



November 1, 2021

To: Regional Planning and Highways Committee
From: Darrell E. Johnson, Chief Executive Officer
Subject: Regional Traffic Signal Synchronization Program Update

Overview

The Orange County Transportation Authority has been working with local cities, the County of Orange, and the California Department of Transportation to fund and implement key regional traffic signal synchronization projects. This report provides an update on the Measure M2 Regional Traffic Signal Synchronization Program, including results from recently completed projects.

Recommendation

Receive and file as an information item.

Background

The Orange County Transportation Authority (OCTA) provides funding and assistance to implement multi-agency signal synchronization as part of the Measure M2 (M2) Regional Traffic Signal Synchronization Program (Project P). Annually, OCTA provides competitive grants dedicated to the coordination of traffic signals across jurisdictional boundaries. The goal of Project P is to improve traffic flow by developing and implementing regional signal coordination that crosses local agencies' boundaries and maintains coordination through freeway interchanges, where possible.

Since 2008, OCTA and local agencies have implemented 94 signal synchronization projects that include 3,265 signalized intersections and 838 centerline miles of streets (Attachment A). The projects have improved travel times, reduced delays and congestion, and increased the number of successive green lights drivers experience in their daily commutes. The results of the program translate into direct benefits to motorists and the environment measured in time and cost savings from lower fuel consumption and a reduction of greenhouse gas (GHG) emissions.

Discussion

Signal synchronization is a cost-effective way to maximize roadway throughput without major new construction. Projects are corridor-based, and new optimized signal timings are developed based on traffic conditions and current travel patterns. These projects optimize traffic signal timing to reduce travel times, stops, delays, and ultimately give users an overall better driving experience. Key to these efforts is regular dialogue between partner agencies and the California Department of Transportation, resulting in agencies working together towards the multijurisdictional goal of the program.

Funding is provided through annual calls for projects (call), with 80 percent of funding from M2 (Project P) and 20 percent from local agencies' matching funds. Supplemental funding is used whenever available, including SB 1 (Chapter 5, Statutes of 2017) Local Partnership Program funds, and Solutions for Congested Corridors Program grants. Various sources have been used in the past to fund signal synchronization projects, including Measure M1, Proposition 1B Traffic Light Signal Synchronization Program, and air quality funds.

Signal synchronization projects implement a coordination strategy involving time-based synchronization of the respective agencies' systems, including the necessary upgrades to the traffic signal infrastructure. This includes modifications to prepare for future connected and autonomous vehicle technologies and applications. Existing synchronization on crossing arterials is incorporated when and where possible. Optimized timings are developed and implemented for identified peak periods, which are typically weekday mornings, midday, and evenings. For weekend operations, the peak is typically mid-morning through early evening. To quantify signal synchronization benefits, "before" and "after" travel time studies are conducted to evaluate the improvements from these new optimized timing plans.

These studies are conducted during peak traffic periods with specially equipped vehicles that have computer-linked global positioning system devices to collect traffic data. Several runs are made in each direction with the car "floating" in the middle of the traffic platoon of vehicles for each run. These studies showed improvements across all performance measures, including travel time, number of stops, and average safe speed. Additionally, fuel consumption, GHG, and other vehicle emission data is reported (Attachment B). Historically, signal synchronization efforts nationwide have resulted in travel time and speed improvements, as well as a reduction in stops in the range between five and 15 percent. Comparisons of the corridors' before and after studies indicate results in the high-end of this range due to the combination of the optimized traffic signal timing plans, cooperation between all participating agencies, and minor signal upgrades to maximize traffic flow.

Signal Synchronization Projects

The signal synchronization program's target is to regularly synchronize 2,000 signalized intersections, as expressed in the M2 voter guide. OCTA and local agencies have completed 94 signal synchronization projects since 2008. A total of 3,265 signalized intersections and 838 centerline miles of streets have been implemented. The total Board of Directors' (Board) grant allocations for the completed projects were approximately \$78 million. The completed projects are identified on the map in Attachment A. A summary of the results for the 94 completed signal synchronization projects is identified in Attachment B. The early acceleration of Project P allowed the benefits of signal synchronization to be experienced by travelers much earlier than originally promised.

The completed projects have reduced average travel time by 12 percent and the average number of stops by 28 percent. Average speed improved by 14 percent. Consumers will save approximately \$201.1 million (at \$3.90 per gallon in today's dollars) on fuel costs and reduce GHG emissions by approximately 1.04 billion pounds over the three-year project cycle. The reduction of GHG emissions is made possible by reducing the number of stops, smoothing the flow of traffic, and reducing the amount of acceleration and deceleration of vehicles. These results are comparable to signal synchronization efforts nationwide.

The following table lists five signal synchronization projects, where new timing plans were implemented within the last two years, along with the corresponding travel time and speed improvements:

Corridor	Limits	Length (Miles)	Travel Time Improvements	Average Speed Improvements
Brookhurst Street	Commonwealth Avenue to Pacific Coast Highway	16.51	19%	25%
Imperial Highway/SR-90	Cajon Drive-Brass Lantern Drive to Avocado Avenue	10.28	14%	17%
Los Alisos Boulevard Route	Columbia/Polaris Way to Promenade	10.92	2%	2%
Magnolia Street	Commonwealth Avenue to Banning Avenue	16.20	2%	0%
Main Street	Taft Avenue to Culver Drive	11.86	14%	15%

SR-90 – State Route 90

Note that these five projects faced significant challenges due to traffic patterns that fluctuated because of the pandemic. Most projects resulted in significant improvements in both travel time and speeds; however, in the case of Los Alisos Boulevard and Magnolia Street, the improvements were relatively limited. This was due to lower traffic volumes along the corridors and cross streets.

As part of the projects, other improvements were installed, which will greatly benefit future retiming efforts to quickly account for a return of traffic volumes. Traffic engineers continue to monitor and update the signal timing to respond to changes in traffic patterns and to ensure travelers experience benefits from the completed projects.

OCTA is currently funding an additional 26 signal synchronization projects that are in various stages of implementation. The total Board grant allocations for the planned projects is approximately \$61.2 million, including external funds. Once completed, these funded projects will synchronize an additional 1,015 signals and 250 miles of roadway.

It is best practice to periodically resynchronize traffic signals to make sure they consider changes in traffic. The OCTA M2 Signal Synchronization Program allows previously completed streets and highways projects to compete again for funding during the annual call. Previous investments made as part of earlier projects are incorporated into revisited projects. An example of this would be the three recently completed projects on Brookhurst Street, Magnolia Street, and Los Alisos Boulevard. The signals along these corridors were synchronized prior to 2015. The result is a program that can regularly coordinate intersections as the basis for synchronized operation across Orange County.

Next Steps

OCTA continues to work with local agencies through various venues, including the Technical Steering Committee, Technical Advisory Committee, and the traffic forum to identify corridors that are eligible for funding and would benefit from signal program funding as part of the annual call.

Summary

OCTA and local agencies have successfully implemented new cooperative traffic signal synchronization timing on 94 corridors. Another 26 projects are planned or underway. The synchronization of traffic signals along these regional corridors continually results in significant improvements to traffic flow by reducing total travel times, stops per mile, and improving average safe speeds while decreasing fuel costs, GHG, and overall vehicle emissions.

Attachments

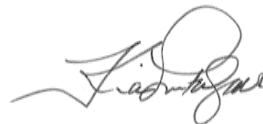
- A. OCTA-Funded Signal Synchronization Projects, (2008 – Present)
- B. Summary of Results for Completed Regional Traffic Signal Synchronization Projects

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