



**June 5, 2023**

**To:** Regional Transportation Planning 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 cities, the County of Orange, and the California Department of Transportation to fund and implement key regional traffic signal synchronization projects. This annual 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 multiagency 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 101 signal synchronization projects along key corridors within Orange County. The projects have improved travel times, reduced delays and congestion, and increased the number of successive green lights drivers experience on their travels. The results of the program translate into direct benefits to motorists and the environment measured in time and cost savings from lower fuel consumption, a reduction of greenhouse gas (GHG) emissions, and air pollution. Additionally, the program includes signal infrastructure upgrades to improve signal operations and safety for all modes of travel along and crossing the project corridors.

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### ***Discussion***

Signal synchronization is a cost-effective way to maximize roadway throughput without major new construction. M2 Project P provides funding for signal synchronization projects through annual competitive 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. Prior to M2 Project P, 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.

Projects are corridor-based and begin with detailed field review. The existing basic parameters, such as the yellow, all-red, and flashing don't walk intervals, for vehicles, bicycles, and pedestrians are also evaluated with the field data to ensure these parameters meet the standards approved by the agency that operates them for safe clearance through each signalized intersection. The new optimized signal timings are developed based on current traffic conditions and travel patterns and ultimately give users an overall better travel experience. Key to these efforts is through regular dialogue between all partner agencies along each project corridor, including the California Department of Transportation (Caltrans) at highway and freeway crossings, to ensure the project addresses the unique operational needs of the corridor, resulting in agencies working together towards the multijurisdictional goal of the program.

Signal synchronization projects implement a coordination strategy involving time-based synchronization of the respective agencies' signal systems, including the necessary upgrades to the traffic signal infrastructure. Eligible signal infrastructure improvements include traffic signal devices, central system upgrades, and solutions that enhance the operation and increase safety for all modes of travel. This includes modifications that 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.

The travel time 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 are also captured. Historically, signal synchronization efforts

nationwide have resulted in the range between five and 15 percent of travel time and speed improvements, as well as a reduction in stops. 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 pamphlet. OCTA and local agencies have completed 101 signal synchronization projects since 2008, of which 21 projects were a revisit and retiming of a previously completed corridor. A total of 3,522 signalized intersections and 903 centerline miles of streets have been implemented. The total Board of Directors (Board) grant awards for the completed projects were approximately \$92.1 million. The completed projects are identified on the map in Attachment A.

The completed projects have reduced average travel time by 13 percent and the average number of stops by 29 percent (Attachment B). Average speed improved by 14 percent. Consumers will save approximately \$227.5 million (at \$3.90 per gallon in today’s dollars) on fuel costs and reduce GHG emissions by approximately 1.19 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 three signal synchronization projects that reported the completion of new timing plan implementation since the 2022 update to the Board, along with the corresponding travel time and speed improvements:

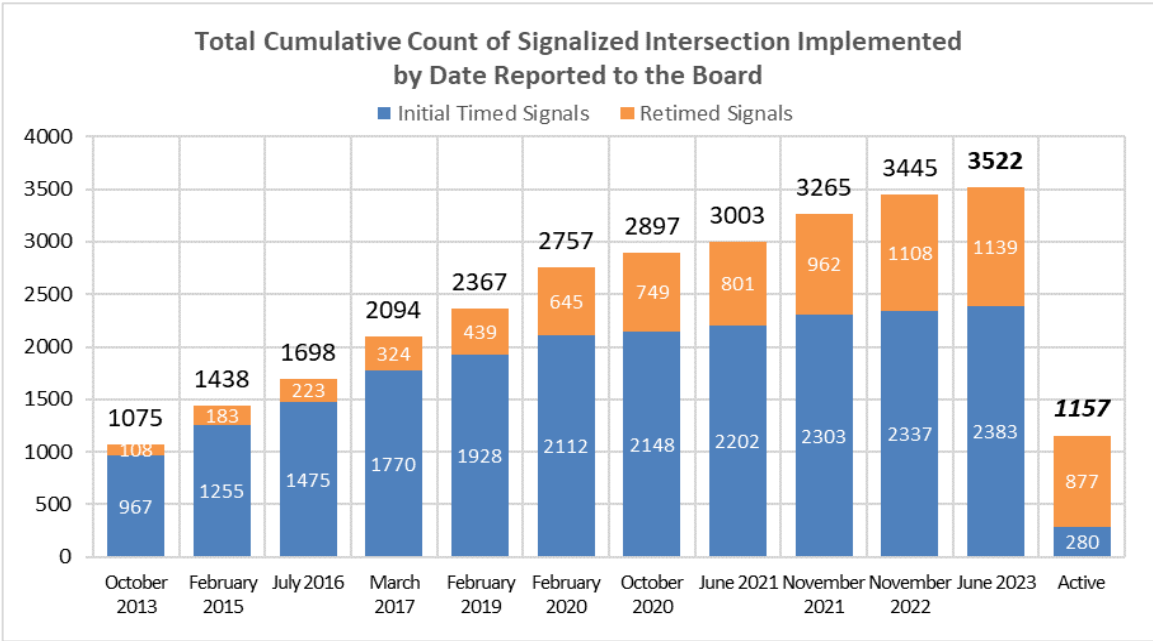
Corridor	Limits	Length (Miles)	Travel Time Improvements	Average Speed Improvements
Aliso Creek Road	El Toro Road to Moulton Parkway	4.98	14 percent	15 percent
Bear Street	Seegerstrom Avenue to Bristol Street	2.41	10 percent	11 percent
Malvern Avenue/Chapman Avenue	Beach Boulevard to Orangethorpe Avenue	9.33	15 percent	17 percent

Note that these three projects faced significant challenges due to traffic patterns that fluctuated because of the pandemic. As part of the projects, advanced signal operation equipment and software were also installed, which will greatly benefit future retiming efforts to quickly account for a change in 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.

Currently, there are 24 active projects funded by OCTA that aim to synchronize traffic signals. These projects are in various stages of implementation and have been awarded a total of approximately \$64.3 million in grants, including external funds. Once completed, these projects will synchronize an additional 1,157 signalized intersections and 240 miles of roadway. This investment is in addition to the \$92.1 million for completed projects described earlier in this report.

Resynchronizing traffic signals periodically is the best practice to respond to 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. The following chart displays the cumulative count of signalized intersections of completed projects organized by the order in which it was presented to the Board. For each reporting year, the total signalized intersections implemented is further divided to indicate the total number of those signalized intersections that were initially timed and have been retimed as part of the program.



The last column in the chart above shows the additional 1,157 signalized intersections that will be synchronized by currently active projects. This includes a total of 877 intersections (75.8 percent) that will be a revisit of timing implemented previously as part of this program and make adjustments based on current traffic patterns. The program incorporates previous investments made as part of earlier projects into revisited projects, resulting in 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. On March 14, 2022, OCTA staff provided the Board a summary of the Countywide Signal Synchronization Plan Study that identified opportunities for enhancements to the signal program. The next generation of Project P will begin with a cooperative partnership that leverages external funds to implement a countywide signal synchronization project. As part of that effort, the Countywide Signal Synchronization Baseline project will retime approximately 2,500 signals in Orange County, evaluate corridor synchronization as a network, reduce the impact to crossing coordination, and establish a new baseline for signal synchronization performance. The project will be implemented over a 36-month period starting in early 2024. This project will build on the investments to date and shift the approach of synchronization from a corridor-based approach to a grid-based coordination because coordinated corridors often cross one another. OCTA will be leveraging the Congestion Mitigation and Air Quality and Surface Transportation Block Grant Program funds to ensure that partner agencies and Caltrans can participate without requiring matching funds.

### **Summary**

OCTA and local agencies have successfully implemented new cooperative traffic signal synchronization timing on 101 corridors. Another 24 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.

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**Attachments**

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

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