



GUIDELINES FOR THE PREPARATION OF

LOCAL SIGNAL SYNCHRONIZATION PLANS

April 2023

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Chapter 1. Overview

On November 6, 1990, voters in Orange County approved a ½-cent sales tax for transportation improvements known as Measure M. This sales tax includes funding for streets and roads available to eligible local agencies through both a formula distribution and a competitive process. On November 6, 2006, voters approved Measure M2 to continue the ½-cent sales tax for thirty years, beginning in 2011. Project P, the Regional Traffic Signal Synchronization Program (RTSSP), was included as part of Measure M2.

The RTSSP is comprised of a 750-mile regional signal synchronization network with approximately 2,000 signals. The goals of the program are to improve the flow of traffic on Orange County streets and roads by implementing multi-agency signal synchronization. Local agencies and Caltrans are encouraged to work cooperatively with the Orange County Transportation Authority (OCTA) to synchronize traffic signals throughout Orange County on a corridor basis to improve travel time and reduce stops. Local agencies will maintain local control and responsibility for signals within their jurisdiction. Any changes to traffic signals, signal timing equipment, or related signal policies (including transit signal priority, transit preemption, or emergency vehicle preemption) are at the full discretion of the responsible local agency.

1.1. Measure M2 Eligibility Requirements

1.1.1. Local Signal Synchronization Plan Initial Adoption

Eligibility requirements included in Measure M2 specify that each local jurisdiction must adopt a local signal synchronization plan (LSSP). For eligibility purposes, each local jurisdiction initially adopted a LSSP in 2010 that included the following components:

- Signal synchronization goals
- Traffic signal synchronization street routes
- Traffic signal inventory
- Three-year capital, operations, and maintenance plan

1.1.2. Local Signal Synchronization Plan Update

Subsequent to the adoption of each 2010 LSSP, the local agencies must maintain and update their respective LSSP for the duration of Measure M2 to remain eligible for Measure M2 funding. In addition to refreshing the section 1.1.1 elements included in the adopted LSSP with current information, the update shall include information on the following:

- Review and revise signal timing, as may be necessary, along traffic signal synchronization street routes and traffic signals based on the signal synchronization assessment.
- Report on the status and performance of signal synchronization activities along the traffic signal synchronization street routes and traffic signals. Jurisdictions may use related efforts that are included as part of the Regional Traffic Signal Synchronization Master Plan (Appendix A) to the extent appropriate to fulfill

this reporting requirement. In addition, performance results from Project P corridor projects completed since the last update may be included.

For eligibility purposes, this means that a local agency must update an adopted plan by June 30, 2023, concurrent with the annual eligibility cycle and every three years thereafter. For a plan update, city council adoption is required.

The following table outlines the LSSP eligibility requirements and completion dates for the first seven years of Measure M2. Additionally, the table identifies the fiscal years for which the eligibility requirement applies.

Local Signal Synchronization Plan Eligibility Requirement and Completion Date	Applicable Fiscal Years (FY)
<i>Initial Adoption</i> Completed: December 31, 2010	Part of FY 2010-11 as well as all of FY 2011-12 through FY 2013-14
<i>Subsequent 3-Year Updates:</i> Completed: June 30, 2014 Completed: June 30, 2017 Completed: June 30, 2020	FY 2014-15 through FY 2016-17 FY 2017-18 through FY2019-20 FY2020-21 through FY 2022-23
<i>Current 3-Year Update</i> Completion Date: June 30, 2023	FY 2023-24 through FY 2025-26

1.2. Local Match Reduction

By implementing, maintaining, and operating an LSSP in conformance with the Regional Traffic Signal Synchronization Master Plan (Master Plan), a local agency benefits through a local match reduction of 10 percent of eligible costs as part of the Regional Capacity Program (Project O) competitive grant program.

1.3. Purpose and Objectives of LSSP

LSSPs provide a tool to succinctly report local agency plans, goals and objectives regarding signal operations. Budgetary needs and system performance metrics are included to help communicate overall system operations and investment effectiveness. Submittal of these plans as part of the Measure M2 Eligibility (M2 Eligibility) process enables OCTA verification of consistency with the Master PlanC.

This manual provides guidelines and procedures necessary for Orange County agencies to develop and maintain their LSSP in conformance with the criteria stated in the Measure M2 Ordinance No. 3. The guidelines outline the components of the LSSP and the required documents to fulfill the signal synchronization portion of the M2 Eligibility process, including a "Consistency Review Checklist" in Appendix B.

It should be noted that these guidelines provide the framework for meeting minimum requirements to achieve M2 Eligibility. Local agencies are encouraged to plan beyond these

basic parameters and fully consider the role traffic systems management plays in safe, cost-effective improvements in tandem with other transportation investments. Many agencies have enhanced the signal network planning within their communities by expanding the regional signal network identified in the RTSSP to include “local” routes that are found on the Master Plan of Arterial Highways (MPAH). In many instances, these network additions are made in concert with neighboring jurisdictions to enhance multi-jurisdictional coordination.

Chapter 2. Local Signal Synchronization Plan Guidelines

The LSSP guidelines are discussed under the following categories:

- Signal synchronization goals
- Traffic signal synchronization street routes
- Traffic signal inventory
- Three-year capital, operations, and maintenance plan
- Signal synchronization timing review, revision, and assessment

2.1. Signal Synchronization Goals

The Measure M2 RTSSP is envisioned as a multi-agency, corridor-based approach that optimizes the performance of traffic signals based on existing traffic patterns. The approach acknowledges local agency responsibility and control of signal timing, and works with those agencies to develop acceptable synchronization timing. Concurrence with these broad goals shall be provided. Information on how traffic signals and street routes may be coordinated across jurisdictional boundaries shall be described.

The LSSP should provide sufficient information to describe the role of existing and planned synchronized signals and coordinated corridors within the city ensuring an efficient and effective transportation circulation system. Supporting information including compatible traffic signal timing technical parameters and communication with other agencies should be included. Additional information including existing traffic patterns and time periods when synchronization is implemented (peak periods, midday, and weekends) may be expanded upon as necessary.

The depth of discussion regarding comprehensive future planning is at the discretion of each agency. Careful consideration regarding connected vehicle capability, operational versus capacity improvements, replacement of obsolete equipment and other traffic management strategies are encouraged.

2.2. Traffic Signal Synchronization Street Routes

At minimum, all street routes included in the RTSSP located within the local agency boundaries must be identified by the LSSP, regardless of implementation status, ownership and operating responsibility. Reductions below that level will result in the LSSP being inconsistent with the RTSSP Master Plan and therefore not meet M2 eligibility requirements. Local agencies have the option to include additional streets not part of the Master Plan. This information will be useful for cities and OCTA to coordinate future projects with neighboring jurisdictions and aid in development of funding strategies. OCTA will provide maps with the MPAH network identified for each local agency to facilitate this process.

2.3. Traffic Signal Inventory

Traffic signals that are part of the local agency signal synchronization routes identified in section 2.2 shall be inventoried in the LSSP, regardless of ownership and operating responsibility. The inventory is designed to help improve information flow to enhance signal coordination between agencies. Along with the signal inventory, cycle length information by time period shall be provided. This information will aid in tracking technology opportunities

and potential gaps in the regional network. Maintenance responsibility for shared signals should be indicated.

2.4. Three-year Capital, Operations, and Maintenance Plan

Implementing, maintaining and updating signal synchronization includes initial and periodic capital equipment investment and periodic timing plan updates. The LSSP identifies specific goals, routes and equipment required to ensure network operability with maximum traffic management efficiency. A planning level budget estimate shall be presented reflecting expenditures required to fully implement near term (three year) and long-term (beyond three years) synchronization program. These scenarios should be presented without regard to available funds (unconstrained scenario). The 3-year budget estimate shall be provided by fiscal year and separated into capital, operations, and maintenance elements. This unconstrained scenario should be presented with candidate signal synchronization projects for planning purposes. These projects may be submitted as part of future Project P calls for projects.

A separate three-year budget estimate based upon available funding (constrained scenario) using resources the local agency will commit to signal synchronization efforts shall also be provided. Anticipated monies not yet awarded as part of competitive Project P should not be included in this constrained plan. This budget estimate shall be provided by fiscal year and separated into capital, operations, and maintenance elements.

The following definitions are provided to help meet the intent of the three-year plan. Capital should include traffic signal infrastructure (e.g., detection and traffic controllers) and communication infrastructure (e.g., Ethernet and software for system traffic control) improvements necessary to achieve signal synchronization. Operations should consist of the development, on-going review/monitoring, and fine-tuning of synchronized signal timing. Finally, maintenance should comprise of the upkeep of traffic signal and communication infrastructure related to signal synchronization. Routine signal maintenance such as replacing signal heads, bulbs, and poles may be included as "ongoing maintenance" and would not be considered replacement or upgrade of obsolete equipment. The inclusion of other costs not listed here shall be at the discretion of the local agency.

2.5. Signal Synchronization Timing Review, Revision, and Assessment

This section shall show the status of required signal synchronization timing reviews along the agency's identified signal synchronization routes. Timing revisions should be noted; if additional information such as a "before and after study" is available, it should be provided. Qualitative descriptions of the review process may also be provided if desired. In addition, specific details may be provided on the signal timing revisions such as cycle length changes.

A signal synchronization assessment shall be provided by each local agency. This assessment will report on the performance of synchronization activities along the signal synchronization street routes and traffic signals. The assessment shall be prepared based on overall performance criteria that may include average speeds, green lights to red lights, and stops per mile. Jurisdictions may collect assessment data themselves or use the assessment information collected by OCTA.

Chapter 3. Agency Submittals

This chapter summarizes for submittal purposes the information required to fulfill the LSSP requirements. This information has been described more fully previously in this document. As a summary, local agencies must submit the following to OCTA:

- Local Signal Synchronization Plan which includes the following:
 - Signal synchronization goals
 - Concurrence with the goals: corridor-based, multi-agency, existing traffic patterns, and local traffic signal timing and operation responsibility
 - Traffic management objectives
 - Traffic signal synchronization street routes
 - Regional signal synchronization network from the Master Plan
 - Relationship to Master Plan of Arterial Highways
 - Additional local streets, if desired
 - Traffic signal inventory for traffic signal synchronization street routes
 - Traffic signals
 - Cycle length data by time period
 - Controller type, communications, equipment details
 - Status of the signals (online, offline, local) at the time of the inventory
 - Three-year plan showing capital, operations, and maintenance costs
 - Unconstrained scenario with candidate projects
 - Constrained scenario
 - Signal synchronization review, revision, and assessment
 - Note timing reviews and updates underway and those completed since the 2020 LSSP Update
 - Identify revisions
 - Provide performance assessment including before/after study results, CPSI summary information, etc.
- Local Signal Synchronization Plan Consistency Review Checklist (Appendix B)

Appendices

- A. Regional Traffic Signal Synchronization Master Plan
- B. Local Signal Synchronization Plan Consistency Review Checklist

Appendix A: Regional Traffic Signal Synchronization Master Plan

Appendix A: Regional Traffic Signal Synchronization Master Plan

Introduction

The Regional Traffic Signal Synchronization Program is comprised of a 750-mile regional signal synchronization network with about 2,000 signals. The goals of the program are to improve the flow of traffic on Orange County streets and roads by implementing multi-agency signal synchronization. Local agencies and Caltrans are encouraged to work cooperatively with the Orange County Transportation Authority (OCTA) to synchronize traffic signals throughout Orange County on a corridor basis to improve travel time and reduce stops. Local agencies will maintain local control and responsibility for signals within their jurisdiction and control. Any changes to traffic signals, signal timing equipment, or related signal policies (including transit signal priority, transit preemption, or emergency vehicle preemption) are at the full discretion of the responsible local agency.

Regional Traffic Signal Synchronization Master Plan Components

To ensure that this program is successful, this Regional Traffic Signal Synchronization Master Plan (Master Plan) has been developed through local agency discussions, Board of Director guidance and Measure M2 requirements. The Regional Traffic Signal Synchronization Program (RTSSP) is composed of the following:

1. Regional Signal Synchronization Network (SSN)
2. Priority corridors for accelerated signal synchronization
3. Traffic forums
4. Model agreements (presenting roles and responsibilities)
5. Signal synchronization regional assessment

In defining these five elements of the Master Plan, the foundation is set for funding and implementing the competitive RTSSP. The program focuses on higher volume priority corridors for an accelerated signal synchronization effort. It incorporates traffic forums to help implement and maintain signal synchronization along corridors. Model agreements define the roles and responsibilities for local agencies and OCTA resulting in competitively funded projects that successfully meet the goals of the RTSSP.

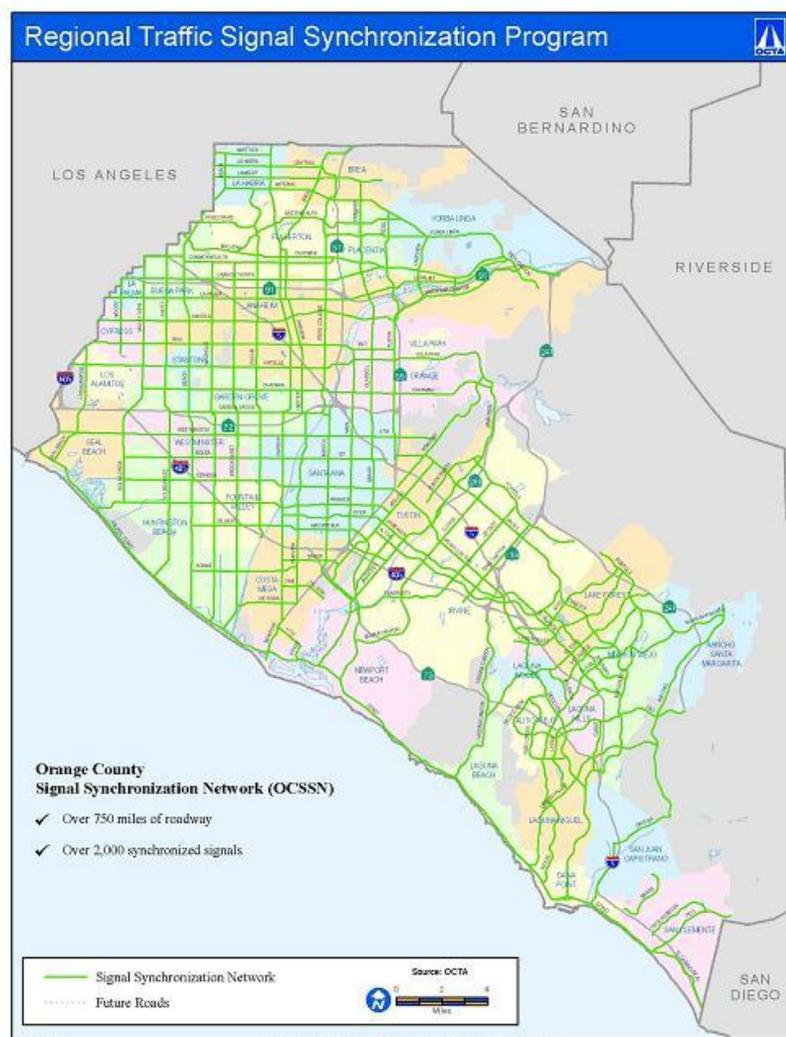
Finally, to ensure compliance with the M2 Ordinance and the promises made to voters to benefit the public from this effort, OCTA will include an element for accountability purposes that will occur through a signal synchronization regional assessment prepared by OCTA every three years. This effort will evaluate performance of the regional signal synchronization network, and identify areas for future improvement. Each of these elements is further discussed below.

Regional Signal Synchronization Network

The regional signal synchronization network (see below) was defined in the Measure M2 Ordinance No. 3. It is a 750-mile network consisting of approximately 2,000 signalized intersections. It is a subset of the Master Plan of Arterial Highways (MPAH). The Master Plan is designated as an element of the MPAH. Specifically, Measure M2 Ordinance No. 3 includes the following definition of the MPAH:

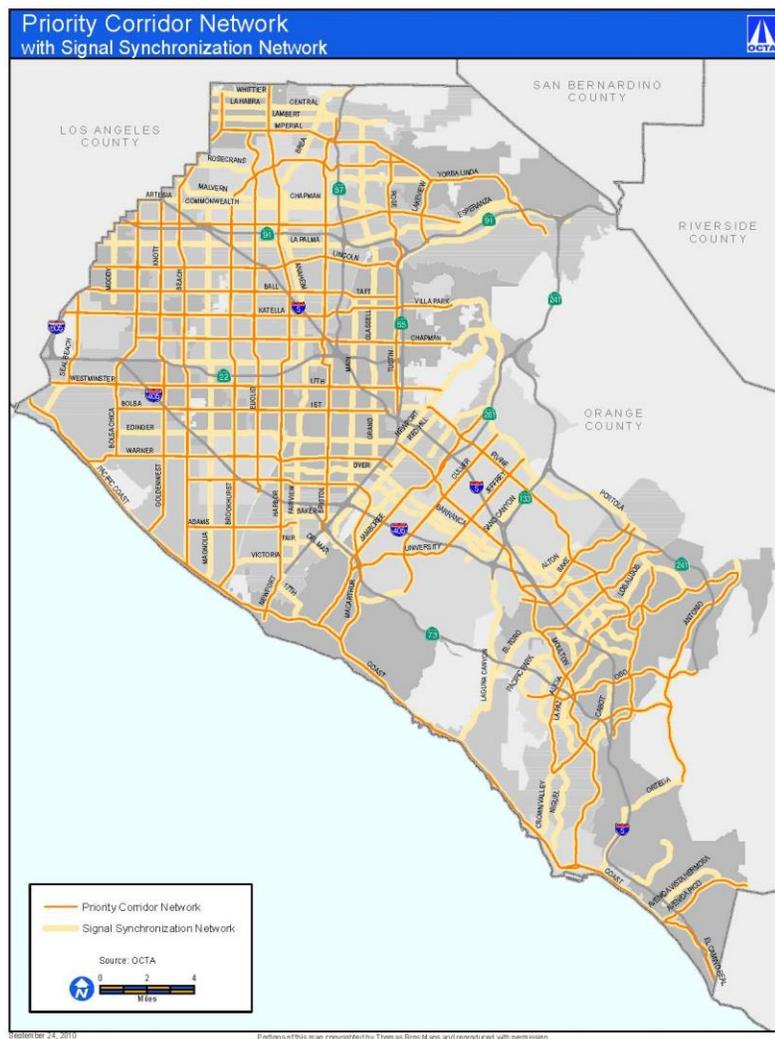
“A countywide transportation plan administered by the Authority defining the ultimate number of through lanes for arterial streets, and designating the traffic signal synchronization street routes in Orange County.”

OCTA has a well-defined process for changes to the MPAH. A procedure for updating the 750-mile signal network will be defined in the future and included in the Guidelines for the MPAH. This would allow documentation and approval of changes to the SSN.



Priority Corridors for Signal Synchronization

Focusing a significant portion of Project P resources to a core set of priority corridors is a main component of the Master Plan. This focused effort will result in a high level of performance along key corridors given the limited resources that are part of the RTSSP. These priority corridors were developed in consultation with and the assistance of the local agencies. They are based on the significance of each route, the traffic volumes, and geographic traffic patterns.



Under this focused effort, signalized intersections along each corridor will be upgraded to provide state of the practice intersection control and associated communications. Optimized timing plans will be developed and implemented along each corridor, aiding movement of the existing traffic patterns. This approach is considered essential to producing an optimized system as early as possible.

The map provides the locations of approximately 36 priority corridors identified along the regional signal synchronization network. These priority corridors reflect key locations for signal synchronization along the signal network. As the Master Plan is implemented through Project

P funds, changes to the priority corridors may be made based on results of the regional assessment subject to OCTA's Board of Directors approval.

Priority corridors ensure implementation of optimized signal timing in a systematic manner. These priority corridors will allow the RTSSP to quickly and continually meet its stated purpose of improving the flow of traffic by developing and implementing signal synchronization that cross jurisdictional boundaries. Most importantly, a priority corridor strategy will facilitate consistent operating speeds along key corridors and provide a good level of public perception.

Traffic Forums

Project P is a competitive program designed to implement signal synchronization across multiple jurisdictions. Traffic forums will facilitate the completion of traffic signal synchronization projects. Traffic forums will be working group sessions that include local agencies, the California Department of Transportation (Caltrans), and OCTA. The interaction between cities, Caltrans, and OCTA will help coordinate multiple signal synchronization projects funded through the RTSSP. It will also provide a venue to project participants to express and address concerns. Participation at the traffic forums is mandatory to satisfy M2 Eligibility requirements.

Model Agreements

The Master Plan includes model agreement terms that set expectations for roles and responsibilities for the implementation of signal synchronization on a project basis. These agreements would be executed following award of Project P funds through a competitive process. It is anticipated that multiple agreements would be developed based on the number of projects funded as part of Project P. A more detailed version of the agreement will be developed and include all local agencies that are identified in the competitive application as well as OCTA.

The model agreement terms help guide the respective roles and responsibilities for the lead agencies, participating agencies, and OCTA. Two versions of the proposed agreements are presented. Option 1 allows the local agencies to implement the synchronized corridors using Project P and local funds while Option 2 authorizes OCTA to implement the synchronized corridors on behalf of the local agencies. The default is Option 1, and local agencies will be required to formally request Option 2.

Signal Synchronization Regional Assessment

To keep the public informed of ongoing signal synchronization efforts, OCTA will prepare a signal synchronization regional assessment every three years. This effort will evaluate status performance of synchronization across agencies along the signal network and identify segments for improvement. An assessment will be prepared based on overall performance for each corridor in the Master Plan; and that assessment will be described using average speed, stops per mile, and the ratio of green signals to red signals. The regional assessment will be provided to the local agencies and may be used in calls for projects for Project P.

Summary

Measure M2 Ordinance No. 3 requires that OCTA develop a Regional Traffic Signal Synchronization Master Plan for cross-jurisdictional traffic signal synchronization. Combined with input from local agencies and OCTA's Board of Directors, the Regional Traffic Signal Synchronization Program is described by the following five components:

1. Regional signal synchronization network – provides the basis for signal synchronization
2. Priority corridors – identifies key corridors for accelerated signal synchronization
3. Traffic forums – working group sessions to facilitate continued signal synchronization
4. Model agreements – define roles and responsibilities for signal synchronization
5. Signal synchronization regional assessment – provides triennial evaluation of regional signal synchronization

These five elements of the Regional Traffic Signal Synchronization Program define the process implementing the competitive Regional Traffic Signal Synchronization Program.

Exhibits

- A. Local Agency Lead Model Agreement Terms – Option 1
- B. OCTA Lead Model Agreement Terms – Option 2

Exhibit A: Local Agency Lead Model Agreement Terms - Option 1**RESPONSIBILITIES OF THE ORANGE COUNTY TRANSPORTATION AUTHORITY:**

The Orange County Transportation Authority agrees to the following responsibilities for the project:

- To provide Project P funds for the project, which will be designated to the lead agency
- To perform outreach activities for the project and to communicate major project milestones and results
- To provide oversight in order to maintain inter-jurisdictional traffic signal operational integrity between existing and new projects and operations
- To provide project audits for allowable expenditures and exceptions

RESPONSIBILITIES OF DESIGNATED LEAD AGENCY:

Lead agency agrees to the following responsibilities for implementation and funding for the project:

- To manage, procure, implement, process payments, and request reimbursements for the project consistent with the agreed scope of work, schedule, and key milestones
- To interface with the Orange County Transportation Authority and coordinate outreach for the project
- To collect manual intersection movement and automated machine traffic counts
- To develop new timing plans optimized for signal synchronization
- To provide updated timing plans and traffic count data to the Orange County Transportation Authority and agencies
- To prepare "before" and "after" studies for the project. These studies shall be provided to the agencies and the Orange County Transportation Authority for comment
- To provide the Orange County Transportation Authority with a Project Final Report for the project as required by Measure M2 Ordinance No. 3, Section (B)(III)(9), and further described in Measure M2 Eligibility Guidelines separately prepared and adopted by the Orange County Transportation Authority

RESPONSIBILITIES OF ALL PROJECT AGENCIES:

ALL project agencies agree to the following responsibilities for implementation and funding of the project:

- To provide a technical representative from each agency to meet and participate as a member of the project team
- To designate the lead agency for the project for receipt of Project P funds and related matching funds
- To maintain M2 Eligibility

- To authorize the lead agency to manage, procure, and implement all aspects of the project
- To provide local match or in-kind services for the project in accordance with the 20 percent requirement as identified in the scope of work
- To provide lead agency and the Orange County Transportation Authority all current intersection, local field master, and/or central control system timing plans and related data upon request
- To provide plans, specifications, and estimates to the Orange County Transportation Authority and lead agency or its representative upon request
- To give project related signal and telecommunications equipment a high maintenance priority
- To take reasonable steps to keep signal control systems, inter-tie, detection systems and related equipment in proper working order
- To maintain and repair their own signal control systems inter-tie, detection systems and related equipment located within each of their respective jurisdiction
- To provide all plan check, permit, and construction inspection functions for facilities within their ownership or control
- 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 scope of work
- To authorize an agency traffic engineer or other designee to make changes or adjustments to the signal timing plans, when required
- To perform the changes required at central or field control locations and/or intersection controller assemblies

Exhibit B: The Orange County Transportation Authority Lead Model Agreement Terms - Option 2

RESPONSIBILITIES OF THE ORANGE COUNTY TRANSPORTATION AUTHORITY:

The Orange County Transportation Authority agrees to the following responsibilities for the project:

- To manage, procure, and implement the project consistent with the agreed budget, scope of work, schedule, and key milestones
- To provide Project P funds for the project
- To interface with the agencies and coordinate outreach for the project
- To collect manual intersection movement and automated machine traffic counts
- To develop new timing plans optimized for signal synchronization
- To provide new timing plans and turning movements to the agencies
- To prepare "before" and "after" studies for the project. These studies shall be provided to the agencies for comment
- To perform outreach activities for the project to communicate major project milestones and results
- To provide project oversight in order to maintain inter-jurisdictional traffic signal operational integrity between existing/legacy and new projects and operations
- To provide project audits for allowable expenditures and exceptions
- To prepare a Project Final Report for each project as required by Measure M2 Ordinance No. 3, Section (B)(III)(9), and further described in Measure M2 Eligibility Guidelines separately prepared and adopted by OCTA

RESPONSIBILITIES OF AGENCIES:

Agencies agree to the following responsibilities for implementation and funding of project:

- To provide a technical representative from each agency to meet and participate as a member of the project team
- To designate OCTA as lead agency for the project for receipt of Project P funds and related matching funds
- To provide local match or in-kind services for the project in accordance with the 20 percent requirement as identified in the scope of work
- To authorize OCTA to manage, procure, and implement all aspects of the project
- To provide OCTA all current intersection, local field master, and/or central control system timing plans and related data upon request
- To give project related signal and telecommunications equipment a high maintenance priority
- To take reasonable steps to keep signal control systems, inter-tie, detection systems and related equipment in proper working

- To provide all plan check, permit, and construction inspection functions for facilities within their ownership or control
- To maintain and repair their own signal control systems inter-tie, detection systems and related equipment located within each of their respective jurisdiction
- 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
- To authorize an agency traffic engineer or other designee to make changes or adjustments to the signal timing plans, when required
- To perform the changes required at central or field control locations and/or intersection controller assemblies

Appendix B: Local Signal Synchronization Plan Consistency Review Checklist

Appendix B: Local Signal Synchronization Plan Consistency Review Checklist

Local Agency Name: _____ Date: _____

Local agencies must submit a copy of the updated Local Signal Synchronization Plan, a completed checklist, and any supporting documentation.

Complete the table below:

Local Agency Statement	Page #s in LSSP	Provided or N/A
1. Signal synchronization goals of the agency are consistent with those outlined as part of the Regional Traffic Signal Synchronization Master Plan.		
2. Traffic signal synchronization street routes are identified, including all corridors along the regional signal synchronization network located within the local agency.		
3. Traffic signal inventory for all traffic signal synchronization street routes.		
4. Three-year plan separately showing costs, available funding, and phasing for capital, operations, and maintenance of signal synchronization along the traffic signal synchronization street routes and traffic signals, which may include unconstrained and build-out scenarios.		
5. Signal synchronization review, revision, and assessment of synchronization activities along the traffic signal synchronization street routes and traffic signals.		

I certify that the above statements are true to the best of my knowledge.

Signature

Date

Printed Name, Title



GUIDELINES FOR THE PREPARATION OF

LOCAL SIGNAL SYNCHRONIZATION PLANS

April 2023