittal	Nov, 2008	Dec, 2008
Project completion		Dec, 2008

Intersections to be included in this project are listed below (from west to east).

1	Ina Road / Silverbell Road	TOM
2	Ina Road / I-10 Interchange (2 intersections, 1 controller)	ADOT
3	Ina Road / Old Father Road	TOM
4	Ina Road / Thornydale Road	TOM
5	Ina Road / Meredith Blvd	TOM
6	Ina Road / Camino de la Tierra	PC
7	Ina Road / Shannon Road	PC
8	Ina Road / Mona Lisa Road	PC
9	Ina Road / La Cholla Blvd	PC
10	Ina Road / La Canada Drive	PC
11	Ina Road / Via Assisi / Paseo del Norte	PC
12	Ina Road / Oracle Road	ADOT

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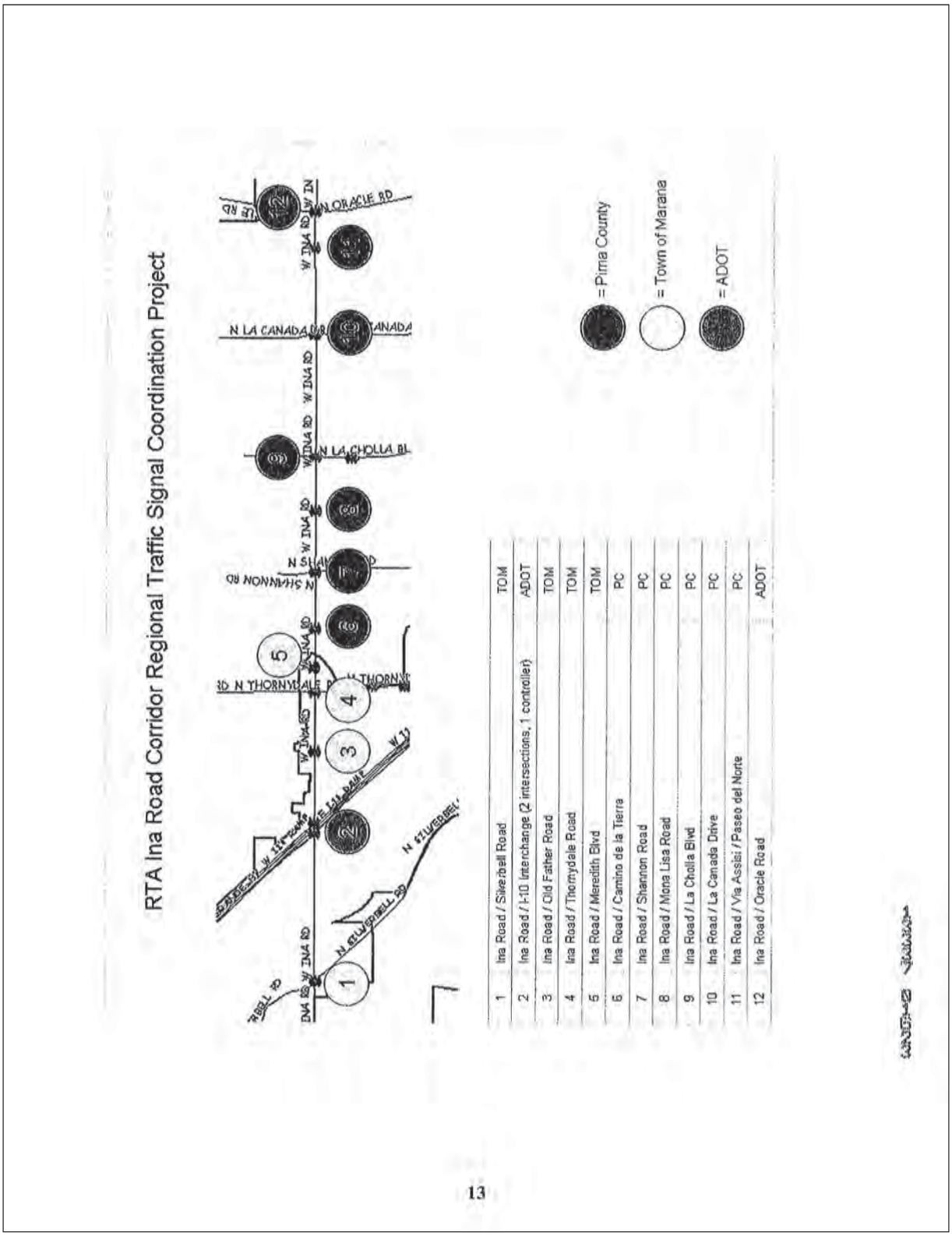

APPENDIX D12. SAMPLE SCOPE OF WORK: METROPOLITAN TRANSPORTATION COMMISSION—SAN FRANCISCO BAY AREA

APPENDIX C

CONSULTANT SCOPE OF WORK, SCHEDULE AND BUDGET

STANDARD SCOPE OF WORK

The purpose of the Program for Arterial System Synchronization (PASS) is to provide technical and financial assistance to Bay Area agencies to help improve the safe and efficient operation of certain traffic signal systems and corridors. The primary responsibility for the operation and retiming of traffic signals resides with the agency that owns them.

The services to be performed by Consultant will consist of services requested by the MTC Project Manager or a designated representative including, but not limited to, the following:

0. PROGRAM KICK-OFF

At the beginning of each annual cycle, Consultant will meet with the MTC Project Manager and other PASS consultants to discuss Program guidelines and standardization of services, deliverable formats, and project administration. Electronic files shall be named in accordance with a naming convention specified by MTC Project Manager.

1. PROJECT START-UP

1.1 Project Kick-Off Meeting – Consultant will schedule a meeting with the project sponsor, other involved agencies, and the MTC Project Manager or designated representative to kick-off the project; establish communication channels and protocols; discuss the scope of work, schedule, and budget; gather available information; and obtain a thorough understanding of the goals of the project. Specific topics to discuss include the turning movement data collection and times to collect travel time data.

1.2 Preparation of a Detailed Workscope, Schedule, and Budget – Consultant will prepare a Detailed Workscope, Schedule, and Budget (DWSB) for review and approval by the project sponsor, other involved agencies, and the MTC Project Manager. Consultant will finalize the DWSB based on comments received from the project sponsor, other involved agencies, and the MTC Project Manager. This deliverable is invoiced after the approval of the Final DWSB.

Deliverable 1A:	Draft Detailed Workscope, Schedule, and Budget
Deliverable 1B:	Final Detailed Workscope, Schedule, and Budget

2. ANALYSIS OF EXISTING CONDITIONS

Consultant will collect and analyze all information necessary to thoroughly understand existing traffic conditions in the study area and be able to develop optimal time-of-day traffic signal coordination plans and transit signal priority plans, if applicable.

2.1 Data Collection – Consultant will collect existing conditions data including, but not limited to, the following:

2.1.1. From the project sponsor and other involved agencies, Consultant will collect existing timing sheets, existing coordination plans, traffic signal as-built drawings, aerial photos, maps, and collision diagrams for the study intersections, if available.

2.1.2. From the project sponsor and other involved agencies, including transit properties, if any, Consultant will collect signal timing and signal priority preferences, including, but not limited to, those related to pedestrian and bicycle timing, leading and lagging left-turn phasing, and conditional service, as well as the timing optimization software preference.

2.1.3. Consultant will conduct weekday peak period turning movement counts at all study intersections, including pedestrian and bicycle counts, and seven-day 24-hour machine counts at strategic locations to determine periods of coordination. All counts shall be taken during times and days that are representative of the times and days for which coordination plans will be developed. It is preferred that all counts be summarized in MS Excel format.

2.1.4. Consultant will conduct a field review of all study intersections and street segments to verify lane geometry, speed limits, storage lengths, signal phasing, distances between intersections, and crosswalk lengths, unless the information is available through other sources such as aerial photos and speed surveys. Consultant will conduct a field review at key intersections to measure queue lengths and saturation flows for heavy movements.

2.1.5. Consultant will conduct a field review to observe typical traffic patterns during the weekday peak periods for which coordination plans will be developed. Consultant will note factors that are expected to affect signal progression including, but not limited to: intersections with high pedestrian or bicyclist volumes; over-saturated intersections; uneven lane distribution; high volumes of trucks and buses; high-volume unsignalized intersections, including interchanges; parking maneuvers; and presence and location of bus stops.

2.1.6. Consultant will verify signal coordination and transit priority capabilities of existing equipment and communications infrastructure. Consultant will take digital photos of the controller cabinet and the contents of the controller cabinet, unless waived by the system owner. The digital photos may be taken during timing plan implementation, at the discretion of the Consultant.

2.1.7. Consultant will conduct travel time and delay studies, including number of stops, during times and days that are representative of the times and days for which coordination plans will be developed. A minimum of four runs shall be conducted for each direction for each peak period. Travel time and delay studies shall be conducted using the floating car method. The time of performance of the travel time and delay studies will be defined at the kick-off meeting.

2.2 Analysis of Existing Conditions – Consultant will analyze the data obtained from Task 2.1 as follows:

2.2.1 As permitted by the project stakeholders, Consultant will review initial and actuated settings for each study intersection to identify opportunities to minimize delay during non-coordination periods and enhance pedestrian and bicyclist safety. The analysis shall include, but not be limited to, review of minimum and maximum green settings; yellow and red times; pedestrian timing; and gap, extension, and reduction settings.

2.2.2 Consultant will review collision diagrams for the study intersections, if available, to identify patterns that are susceptible to correction through signal timing.

2.2.3 Using software specified by the project sponsor, Consultant will develop a model of the study area and calibrate the model based on field observations of existing conditions. Signal coordination optimization software may include, but not be limited to, Synchro, TRANSYT 7-F, or PASSER. Transit signal priority modeling software may include, but not be limited to, VISSIM or Paramics. Consultant will calibrate the model based on travel time and delay studies and field observations of queue lengths and saturation flows for heavy movements at key intersections.

2.2.4 Consultant will summarize the results of the existing conditions analyses in an Existing Conditions Technical Memorandum. At a minimum, the Memo will include: description of the roadway network and surrounding land uses, including a map showing the study intersections; description of traffic volumes, including day-to-day variability and directionality; description of traffic signal controllers and communication capabilities; identification of factors that are expected to affect progression; results of analysis of initial and actuated settings; description of collision patterns that may be susceptible to correction through signal timing; measures of effectiveness, including delay, number of stops, and travel time from the travel time and delay studies, and fuel consumption and emissions using a methodology specified by MTC; and model calibration results, including a summary of changes to the optimization software's default values. Consultant may be required to meet with the project sponsor and other involved agencies to present and discuss the results of the Memo. Consultant will finalize the Memo based on comments received from the project sponsor, other involved agencies, and the MTC Project Manager.

Deliverable 2A:	Draft Existing Conditions Technical Memorandum, including computer model with existing timings
Deliverable 2B:	Final Existing Conditions Technical Memorandum, including computer model with existing timings

3. DEVELOPMENT OF RECOMMENDATIONS

Consultant will develop recommendations of optimal initial and actuated settings; time-of-day coordination plans and hours of coordinated operation; and transit signal priority plans and hours of operation, if applicable. Development of optimal time-of-day coordination plans shall include analyses of signal grouping; phasing and phase sequence, including conditional service; cycle lengths, splits, and offsets. Consultant will summarize recommendations in a Recommendations Technical Memorandum. The Memo shall also include a comparison of existing and proposed timings and a description of expected improvements. Consultant will finalize the Memo based on comments received from the project sponsor, other involved agencies, and the MTC Project Manager.

Deliverable 3A:	Draft Recommendations Technical Memorandum, including computer model with recommended timings
Deliverable 3B:	Final Recommendations Technical Memorandum, including computer model with recommended timings

4. IMPLEMENTATION AND EVALUATION

Consultant will implement and evaluate the approved improvements as follows:

4.1 Consultant will prepare for review and approval by the project sponsor and other involved agencies appropriate timing sheets based on the approved timing plans. Consultant will revise the timing sheets based on comments received from the project sponsor and other involved agencies.

4.2 Consultant will implement, or assist agency staff in the implementation of, the new settings and timings. Implementation may have to be done in the field or from a central location, depending upon communication capabilities and agency preferences.

4.3 Consultant will fine-tune, or assist agency staff in the fine-tuning of, the new settings and timings. Consultant will fine-tune timings in the field and record all changes. Fine-tuning shall be conducted during times and days that are representative of the times and days for which coordination plans were developed. This also requires additional field visits to verify and assess any changes made during the fine-tuning process.

4.4 Consultant will conduct travel time and delay studies, including number of stops, at the key corridors identified under Task 2.1.7. Travel time and delay studies shall be conducted during times and days that are representative of the times and days for which coordination plans were developed. A minimum of four runs shall be conducted for each direction for each peak period. Travel time and delay studies shall be conducted using the floating car method.

4.5 Consultant will provide to the MTC Project Manager electronic files of all traffic counts, and controller and cabinet information, in a file-naming convention specified by MTC.

4.6 Consultant will calculate measures of effectiveness of the improved system, including delay, number of stops, travel time, fuel consumption, emissions, benefit: cost, and cost effectiveness for emissions reductions. The methodology for calculating fuel consumption, emissions, benefit: cost, and cost effectiveness for emissions reductions will be specified by MTC.

4.7 Consultant will prepare a Final Timings and Evaluation Technical Memorandum, which will include but not be limited to: the final periods of coordination; changes between the timings recommended under Task 3 and the final timings that were implemented; the number of locations where changes were made to better accommodate pedestrians and/or bicyclists; and the results of the evaluation of measures of effectiveness.

Deliverable 4A:	Revised Timing Sheets
Deliverable 4B:	Final Timings and Evaluation Technical Memorandum, including final timing sheets with computer model, field review with local jurisdiction, and the Benefit-cost analysis worksheet

5. ADDITIONAL SERVICES

For projects involving transit signal priority, cut-through traffic studies, multiple traffic signal systems, cross-coordination, interconnecting state and local systems, etc., Consultant may be requested to perform services in addition to those described above. Such services may include, but are not limited to, additional meetings, field visits, studies, fine-tuning, procuring and installing GPS clocks, conditional diagrams, updating Visio coversheets when applicable, etc. Should additional services be requested by the MTC Project Manager, Consultant shall include a detailed description of such additional services, a staffing plan, and a man-hour estimate in its DWSB. The scope of these services, as well as the fixed price to be added to the base fee per intersection, will be negotiated on a case-by-case basis. Additional services may also be requested by Consultant after the DWSB has been approved by requesting an amendment to the approved DWSB. If the project requires procuring GPS clocks using the $10,000 per project communication systems improvement funding under PASS, the Consultant shall procure these clocks and invoice MTC as an additional service. The procedures for the installation of this equipment will be discussed in detail at the project kick-off meetings.

6. REDUCED SERVICES

Consultant may be requested to perform only some of the services above in cases where some services are not part of the PASS project, are already available, or agency staff wishes to perform them themselves. Should reduced services be requested, Consultant shall identify in its DWSB which tasks will be performed by the Consultant and which will be performed by the agency. The fee for reduced services shall be a percentage of the base fee per intersection that is commensurate with the proportion of the services to be performed by Consultant. Deliverables will be negotiated on a case-by-case basis.

BUDGET AND BASIS OF PAYMENT

1. BUDGET FOR BASIC SIGNAL COORDINATION

MTC will pay consultants on a fixed fee basis, based on the following fee schedule.

Service (Tasks 0 through 4)	Amount Due*
Time-of-day signal coordination with timings implemented remotely from intersection, e.g., via dial-up or from traffic management center	$2350 per intersection for three scenarios $2100 per intersection for two scenarios
Time-of-day signal coordination with timings implemented in the field	$2550 per intersection for three scenarios $2300 per intersection for two scenarios

* Scenario = two-hour morning, off-peak/midday, or afternoon weekday peak period

2. BUDGET FOR ADDITIONAL SERVICES

MTC recognizes that some projects may require additional analyses, e.g. those involving transit signal priority, cut-through traffic studies, multiple traffic signal systems, cross-coordination, interconnecting state and local systems, etc. The budget for the additional services portion of these projects is based on the nature of the technical assistance requested by the project sponsor, and is finalized at the project kick-off meeting.

3. BASIS OF PAYMENT

MTC will pay consultants by deliverable based tasks based on the following payment schedule. Payment will be authorized after both the project sponsor and the MTC Project Manager have approved the deliverable.

Task	Deliverables (#)	Payment
1.	Draft and Final Detailed Workscope, Schedule and Budget (#1A and #1B)	5% of Base Project Budget
2.	Draft Analysis of Existing Conditions Technical Memorandum (#2A)	35% of Base Project Budget
2.	Final Analysis of Existing Conditions Technical Memorandum (#2B)	10% of Base Project Budget
3.	Draft Recommendations Technical Memorandum (#3A)	15% of Base Project Budget
3.	Final Recommendations Technical Memorandum (#3B)	10% of Base Project Budget
4.	Revised Timing Sheets (#4A)	10% of Base Project Budget
4.	Final Timings and Evaluation Technical Memorandum (#4B)	15% of Base Project Budget
5.	Additional Services or Equipment Purchases	To Be Negotiated

Abbreviations used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation