



July 7, 2008

To: Highways Committee
From: Arthur T. Leahy, Chief Executive Officer
Subject: Oso Parkway/Pacific Park Drive Signal Synchronization Demonstration Project Summary Report

Overview

The Orange County Transportation Authority has been working with local cities, the County of Orange, and the California Department of Transportation on the Oso Parkway/Pacific Park Drive Traffic Signal Synchronization Demonstration Project. This report provides a summary of the project results and next steps.

Recommendation

Receive and file as an information item.

Background

The Orange County Transportation Authority (OCTA) is working to implement projects for expanded, inter-jurisdictional traffic signal synchronization. Oso Parkway/Pacific Park Drive was selected as the second demonstration project for this overall effort. A previous effort on Euclid Street was completed in winter of 2007. RBF Consulting was retained by OCTA to perform the signal synchronization work on Oso Parkway/Pacific Park Drive. OCTA has been working with the local agencies along the corridor, including the California Department of Transportation (Caltrans), and has recently completed implementation of traffic signal synchronization along the complete 8 ¾-mile stretch of this principal highway. A summary of the results and final report of the effort are provided below.

Discussion

The purpose of the Oso Parkway/Pacific Park Drive Signal Synchronization Demonstration Project was to optimize traffic signal timings to reduce travel times, stops, and delays. The approximately 9-mile Oso Parkway/Pacific Park Drive

route is shown in Attachment A. The project extends from Aliso Viejo, through the cities of Laguna Niguel, Laguna Hills, and Mission Viejo, the County of Orange, to the city of Rancho Santa Margarita. This corridor includes 34 signalized intersections with daily traffic volumes ranging from 17,000 to over 56,000 vehicles per day.

At the start of the project, existing traffic patterns on Oso Parkway/Pacific Park Drive were identified as primarily oriented towards the San Diego Freeway (Interstate 5) and secondarily towards the San Joaquin Transportation Corridor (State Route 73) and Foothill Transportation Corridor (State Route 241). Based on this analysis, traffic signal timings were optimized to improve the movement of vehicles to and from Interstate 5 (I-5), State Route 73, and State Route 241 (SR-241). Using these guidelines, optimized signal timing plans were developed, implemented, and fine-tuned in spring 2008, along with necessary signal equipment upgrades.

As the project involved multiple jurisdictions, each of whom separately control, operate, and maintain its respective traffic signals, a coordination strategy was developed that combined time-based synchronization with the necessary signal upgrades. Time-based synchronization uses a common referenced time source to ensure that each signal is running on the exact time. The project then uses common cycle lengths to coordinate groups of intersections.

Signal timing plans were optimized for the morning, midday, and evening peak periods based on existing traffic patterns. Most of the corridor is synchronized throughout the day from 6:30 a.m. to 6:30 p.m., transitioning timing plans between the peak periods (time-of-day operation).

“Before” and “after” studies were conducted to evaluate the improvements from these optimized timing plans. The studies were conducted by driving Global Positioning System-equipped vehicles multiple times on the corridor during each peak time period and recording the travel statistics. The comparison from before to after synchronization shows a reduction of travel times on the length of Oso Parkway/Pacific Park Drive between 20 and 31 percent. Table 1 provides data on the average travel time improvement for the morning and evening peak periods separated into corridor segments. This table identifies the areas with significant improvements where the new synchronization signal timings had the most impact.

The combination of the optimized, inter-agency joint traffic signal timing plans, establishing a common time reference, minor signal upgrades, and cooperation between all participating agencies maximized arterial capacity resulting in

improvements in travel times higher than typically expected with signal synchronization. Historically, traffic signal synchronization efforts result in travel time improvements in the range of 5 to 15 percent.

Table 1

Improvement in Travel Times (in minutes) By Arterial Segment and Direction

Segment (West to East)	Direction and Time Period		Eastbound				Westbound			
			Morning		Evening		Morning		Evening	
	Before	After	Before	After	Before	After	Before	After		
Canyon Vistas to Aliso Viejo Parkway	3	2	2	2	2	2	2	2	2	
Aliso Viejo Parkway to La Paz Road	4	3	4	2	5	2	5	2		
La Paz Road to Cabot/I-5	4	3	4	3	5	3	5	4		
Cabot/I-5 to Felipe Road	5	4	10	7	7	5	5	5		
Felipe Road to SR-241	4	4	6	4	4	4	5	4		
Total Travel Times	20	16	26	18	23	16	22	17		
Percent Improvement	20%		31%		30%		23%			

Care was taken in developing the timing plans to not adversely affect crossing arterials. Specifically, existing crossing arterial synchronization was maintained at Moulton Parkway and Marguerite Parkway. Additionally, available cross street traffic signal timing parameters were incorporated when applicable. The project team implemented various techniques to minimize impacts to minor side streets, including the use of half-cycles (an intersection that operates at one-half the cycle length of the other intersections on the system) to minimize average wait times when necessary. All of the optimized timing plans were reviewed by local agency staff for potential issues. Finally, as part of the regular monitoring, cross street traffic patterns were observed to ensure proper operation.

Future Improvement Plans

Future improvements along the corridor were identified by the project team, which was comprised of the consulting traffic engineer, OCTA, Caltrans,

and cities' technical staff. These recommendations increase traffic carrying capacities to gain full effectiveness of the signal synchronization and can be divided into arterial and intersection capacity improvements, signal system upgrades, and establishment of a maintenance and monitoring program. These recommendations are in addition to programmed improvements along the corridor.

Intersection capacity increases were recommended at a number of locations to reduce or eliminate the impacts of specific bottlenecks. The suggested improvements include the following traffic engineering elements:

- Upgrading single left turn lanes to dual left turn lanes
- Lengthening turn pockets

Signal control system hardware upgrades that would allow more advanced signal coordination techniques to be employed were analyzed. Specific locations for expanding communications links between signals were identified to improve the efficiency of the signal systems.

Finally, the project team recommended that optimized timing plans be revisited every three years. In conjunction with this periodic re-timing of synchronization, an ongoing performance monitoring program is also suggested that would combine surveillance using advanced traffic control systems, field reviews by experienced traffic engineers who drive the corridor recurrently, and quick adjustments of signal timings based on observed conditions. The recommended future upgrades are detailed in maps separated by city segments in Attachments B and C. By combining signal synchronization with these future improvements, the overall travel benefits on the corridor can be greatly enhanced. These types of improvements can be considered for future funding through Renewed Measure M.

These recommendations reflect current traffic engineering best practices and judgment, and will be used to develop the Renewed Measure M Countywide Signal Synchronization Program. The program targets over 2,000 signalized intersections on a roadway network that crosses local agencies' boundaries. To develop and implement this program, OCTA is currently working with the local agencies to develop the foundation of the future signal synchronization program through the Signal Synchronization Master Plan (Master Plan). This project is currently underway.

Additionally, several components of the project helped in its overall success and are presented below:

- Regular dialogue with each participating agency
- Clear understanding of agency goals and objectives for signal synchronization
- Identification of traffic constraints that limit synchronization
- Defined agency roles and responsibilities
- Accounting for existing synchronization on crossing arterials
- Coordination with Caltrans
- Monitoring of the synchronized system

These aspects will be carried forward in the upcoming ten Orange County street corridors that make up the Proposition 1B Traffic Light Synchronization Program and in developing the Master Plan.

Summary

The synchronization of traffic signals on Oso Parkway/Pacific Park Drive resulted in an increase of excess of 20 percent in average speeds throughout the day. Future improvements were outlined to increase arterial traffic carrying capacities on the corridor. Finally, critical project findings were identified to apply to future efforts.

Attachments

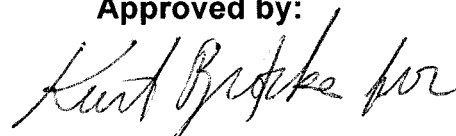
- A. Oso Parkway/Pacific Park Drive Signal Synchronization Demonstration Project
- B. Recommended Future Improvements – Cities of Aliso Viejo, Laguna Niguel, and Laguna Hills
- C. Recommended Future Improvements – City of Mission Viejo and County of Orange

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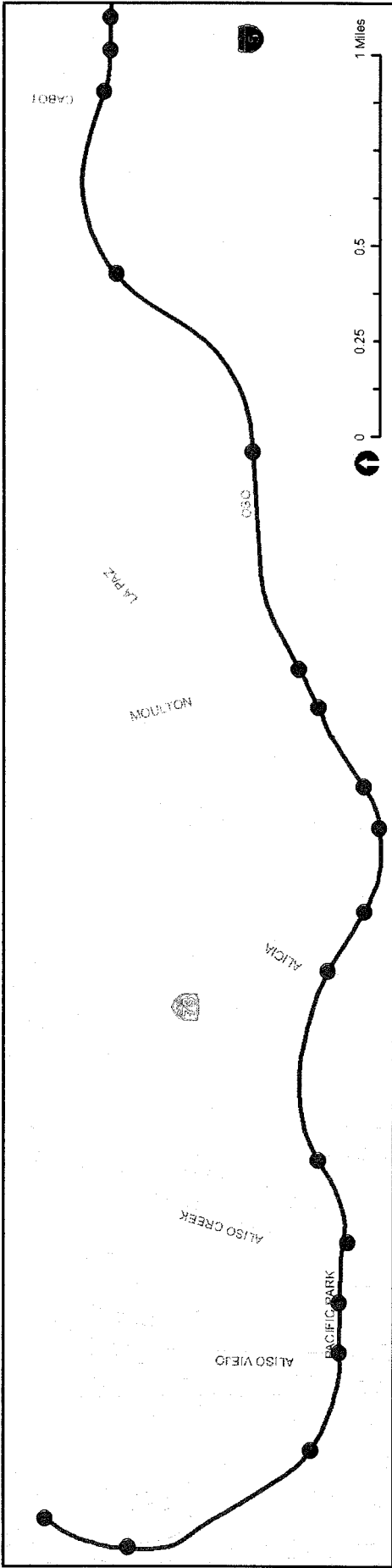


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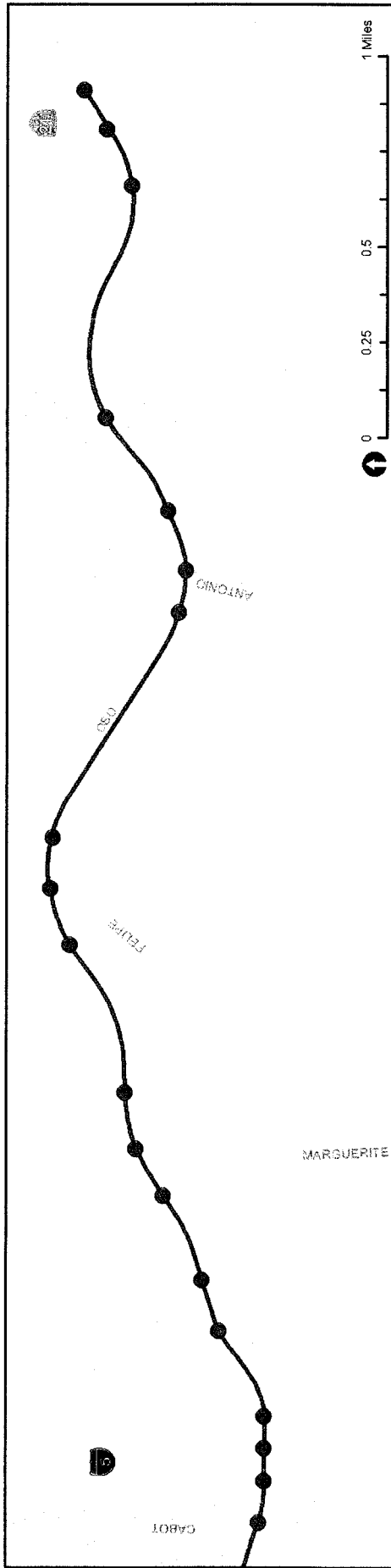
Oso Pkwy. / Pacific Park Dr. Signal Synchronization Project



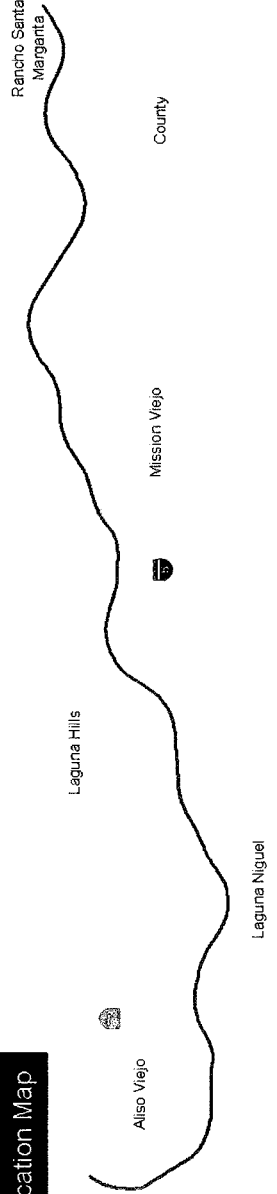
Aliso Viejo, Laguna Niguel, and Laguna Hills



Mission Viejo, County, and Rancho Santa Margarita



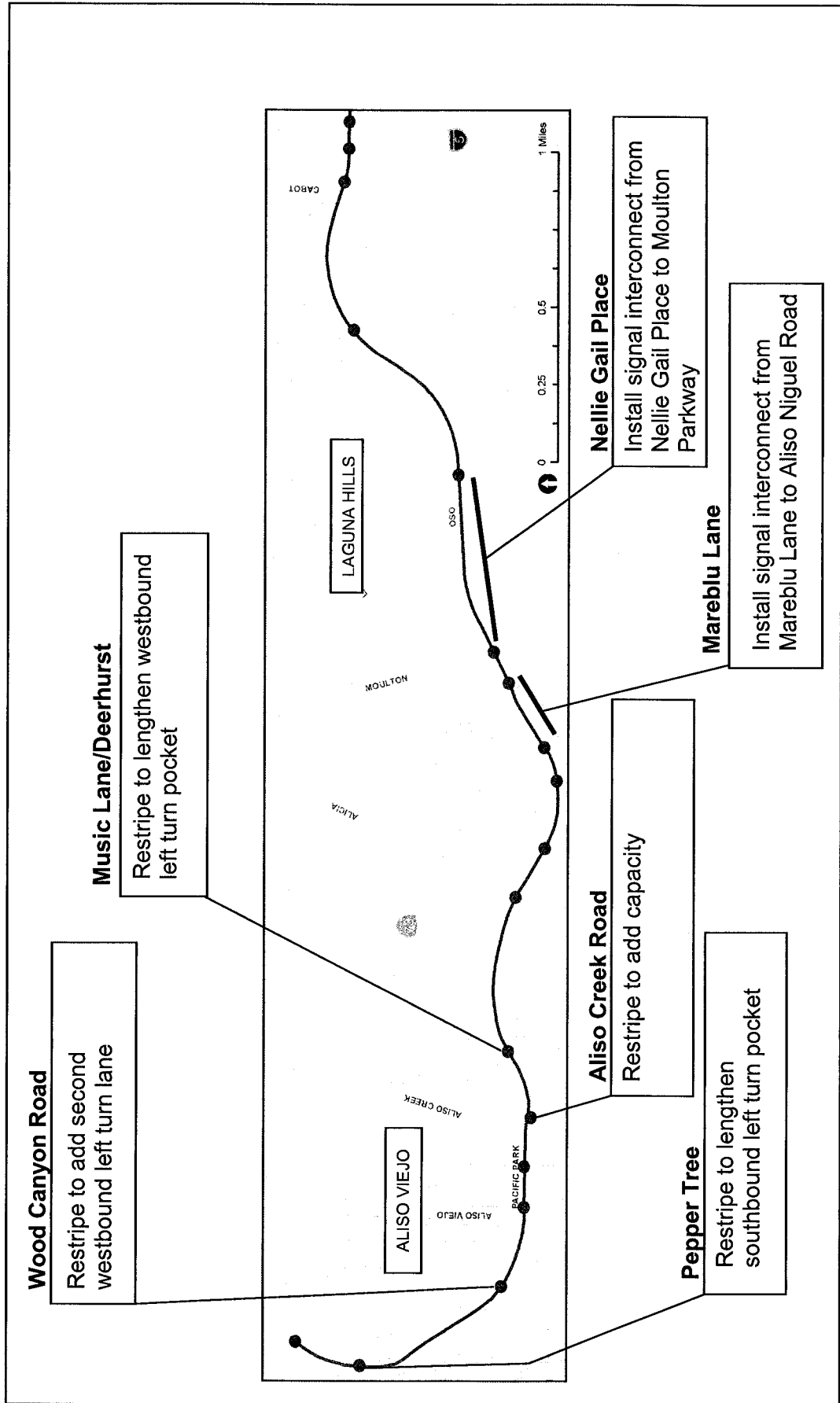
Location Map



Legend

- Traffic Signals
- Oso Pkwy. / Pacific Park Dr.

Recommended Future Improvements – Cities of Aliso Viejo, Laguna Niguel, and Laguna Hills



Recommended Future Improvements – City of Mission Viejo and County of Orange

