TRAFFIC COMMISSION REGULAR MEETING

NOVEMBER 16, 2011
7:00 PM

AGENDA

Rick Frazier - Chair

Tim Hillis - Vice Chair
Donald Froelich - Commissioner
Pamela Dow - Commissioner
Ed Rowe - Commissioner

Location: City Council Chamber, 24035 El Toro Road, Laguna Hills, California 92653

Any person wishing to address the Traffic Commission on any matter, whether or not it appears on this Agenda, is asked to complete a “Request to Speak” form available on the table at the back of the Chamber. The completed form is to be submitted to the Recording Secretary prior to an individual being heard by the Traffic Commission.

Members of the public wishing to address the Traffic Commission can do so during the Public Comments portion of the Agenda with a time limitation of three minutes per person, an overall time limit of ten minutes for any one subject, and a total time limit of thirty minutes for Public Comments. If you are commenting on an Agenda item, your comments will be heard at the time that item is scheduled on the Agenda. If you are addressing the Commission on an item not listed on the Agenda, the Traffic Commission is prohibited by law from discussing or taking any action on that item.

CALL TO ORDER

Resolution No. 96-04-09-1 established rules of decorum for public meetings held by the City of Laguna Hills. Resolution No. 96-04-09-1 is available on the table at the back of the City Council Chamber.

PLEDGE OF ALLEGIANCE

ROLL CALL OF COMMISSION MEMBERS

1. PUBLIC COMMENTS

This is the time to address the Traffic Commission on any matter not listed on this Agenda that is within the subject matter jurisdiction of the Commission. Public Comments are limited to three minutes per person, an overall time limit of ten minutes for any one subject, and a total time limit of thirty minutes.

2. MINUTES

2.1 APPROVAL OF MINUTES OF REGULAR MEETING, SEPTEMBER 21, 2011.

RECOMMENDATION: That the Traffic Commission approve the minutes of the September 21, 2011, regular meeting.

3. PRESENTATIONS

4. ADMINISTRATIVE REPORTS

4.1 ANALYSIS OF LEFT TURN DEMAND AND PEDESTRIAN CONFLICT AT THE INTERSECTION OF PASEO DE VALENCIA AT CALLE DE LA PLATA (0860-50)

RECOMMENDATION: That the Traffic Commission receive and file this report.

4.2 PROPOSED NO PARKING ANYTIME ZONES ON PLAZA POINTE DRIVE (0860-50)

RECOMMENDATION: That the Traffic Commission recommend to the City Council the establishment of No Parking Anytime Zones on portions of Plaza Pointe Drive between South Pointe Drive and Avenida de la Carlota as described.

4.3 PARKING CONTROLS SURVEY IN THE MANDEVILLE DRIVE AREA NEIGHBORHOOD

RECOMMENDATION: That the Traffic Commission receive and file this report.

5. INFORMATIONAL ITEMS

5.1 RADAR TRAILER SCHEDULE FOR DECEMBER/JANUARY (0860-05)

5.2 SHERIFF'S DEPARTMENT VERBAL REPORT

5.3 TRAFFIC CONTROLS

5.4 DOUBLE-YELLOW STRIPING ON WESTBOUND OSO PARKWAY EAST OF CABOT ROAD

6. COMMISSIONER COMMENTS

7. ADJOURNMENT

The next Regular Meeting of the Traffic Commission will be January 18, 2012, at 7:00 PM, in the City Council Chamber, located at 24035 El Toro Road, Laguna Hills, California.

CERTIFICATION

I, HUMZA JAVED, Traffic Engineer of the City of Laguna Hills, do hereby certify that a copy of the foregoing Agenda was posted at Laguna Hills City Hall, Laguna Hills Community Center, and La Paz Center by November 11, 2011, at 5:00 PM.

HUMZA JAVED
ASSOCIATE CIVIL ENGINEER

November 11, 2011
DATE

In compliance with the Americans with Disabilities Act, if you need special assistance to participate in this meeting, you should contact the office of the City Engineer at (714) 707-2650. Notification 48 hours prior to the meeting will enable the City to make reasonable arrangements to assure access.

Materials related to an item on this Agenda submitted to the Commission after distribution of the Agenda packet are available for public inspection in the Public Services Department at 24035 El Toro Road, Laguna Hills, California, during normal business hours.

CITY OF LAGUNA HILLS, CALIFORNIA
TRAFFIC COMMISSION MEETING
MINUTES
SEPTEMBER 21, 2011

CALL TO ORDER

The Regular Meeting of the Traffic Commission of the City of Laguna Hills, California, was called to order by Chair Rick Frazier at 7:02 p.m. in the Laguna Hills City Council Chamber, 24035 El Toro Road, Laguna Hills.

PLEDGE OF ALLEGIANCE:

Chair Rick Frazier led the Pledge of Allegiance.

ROLL CALL OF COMMISSION MEMBERS:

Present:	Rick Frazier, Chair Tim Hillis, Vice Chair Pamela Dow, Commissioner Donald Froelich, Commissioner Ed Rowe, Commissioner
Absent:	
Staff Present:	Humza Javed, Associate Civil Engineer; Steve Doan, Chief of Police Services; Cindy Sands, Administrative Assistant

1. PUBLIC COMMENTS

2. APPROVAL OF MINUTES

IT WAS MOVED BY COMMISSIONER TIM HILLIS, SECONDED BY COMMISSIONER PAMELA DOW, TO APPROVE THE MINUTES OF THE JULY 20, 2011, TRAFFIC COMMISSION MEETING.

The motion carried by the following vote:

AYES:	Commissioners Dow, Froelich, and Vice Chair Hillis
NOES:	
ABSTAIN:	Chair Frazier, Commissioner Rowe

3. PRESENTATIONS

None

4. ADMINISTRATIVE REPORTS

4.1 ANALYSIS OF LEFT TURN DEMAND AND PEDESTRIAN CONFLICT AT THE INTERSECTION OF PASEO DE VALENCIA AT CALLE DE LA PLATA

Staff stated that this item was continued from the two previous Traffic Commission meetings and reported that two "Turning Traffic Must Yield to Pedestrians" signs have been installed per request of the Traffic Commission at its meeting of May 18, 2011. One sign is located in the median of Calle de la Plata westbound and the second is located on the traffic signal mast arm at Calle de la Plata at Paseo de Valencia. Staff reviewed the results of the traffic survey performed by Hartzog & Crabill, Inc. which determined that this location does not meet State standards for the implementation of left-turn traffic signal phasing. Staff is recommending that the Traffic Commission receive and file this report.

Ms. Jean Schulte, a concerned community member, stated that while she appreciates the additional signage, she still believes that left-turn phasing is needed at this intersection. Ms. Schulte expressed her opinion that driver's will not read the signage and commented that she feels the sign located on the traffic signal mast arm would be more visible placed on the smaller traffic signal pole.

The Commission engaged in a discussion with staff regarding the various issues and other options available to address the situation.

MOTION WAS MADE BY COMMISSIONER FROELICH, SECONDED BY COMMISSIONER DOW, TO RECOMMEND THE CONTINUANCE OF THIS ITEM TO THE MEETING OF NOVEMBER 16, 2011, IN ORDER TO GIVE THE COMMISSIONERS AN OPPORTUNITY TO REVIEW THE CROSSWALK AND SIGNAGE AND GIVE STAFF THE OPPORTUNITY TO REVIEW THE INCREMENTAL PROCESS AND COME BACK WITH AN ADDITIONAL ANALYSIS.

The motion carried by the following vote:

AYES:	Commissioners Dow, Froelich, and Row, Chair Frazier
NOES:	Vice Chair Hills
ABSENT:	

4.2 TRAFFIC CONTROL ON MUSTANG DRIVE

This item is an evolving issue addressed at the three previous Traffic Commission meetings and staff briefly reviewed the background information and history of the City's actions including the installation of additional signage. Per request of the Traffic Commission, staff conducted a survey of 38 residents along Mustang Drive, from Nellie Gail Road to Appaloosa Place, to seek their input on the proposed installation of yellow "skip" centerline striping. Of those surveys, 22 were returned with 18 residents in agreement that there is a traffic speeding problem on Mustang Drive and 13 indicating support of the installation of centerline striping. Staff reported that radar trailer was placed on Mustang Drive on September 7, 2011, and the results indicated an average speed of 25.34 miles per hour, an 85th percentile of 30 miles per hour, one vehicle at 41 miles per hour, one vehicle at 39 miles per hour, and two vehicles at 38 miles per hour. Staff is recommending installation of yellow "skip" centerline striping along Mustang Drive from Nellie Gail Road to Appaloosa Place.

Mr. Norm Dangelo, a resident of Mustang Drive, stated that although he has some reservations regarding the yellow "skip" centerline striping he does believe there is some merit to "narrowing" the roadway in terms of perception and agrees that additional enforcement should be continued.

Mr. Michael Klister, a resident of Mustang Drive, stated that he opposes the use of radar speed enforcement on Mustang Drive and also presented a letter from Mr. and Mrs. Wilner, residents of Mustang Drive, also stating their opposition to the use of this enforcement on Mustang Drive.

Dr. Cynthia McMullin, a resident of Bootstrap Place, stated that she is opposed to the installation of centerline striping as she believes it will take away from the ranch style community and requested that other options be reviewed. Dr. McMullin also read a letter from Ms. Mary King, a resident of Red Corral Road, which expressed opposition to traffic enforcement.

Ms. Pam Klister, a resident of Mustang Drive, stated that she opposes the use of traffic enforcement on Mustang Drive.

The Commission engaged in discussions with staff and residents regarding the various issues and options available to address the situation.

MOTION WAS MADE BY VICE CHAIR HILLIS, SECONDED BY COMMISSIONER DOW, TO: (1) RECOMMEND TO THE CITY COUNCIL THE INSTALLATION OF YELLOW "SKIP" CENTERLINE STRIPING ALONG MUSTANG DRIVE FROM NELLIE GAIL ROAD TO APPALOOSA PLACE; (2) CONTINUED TRAFFIC ENFORCEMENT; AND (3) CONTINUED USE OF THE RADAR TRAILER.

The motion carried by the following vote:

AYES:	Commissioners Dow, Froelich, Vice Chair Hillis, Chair Frazier
NOES:	Commissioner Rowe
ABSENT:	

4.3 PARKING CONTROLS SURVEY WITH THE MANDEVILLE DRIVE AREA NEIGHBORHOOD

Staff stated that this is an evolving issue which was presented to the Traffic Commission on July 20, 2011, due to concerns voiced by residents of the Mandeville Drive neighborhood regarding undesired on-street parking along Mandeville Drive and the adjacent streets coming from the Crestline Homeowners Association development. Staff reported that City Council approved a No Parking Anytime red curb zone on the north side of Mandeville Drive from Moulton Parkway to the drive approach of 24441 Mandeville Drive and parking control surveys were conducted in the two neighborhoods adjacent to the Crestline development. Staff reviewed the results of the two surveys and reported that the overall survey response was fifty-three percent. Staff is recommending that this item be continued to the meeting of November 16, 2011, in order to allow staff the opportunity to advise all residents of the outcome of the first survey and request a final "vote" indicating their parking control preferences.

MOTION WAS MADE BY CHAIR FRAZIER, SECONDED BY COMMISSIONER FROELICH, TO RECOMMEND THE CONTINUANCE OF THIS MATTER TO THE MEETING OF NOVEMBER 16, 2011.

The motion carried by the following vote:

AYES:	Commissioners Dow, Froelich, Rowe, Vice Chair Hillis, Chair Frazier
NOES:	
ABSENT:	

4.4 EVALUATION OF TRAFFIC SPEEDS ON LAGUNA HILLS DRIVE

Staff stated that a resident had expressed concerns about traffic speeds on Laguna Hills Drive. As a result of this concern, staff requested that the City's Consulting Traffic Engineers of Hartzog & Crabill, Inc. perform a traffic analysis along Laguna Hills Drive between Moulton Parkway and Paseo de Valencia. Results determined that the 85^{th} percentile speed was approximately 48.8 miles per hour in the morning and 51.6 miles per hour in the afternoon. These results are not considered to be excessive on an arterial highway with a 45 mile per hour posted speed limit. Staff is recommending increased traffic enforcement as resources allow especially during the peak evening hours.

MOTION WAS MADE BY COMMISSIONER DOW, SECONDED BY VICE CHAIR FRAZIER, TO RECOMMEND TO CITY COUNCIL INCREASED POLICE ENFORCEMENT FOR SPEED ISSUES ON LAGUNA HILLS DRIVE FROM PASEO DE VALENCIA TO MOULTON PARKWAY.

The motion carried by the following vote:

AYES:	Commissioners Dow, Froelich, Rowe, Vice Chair Hillis, Chair Frazier
NOES:	
ABSENT:	

5. INFORMATIONAL ITEMS

5.1 RADAR TRAILER SCHEDULE FOR OCTOBER/NOVEMBER

Staff submitted the planned schedule for deployment of the radar trailer and stated the Commission is welcome to make suggestions for other locations.

5.2 SHERIFF'S DEPARTMENT VERBAL REPORT

Chief Doan stated there are two new motor officers currently in training and should be on the streets in a couple of weeks.

5.3 PUBLIC SERVICES DEPARTMENT VERBAL UPDATE

Staff gave a brief report on Public Services Department projects including the I-5/La Paz Road Widening, Avenida de la Carlota Widening, and reported that the Taj Mahal is making major improvements and Ashley Furniture has submitted plans for major redevelopment of the Circuit City site.

6. COMMISSIONER COMMENTS

Chair Frazier stated that he was impressed by the I-5/La Paz Road Widening Update information mailed to residents.

Commissioner Froelich requested that additional information regarding new traffic calming/control devices be presented at the next meeting.

Commissioner Rowe stated that he is impressed with the level of responsiveness the City provides when addressing traffic complaints.

Commissioner Hillis commented about the new striping on Oso Parkway between the I-5 and Cabot Road in regards to the three through lanes, the added left turn lane for south on Cabot, and the dedicated right turn only lane for Cabot Road coming off of the freeway. Staff stated that the City has received other comments and Caltrans has been informed. Commissioner Rowe suggested the possibility of a problem with the advance signing as ineffective signage when exiting the freeway.

7. ADJOURNMENT

There being no further business before the Traffic Commission at this session, Chair Frazier declared the meeting adjourned at 8:45 p.m. to the meeting of November 16, 2011.

Prepared by:	Approved by:
__________________________	__________________________
Humza Javed, P.E. Associate Civil Engineer	Rick Frazier Chair

CITY OF LAGUNA HILLS

MEMORANDUM

DATE: November 16, 2011

TO: Traffic Commissioners

FROM: Humza Javed, P.E. HJ
Associate Civil Engineer

SUBJECT: Analysis of Left Turn Demand and Pedestrian Conflict at the intersection of Paseo De Valencia at Calle De La Plata

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Per request of the Traffic Commission at its September 21, 2011 meeting, the subject matter was agendized at this meeting for further discussion. Staff reviewed additional traffic control measures including in-roadway pavement warning lighting along the southerly crosswalk at the intersection of Paseo de Valencia at Calle de la Plata. It was determined that this intersection does not meet the standard for in-roadway pavement warning lights. These types of lights are not allowed on crosswalks in signalized intersections.

From the previous analysis performed, this intersection does not meet the criteria for left-turn phasing, neither is there a justification for additional traffic control measures at this time. Staff is recommending the Traffic Commission receive and file this report.

CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT

ISSUE: ANALYSIS OF LEFT TURN DEMAND AND PEDESTRIAN CONFLICT AT THE INTERSECTION OF PASEO DE VALENCIA AT CALLE DE LA PLATA

SUMMARY:

Upon receiving a complaint from a community member regarding pedestrian safety due to potential vehicle conflicts at the signalized intersection of Paseo de Valencia at Calle de la Plata, staff evaluated traffic collision histories and performed an analysis of left-turn phasing on Calle de la Plata at the subject intersection. Based on traffic collision history and traffic movements, it was determined that the location does not meet State standards for the implementation of left-turn traffic signal phasing. A report of these findings was presented at the May 18, 2011, Traffic Commission meeting. Upon request of the Traffic Commission, staff has installed two “Turning Traffic Must Yield to Pedestrians” signs for traffic along Calle de la Plata turning left onto southbound Paseo de Valencia. Per request of the community member, the Traffic Commission continued this agenda item for further discussion twice since the original May 18, 2011 meeting, and was agendized for further discussion per the request of the Traffic Commission at the meeting of September 21, 2011. It is recommended that the Traffic Commission receive and file this report.

BACKGROUND:

Ms. Jean Schulte, a Lake Forest resident and stated regular user of the crosswalk crossing of Paseo de Valencia at Calle de la Plata, expressed concerns that when crossing Paseo de Valencia vehicles turning left from westerly bound Calle de la Plata to southerly bound Paseo de Valencia are failing to yield to pedestrian traffic that is crossing Paseo de Valencia. This concern has been echoed by Mr. and Mrs. Costello of Laguna Woods via email to City staff. In response to the complaint, staff retained the Consulting Traffic Engineers of Hartzog & Crabill, Inc. to evaluate the intersection.

Attached is a full report dated May 12, 2011, from Hartzog & Crabill, Inc., with all of the appurtenant data with regards to traffic movements and traffic collision histories at the location. The report concludes that the addition of left-turn phasing at the subject traffic

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RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECEIVE AND FILE THIS REPORT.

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signal is not justified based upon standards for the installation of left-turn phasing. In addition, there is a single recorded traffic collision incident involving a pedestrian at this intersection which, while unfortunate, does not trigger the standards for which the installation of left-turn phasing is appropriate.

Pedestrian count data was subsequently collected at the intersection on Thursday, May 26, 2011, during morning peak hours (7:00 AM to 9:00 AM) and afternoon peak hours (4:00 PM to 6:00 PM). It was determined that the highest pedestrian count on the south leg occurred during the PM period, in which there were 40 pedestrians counted, an average of 20 pedestrians per hour. This number does not meet the standards to justify the requested left-turn phasing.

In order to remind motorists of their legal responsibility as a driver, the Traffic Commission at its May 18, 2011 meeting, requested staff to install two “Turning Traffic Must Yield to Pedestrians” signs for traffic along Calle de la Plata turning left onto southbound Paseo de Valencia. Both have been installed. One is located on the signal mast arm along Paseo De Valencia facing Calle De La Plata and the other is located in the center median along Calle De La Plata, please see attached photo.

RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECEIVE AND FILE THIS REPORT.

ATTACHMENTS:

- May 12, 2011 Hartzog & Crabill, Inc. Left-Turn Phasing Report
- June 6, 2011 Hartzog & Crabill, Inc. Pedestrian Count Data
- Photo of Sign Installations

May 12, 2011

HARTZOG & CRABILL, Inc.

Trammell Hartzog, President
Jerry Crabill, P.E. (Retired)
Gerald J. Stock, P.E., Executive Vice-President

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Mr. Kenneth H. Rosenfield, P.E.
Director of Public Services
City of Laguna Hills
24035 El Toro Road
Laguna Hills, CA 92653

Subject: Left-Turn Phasing Analysis at the Intersection of Paseo de Valencia and Calle de La Plata

Dear Mr. Rosenfield:

Hartzog & Crabill, Inc. (HCI) has completed a Left-Turn Phasing Warrant Analysis at the subject intersection. As you will see in the attached report, the findings of this study show the installation of fully-protected left-turn phasing for the east-west approaches is not recommended at this intersection.

The analysis was completed in response to the City's request to verify if left-turn phasing is warranted, and recommended based on meeting standard guidelines. At the present time, the intersection is signalized with a 6-phase operation with protected left-turn phasing for the north-south approaches and permissive operations on the east-west approaches. The California Manual of Uniform Traffic Control Devices (*California MUTCD*) was used for defining the requirements for left-turn phasing. Highway Capacity Manual (*HCM*) left-turn phasing guidelines were also reviewed. Based on these State guidelines, there are four conditions considered for left-turn phasing: 1) Accident History; 2) Delay; 3) Traffic Volumes; and 4) Miscellaneous (*i.e., impaired sight distance, roadway curvature, etc.*). Of these (4) conditions, none were warranted. There are no other recommendations for this intersection at this time.

It has been our pleasure to prepare this analysis for the City of Laguna Hills. If you have any questions or need more information please call (714) 731-9455.

Very truly yours,
HARTZOG & CRABILL, INC.

Gerald J. Stock, P.E.
Vice President
City & Traffic Engineering Services

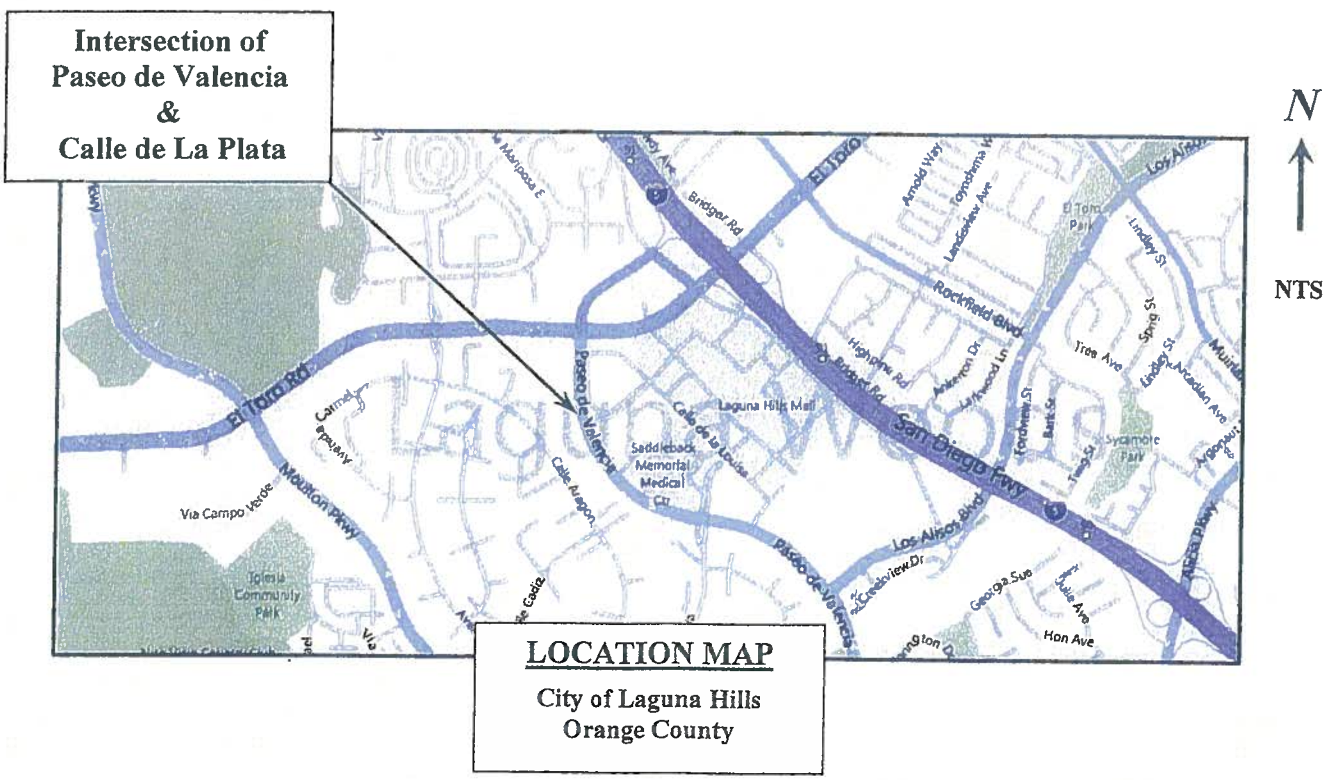
Attach: Left-Turn Phasing Analysis Report

LEFT-TURN PHASING ANALYSIS:

INTERSECTION OF
PASEO DE VALENCIA AND CALLE DE LA PLATA
IN THE CITY OF LAGUNA HILLS, CA

INTRODUCTION

The City of Laguna Hills requested Hartzog & Crabill, Inc. (HCI) to complete a Left-Turn Phasing Warrant Analysis at the intersection of Paseo de Valencia and Calle de La Plata. This analysis was completed in order to verify if left-turn phasing is warranted for the east-west (Calle de La Plata) approaches, and recommended based on meeting standard guidelines. The intersection is considered a standard, four-legged, urbanized commercial intersection with Paseo de Valencia running in the north-south directions and Calle de La Plata in the east-west directions. The intersection is located southwest of the I-5 San Diego Freeway, and just south of El Toro Road (*see Location Map below*). At the present time, the intersection is signalized with a 6-phase operation with protected-left-turn phasing on Paseo de Valencia and permissive left-turns on Calle de La Plata.



11/16/2011 ITEM NO. 4.1

BACKGROUND

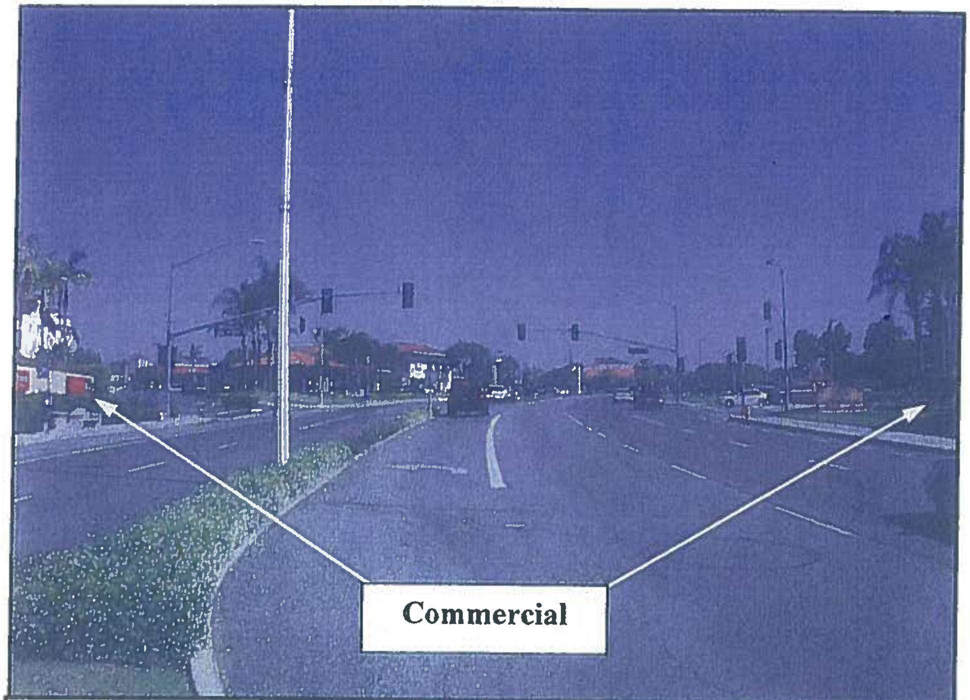
Paseo de Valencia is a 96-foot wide north-south major collector with primarily commercial frontage (banks & office buildings) on both sides of the roadway. The raised landscaped center median provides for two (2) southbound through-lanes and three (3) northbound through-lanes of traffic with bicycle lanes in each direction along with a dedicated left-turn lane in each approach. There is a marked white crosswalk across the south leg of Paseo de Valencia only (no crosswalk across north leg). There are curb, gutter, and sidewalk improvements along both sides of the roadway. Paseo de Valencia has a posted speed limit of 40 MPH. On-street parking is restricted on both sides of the roadway. Currently, the traffic signal provides for protected left-turn phasing for traffic on Paseo de Valencia.

See Exhibit 1 (next page) for photo images of Paseo de Valencia.

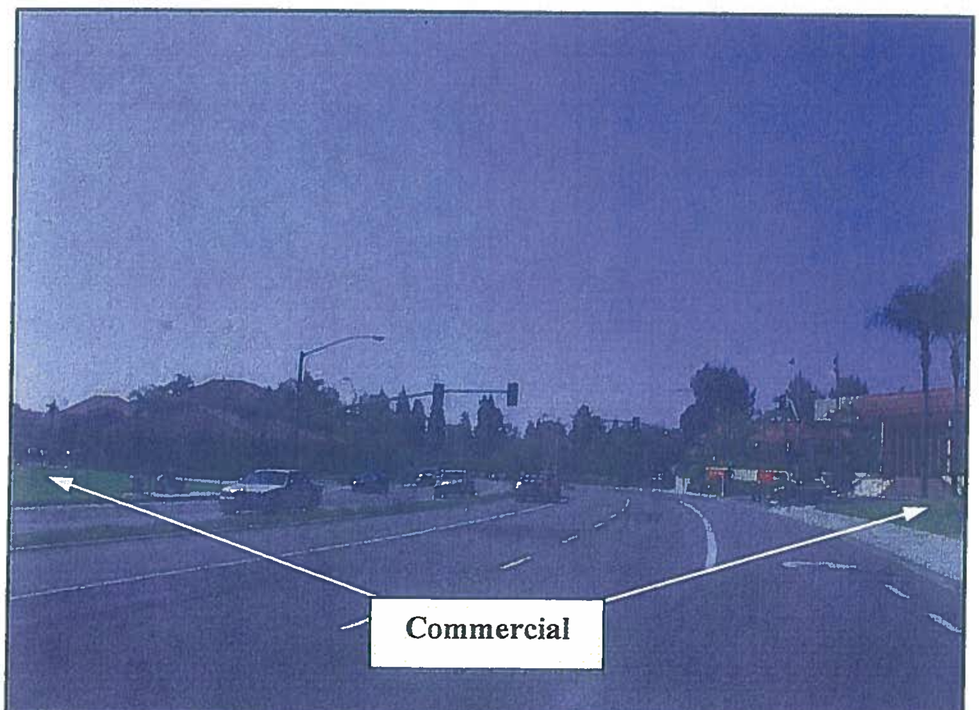
Calle de La Plata is a 74-foot wide minor collector on the east leg of the intersection with Paseo de Valencia, with primarily commercial frontage on both sides of the roadway. On the west leg, the roadway is a 62 foot wide local roadway that narrows further away from the intersection and includes residential land use. The roadway provides for one through-lane of traffic on each approach and an exclusive left-turn lane at the intersection with Paseo de Valencia. On the east leg, the striping also provides for a dedicated right-turn lane. The directions are separated by a raised landscaped center median along the east leg and a combination of a small raised landscaped median and yellow centerline striping on the west leg. There are marked white crosswalks across both east and west legs of Calle de La Plata, and curb, gutter, and sidewalk improvements along both sides of the roadway. Calle de La Plata has a posted speed limit of 30 MPH. On-street parking is restricted on both sides of the roadway along the east leg only. Currently, the traffic signal provides for permissive operations for left-turning traffic on Calle de La Plata.

See Exhibit 2 (following page) for photo images of Calle de La Plata.

EXHIBIT 1

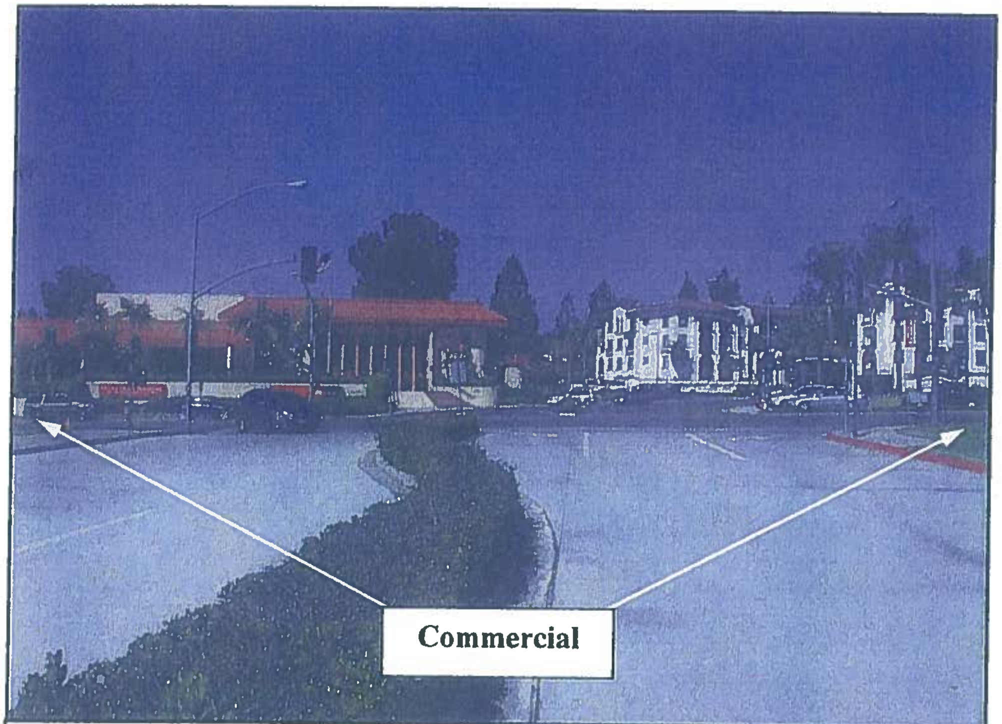


Paseo de Valencia (*Looking Northbound*) @ Calle de La Plata

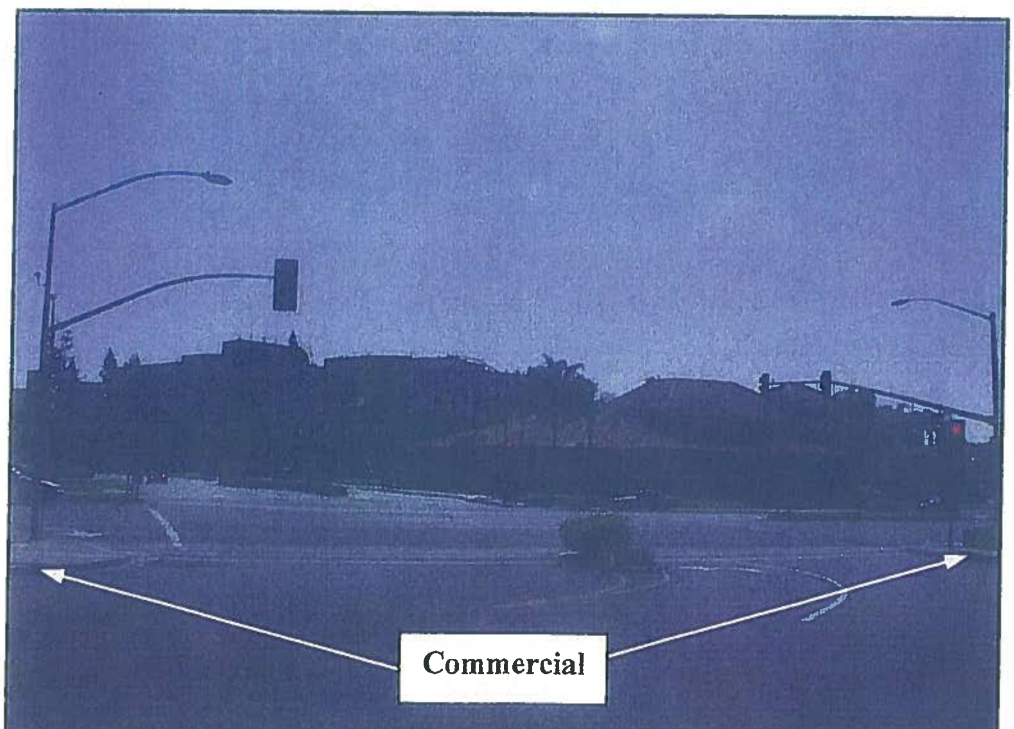


Paseo de Valencia (*Looking Southbound*) @ Calle de La Plata

EXHIBIT 2



Calle de La Plata (*Looking Westbound*) @ Paseo de Valencia



Calle de La Plata (*Looking Eastbound*) @ Paseo de Valencia

11/16/2011 ITEM NO. 4.1

LEFT-TURN PHASING ANALYSIS

As is common practice with many municipal agencies, the City of Laguna Hills has an adopted practice for using State guidelines as reference standards in order to provide uniformity and consistency in terms of traffic control. Therefore, the following two prevailing sources that address this topic were considered: 1) State of California Manual of Uniform Traffic Control Devices (*California MUTCD*); and 2) State of California Highway Capacity Manual (*HCM*). Both sources were referenced because some diversity exists between them regarding left-turn phasing guidelines ***(see Appendix A for both guidelines)***. Based on the guidelines in the California MUTCD, which is most-typically referenced, there are four conditions that are considered for left-turn phasing: 1) Accident History; 2) Volume; 3) Delay; and 4) Miscellaneous. If any one of these conditions is met, then left-turn phasing should be considered. Accident history and traffic volume data are the conditions most often studied by HCI for left-turn phasing analyses, since both provide a good overall picture of the intersection characteristics. This analysis has focused on accident history and traffic volume data to determine if left-turn phasing is warranted on the east-west approaches of Calle de La Plata; although, delay and other miscellaneous factors are included in the analysis.

Accident History

The guidelines for left-turn phasing contained in the California MUTCD regarding accidents require a minimum of five (5) accidents for a particular left-turn movement during a recent 12-month period. The HCM does not include minimum guidelines for left-turn accidents, but concentrates on left-turning & opposing-through traffic volumes, along with vehicular lane usage.

Accident History (continued)

The available accident history for the intersection of Paseo de Valencia and Calle de La Plata was gathered from the City of Laguna Hills and reviewed to determine whether there were accidents susceptible to correction by the installation of left-turn phasing. Typically, left-turn type accidents are categorized as 'Broadside' or 'Head-On'. Table 1 below provides a recent 3-year summary of the reported east-west left-turn accident history susceptible to correction at this intersection.

As can be seen below, there was (1) reported Auto-Pedestrian type collision in 2007, which involved the westbound left-turning movement considered susceptible to correction at the intersection. Therefore, the minimum requirement of five (5) accidents susceptible to correction is not satisfied for consideration of protected left-turn phasing in the east-west directions per the California MUTCD guidelines.

A comprehensive 5-year traffic collision history report is included in Appendix B for this intersection.

TABLE 1
LEFT-TURN ACCIDENT SUMMARY

Intersection	2007		2008		2009	
	Date	Type of Acc. / Dir. of Left	Date	Type of Acc. / Dir. of Left	Date	Type of Acc. / Dir. of Left
Paseo de Valencia at Calle de La Plata	12/29	**Auto-Ped / WB**		None Reported		None Reported
				Susceptible to Correction		Susceptible to Correction

Notes: Intersection collision data provided by the City of Laguna Hills on 4/18/11 (***Appendix B***).

Abbreviations:

1) Type of Acc. = Type of Accident.
2) Dir. of Left = Direction of Left-Turning Traffic.

11/16/2011 ITEM NO. 4.1

Traffic Volumes

As noted below and in the California MUTCD, left-turn phasing should be considered when the following left-turn traffic volume criteria are met:

> ***For a pretimed signal or a background-cycle-controlled actuated signal, a left turn volume of more than two vehicles per approach per cycle for a peak hour; or for a traffic-actuated signal, 50 or more left turning vehicles per hour in one direction with the product of the turning and conflicting through traffic during the peak hour of 100,000 or more.***

This particular intersection is a semi-actuated traffic signal since it has vehicle detection loops on each side-street approach and on the left-turn lanes. Therefore, (50) or more left-turning vehicles per hour in one direction are required, along with the left/conflicting-through vehicle product of 100,000. Intersection peak-hour turning movement counts were gathered at the intersection of Paseo de Valencia and Calle de La Plata to determine the activity level during a typical mid-week time period. The traffic volumes were collected on Tuesday, April 26, 2011. The morning peak-hour was determined to start at 8:00 AM and the afternoon peak-hour at 4:45 PM. Table 2 below summarizes the weekday peak-hour traffic counts. ***All peak-hour traffic volume data is included in Appendix C.***

TABLE 2
INTERSECTION WEEKDAY
PEAK-HOUR VEHICLE TURNING MOVEMENT COUNTS

Intersection	Peak Hour	Northbound			Southbound			Eastbound			Westbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Paseo de Valencia and Calle de La Plata	AM	**74**	618	154	**208**	612	45	**46**	11	24	**37**	8	53
	PM	**107**	738	79	**106**	914	44	**93**	20	93	**113**	25	128

L = Left-turning vehicles
T = Through vehicles
R = Right-turning vehicles

Traffic Volumes (continued)

As can be seen from Table 2 above, all left-turn movements meet the minimum (50) left-turning vehicles per hour in one direction that is needed to partially satisfy the Traffic Volume guideline described above, with exception to east-west traffic in the AM peak hour.

The remaining portion of the guideline specifies that the product of the left-turning movement and the conflicting-through traffic during the peak-hour equal 100,000 or greater. It should be noted that the conflicting-through (or opposing) traffic does include opposing right-turning traffic since many left-turning vehicles can be expected to yield until the opposing right-turns complete their movement before proceeding. As shown in Table 3 below, this portion of the guideline is not met in either eastbound or westbound approach to the intersection. Therefore, the minimum traffic volume condition is not satisfied for Calle de La Plata per the California MUTCD guidelines.

TABLE 3
LEFT-TURN PHASING CROSS-PRODUCT CHECK
PASEO DE VALENCIA AT CALLE DE LA PLATA

Product of Left-Turns and Opposing Through Movements	Peak Hour	Northbound			Southbound			Eastbound			Westbound		
		Left	Opposing	Product	Left	Opposing	Product	Left	Opposing	Product	Left	Opposing	Product
	AM	**74**	657	**48,618**	**208**	772	**160,576**	**46**	61	**2,806**	**37**	35	**1,295**
	PM	**107**	958	**102,506**	**106**	817	**86,602**	**93**	153	**14,229**	**113**	113	**12,769**

In comparison to the California MUTCD, the guidelines given in the Highway Capacity Manual (HCM), 2000 edition, have lower minimum cross-products associated with the number of opposing through-lanes. The threshold set by the HCM establishes a minimum cross-product of 50,000 for left-turns opposed by one (1) through-lane, 90,000 when opposed by (2) lanes, and 110,000 with (3) opposing lanes. Similarly, from Table 3 above, the minimum traffic volume condition is not satisfied for either east-west approach of Calle de La Plata per the HCM guidelines (***see Appendix A for completed HCM Left-Turn Treatment Worksheet***).

Delay

The left-turn delay condition per the California MUTCD guidelines calls for one or more vehicles, which were waiting at the beginning of the green interval and are still remaining in the left-turn lane at the end of yellow, for at least 80% of the total number of cycles in one hour. A delay study was included in the data collection on Tuesday, April 26, 2011 during the AM and PM peak-periods with the results summarized below:

AM Peak-Hour

During the two (2) hours of delay study in the morning peak period, the highest approach in the east-west directions that experienced any left-turn delay was eastbound. There were (2) cycles *(out of 61)* that were reported as having vehicles at the beginning of green and remaining at the end of the yellow interval during the 8:00 AM hour. This calculates to approximately 3% of the cycles, which does not satisfy the 80% required.

PM Peak-Hour

During the two (2) hours of delay study in the afternoon peak period, the highest approach in the east-west directions that experienced any left-turn delay was also eastbound. There were (7) cycles *(out of 58)* that were reported as having vehicles at the beginning of green and remaining at the end of the yellow interval during the 4:15 PM hour. This calculates to approximately 12% of the cycles, which does not satisfy the 80% required.

Therefore, the left-turn delay data for the east-west approaches at this intersection does not meet the minimum requirements of 80% delayed cycles per the California MUTCD guidelines for either peak period.

Peak-hour delay data is included in Appendix D.

Miscellaneous

The geometry of the intersection of Paseo de Valencia and Calle de La Plata provides for an approximate 90-degree angle at its intersection, and horizontal roadway curvature on both streets just beyond the intersection. There is also a gradual vertical roadway curvature inclining in the northbound direction along Paseo de Valencia. In consideration of the surrounding urbanized commercial environment, this intersection geometry was field-reviewed and determined to not require special traffic signal head locations for improved visibility or advanced signage for impaired sight distance. As shown in Exhibits 1 and 2, both streets are relatively flat at their intersection, and field observations also showed that a driver's visibility is not restricted due to any existing roadway design, curvature, or physical obstruction.

Driver visibility was verified from the side-streets (Calle de La Plata) and shown to be un-restricted for left-turn maneuvers. In other terms, the visibility between left-turning drivers and opposing traffic and/or pedestrians using the crosswalk across the south leg is not restricted.

ANALYSIS SUMMARY

Based on left-turn accidents in the east-west approaches, the intersection accident history did not satisfy the California MUTCD requirements for installation of left-turn phasing, as there was (1) collision (*not 5*) considered susceptible to correction by protected left-turn phasing in a recent 12-month period.

Based on the minimum traffic volume guidelines set forth in the California MUTCD and Highway Capacity Manual, this analysis showed that existing traffic volumes did not satisfy the guidelines for installation of protected left-turn phasing on the east-west approaches. In other words, traffic volumes on Calle de La Plata at Paseo de Valencia did not meet the minimum volume requirements for the amount of left-turns with opposing through-movements during both peak traffic periods.

ANALYSIS SUMMARY (*continued*)

In terms of vehicular delay at Paseo de Valencia and Calle de La Plata, a delay study was performed which showed that vehicles did not experience high delay, as the amount of cycles where vehicles experienced left-turn delay were well below the minimum guidelines of 80% of peak-hour cycles. Also, as shown in Table 2, the peak-hour traffic volumes on the Calle de La Plata are significantly less when compared to those using the main street (Paseo de Valencia). Therefore, eastbound and westbound vehicular queuing was also field-verified and not considered significant to warrant protected left-turn phasing.

Engineering judgment should always be included in any decision regarding traffic safety improvements. Further information observed in the field in regards to pedestrian activity describes a moderate-to-high activity, including bicycle traffic since Paseo de Valencia has bicycle lanes. The intersection geometry was field-reviewed and determined to not require special traffic signal head locations for improved visibility or advanced signage for impaired sight distance. Field observations also showed that a driver's visibility was not restricted due to any existing roadway design, curvature, or physical obstruction. Driver visibility was also verified from the Calle de La Plata approaches to the intersection and shown to be un-restricted, especially visibility between left-turning drivers and opposing traffic or pedestrians using the crosswalk across the south leg.

CONCLUSION

Based on the findings of this study, the installation of fully-protected left-turn phasing is not warranted for the east-west approaches on Calle de La Plata at its intersection with Paseo de Valencia. There are no further intersection recommendations at this time.

APPENDIX A

LEFT-TURN PHASING GUIDELINES:

CALIFORNIA MUTCD
and
HIGHWAY CAPACITY MANUAL

~~If U-turns are permitted from the approach and if drivers making a right turn from the conflicting approach to the left are simultaneously being shown a right-turn GREEN ARROW signal indication, drivers making a U-turn may be advised of the operation by the installation near the left-turn signal face of a U-TURN YIELD TO RIGHT TURN (R10-16) sign (see Section 2B.45).~~

Standard:

When a RIGHT TURN ARROW controls the Right Turn movement, a conflicting U-turn approach shall be prohibited.

Section 4D.06 Application of Steady Signal Indications for Left Turns

Support:

Left-turning traffic is controlled by one of four modes as follows:

A. Permissive Only Mode—turns made on the CIRCULAR GREEN signal indication after yielding to oncoming traffic and pedestrians;

B. Protected Only Mode—turns made only when the left-turn GREEN ARROW signal indication is displayed;

C. Protected/Permissive Mode—both modes occur on an approach during the same cycle; or

D. Variable Left-Turn Mode—the operating mode changes among the protected only mode and/or the protected/permissive mode and/or the permissive only mode during different periods of the day.

Option:

In areas having a high percentage of elderly drivers, special consideration may be given to the use of protected only mode left-turn phasing, when appropriate.

Standard:

The required left-turn signal faces and operation for an approach shall be determined by the selected mode of left-turn operation, as follows:

A. Permissive Only Mode—The signal indications for permissive only mode left turns shall be provided by the signal faces controlling the through movement, or by a permissive-only left-turn signal face that is either a shared signal face or a separate signal face. A permissive-only shared signal face, regardless of where the permissive-only left-turn signal face is positioned and regardless of how many adjacent through signal faces are provided, shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display. A separate permissive-only left-turn signal face sometimes displays a different color of circular signal indication than the adjacent through signal faces display.

If a separate left-turn signal face is provided for permissive only left turns, it shall meet the following requirements:

1. During the permissive left-turn movement, the left-turn signal face shall display a CIRCULAR GREEN signal indication.

2. If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the left-turn signal face are visibility-limited from the adjacent through movement, the left-turn signal face shall not be required to simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement.

3. If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the left-turn signal face are visibility-limited from the adjacent through movement, the display of a CIRCULAR GREEN signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display CIRCULAR RED signal indications and the opposing left-turn signal faces display left-turn GREEN ARROW signal indications for a protected left-turn movement shall be permitted.

~~**4. If the left-turn signal face does not simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement, a LEFT TURN YIELD ON GREEN (symbolic green ball) (R10-12) sign or a LEFT TURN SIGNAL – YIELD ON GREEN (symbolic green ball) (R10-21) sign (see Figure 2B-19) shall be used.**~~

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B. Protected Only Mode—The left-turn signal face shall be capable of displaying one of the following sets of signal indications:

1. Left-turn RED ARROW, YELLOW ARROW, and GREEN ARROW signal indications only. At least one left-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the major movement. Only one of the three colors shall be illuminated at any given time. A signal instruction sign shall not be required with this set of signal indications. If used, it shall be a LEFT ON GREEN ARROW ONLY sign (R10-5).

2. CIRCULAR RED, left-turn YELLOW ARROW, and left-turn GREEN ARROW signal indications. At least one left-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the major movement. Only one of the three colors shall be illuminated at any given time. Unless the CIRCULAR RED signal indication is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s), a LEFT TURN SIGNAL sign (R10-10) shall be used.

3. CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and left-turn GREEN ARROW signal indications. This four-section signal face shall be used only when the CIRCULAR GREEN and left-turn GREEN ARROW signal indications begin and terminate together. During each interval, the circular signal indication shall be the same color as the signal indication on the signal face(s) for the adjacent through traffic.

C. Protected/Permissive Mode—The signal indications for protected/permissive mode left turns shall be provided in either a shared signal face or a separate signal face. Any protected/permissive left-turn signal face that always simultaneously displays the same color of circular signal indication that the adjacent through signal faces display shall be considered to be a shared signal face, regardless of where the left-turn signal face is positioned and regardless of how many adjacent through signal faces are provided. Any protected/permissive left-turn signal face that sometimes displays a different color of circular signal indication than the adjacent through signal faces display shall be considered to be a separate signal face. The requirements for each type of signal face are as follows:

1. If a shared signal face is provided, it shall be considered an approach signal face, and shall meet the following requirements:

(a) During the protected left-turn movement, the signal face shall simultaneously display a left-turn GREEN ARROW signal indication and a circular signal indication that is the same color as the signal indication for the adjacent through lane on the same approach as the protected left turn.

During the protected left-turn movement, the signal faces for through traffic on the opposing approach shall simultaneously display CIRCULAR RED signal indications.

(b) During the permissive left-turn movement, all signal faces on the approach shall display CIRCULAR GREEN signal indications.

(c) All signal faces on the approach shall simultaneously display the same color of circular signal indications to both through and left-turn road users.

(d) A supplementary sign shall not be required. If used, it shall be a LEFT TURN YIELD ON GREEN (symbolic green ball) (R10-12) sign (see Figure 2B-19).

2. If a separate signal face is provided, it shall be considered a left-turn signal face, and shall meet the following requirements:

(a) During the protected left-turn movement, the left-turn signal face shall display a left-turn GREEN ARROW signal indication.

During the protected left-turn movement, the signal faces for through traffic on the opposing approach shall simultaneously display CIRCULAR RED signal indications.

(b) During the permissive left-turn movement, the left-turn signal face shall display a CIRCULAR GREEN signal indication.

(c) If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the left-turn signal face are visibility-limited from the adjacent through movement, the left-turn signal

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face shall not be required to simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement.

(d) If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the left-turn signal face are visibility-limited from the adjacent through movement, the display of a CIRCULAR GREEN signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display CIRCULAR RED signal indications and the opposing left-turn signal face displays a left-turn GREEN ARROW for a protected left-turn movement shall be permitted.

(e) If the left-turn signal face does not simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement, a LEFT TURN SIGNAL—YIELD ON GREEN (symbolic green ball) (R10-21) sign (see Figure 2B-19) shall be used.

D. Variable Left-Turn Mode—If the protected only mode occurs during one or more periods of the day, and the permissive only mode or the combined protected/permissive mode occurs during other periods of the day, the requirements of Items A, B, and C in this Standard that are appropriate to that mode of operation shall be met, subject to the following:

1. The CIRCULAR GREEN and CIRCULAR YELLOW signal indications shall not be displayed when operating in the protected only mode.

2. The left-turn GREEN ARROW and left-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode.

Option:

Additional appropriate signal indications or changeable message signs may be used to meet the requirements for the variable left-turn mode.

Guidance:

Since separate signal phases for protected left turns will reduce the green time available for other phases, alternate means of handling left turn conflicts should be considered first.

Support:

The most likely possibilities are:

1. Prohibition of left turns. This can be done only if there are convenient alternate means of making the movement. Typical alternate means are:
   a. A series of right and/or left turns around a block to permit getting to the desired destination; or
   b. Making the left turn at an adjacent unsignalized intersection during gaps in the opposing through traffic.
2. Geometric changes to eliminate the left turn. An effective change would be a complete separation or a complete or partial "clover leaf" at grade. Any of these, while eliminating left turns, requires additional cost and right of way.
3. Provide protected-permissive or permissive-protected left turn operation. The protected left turn interval may be prohibited during certain periods of the day to allow only permissive intervals for left turn movement in order to increase the green time available for other phases. Refer to Section 4D.111(CA) for the requirements of protected-permissive or permissive-protected left turn operation.

Guidance:

Protected left turn phases should be considered where such alternatives couldn't be utilized, and one or more of the following conditions exist:

1. Collisions - Five or more left turn collisions for a particular left turn movement during a recent 12-month period.
2. Delay - Left-turn delay of one or more vehicles, which were waiting at the beginning of the green interval and are still remaining in the left turn lane after at least 80% of the total number of cycles for one hour.
3. Volume - At new intersections where only estimated volumes are available, the following criteria may be used. For pretimed signal or a background-cycle-controlled actuated signal, a left turn volume of more than two vehicles per approach per cycle for a peak hour; or for a traffic-actuated signal, 50 or more left turning vehicles per hour in one direction with the product of the turning and conflicting through traffic during the peak hour of 100,000 or more.
4. Miscellaneous. Other factors that might be considered include but are not limited to: impaired sight distance due to horizontal or vertical curvature, or where there are a large percentage of buses and trucks.

LEFT-TURN TREATMENT WORKSHEET

General Information

Description Intersection of La Palma Avenue and Moody Street in the City of La Palma

Check #1. Left-Turn Lane Check

Approach	EB	WB	NB	SB
Number of left-turn lanes	1	1	1	1
Protect left turn (Y or N)?	N	N	N	N

If the number of left-turn lanes on any approach exceeds 1, then it is recommended that the left turns on that approach be protected. Those approaches with protected left turns need not be evaluated in subsequent checks.

Check #2. Minimum Volume Check

Approach	EB	WB	NB	SB
Left-turn volume	132	229	219	105
Protect left turn (Y or N)?	N	N	N	N

If left-turn volume on any approach exceeds 240 veh/h, then it is recommended that the left turns on that approach be protected. Those approaches with protected left turns need not be evaluated in subsequent checks.

Check #3. Minimum Cross-Product Check

Approach	EB	WB	NB	SB
Left-turn volume, V_L (veh/h)	132	229	219	105
Opposing mainline volume, V_o (veh/h)	708	574	794	1,045
Cross-product ($V_L * V_o$)	93,456	131,446	173,886	109,725
Opposing through lanes	2	2	2	2
Protected left turn (Y or N)?	Y	Y	Y	Y

Minimum Cross-Product Values for Recommending Left-Turn Protection

Number of Through Lanes	Minimum Cross-Product
1	50,000
2 ✓	90,000 ✓
3	110,000

If the cross-product on any approach exceeds the above values, then it is recommended that the left turns on that approach be protected. Those approaches with protected left turns need not be evaluated in subsequent checks.

Check #4. Sneaker Check

Approach	EB	WB	NB	SB
Left-turn volume, V_L (veh/h)	132	229	219	105
Sneaker capacity = 7200/C	72	72	72	72
Left-turn equivalence, E_{L1} (Exhibit C16-3)	2.5	2.3	2.8	3.3
Protected left turn (Y or N)?	N	N	N	N

If the left-turn equivalence factor is 3.5 or higher (computed in Exhibit A10-4, quick estimation lane volume worksheet) and the unadjusted left turn is greater than the sneaker capacity, then it is recommended that the left turns on that approach be protected.

Notes

1. If any approach is recommended for left-turn protection but the analyst wishes to analyze it as permitted, the planning application may give overly optimistic results. The analyst should instead use the more robust method described in Chapter 16, Signalized Intersections.
2. All volumes used in this worksheet are unadjusted hourly volumes.

EXHIBIT C16-3. THROUGH-CAR EQUIVALENTS, E_{L1}, FOR PERMITTED LEFT TURNS

Type of Left-Turn Lane	Effective Opposing Flow, $v_{oe} = v_o/f_{LUo}$						
	1	200	400	600	800	1000	1200[a]
Shared	1.4	1.7	2.1	2.5	3.1	3.7	4.5
Exclusive	1.3	1.6	1.9	2.3	2.8	3.3	4.0

Notes:

a. Use formula for effective opposing flow more than 1200; v_{oe} must be > 0.

$E_{L1} = s_{HT}/s_{LT} - 1$ (shared)

$E_{L1} = s_{HT}/s_{LT}$ (exclusive)

$$s_{LT} = \frac{v_{oe} e^{\left(\frac{-v_{oe} t_c}{3600}\right)}}{1 - e^{\left(\frac{-v_{oe} t_f}{3600}\right)}}$$

where

E_{L1} = through-car equivalent for permitted left turns

s_{HT} = saturation flow of through traffic (veh/h/ln) = 1900 veh/h/ln

s_{LT} = filter saturation flow of permitted left turns (veh/h/ln)

t_c = critical gap = 4.5 s

t_f = follow-up headway = 4.5 s (shared), 2.5 s (exclusive)

A reduced form is given as Equation C16-3.

$$f_m = \left(\frac{g_f}{g}\right) + \left(\frac{g_u}{g}\right)\left[\frac{1}{1 + P_L(E_{L1} - 1)}\right] \quad \text{(C16-3)}$$

Sneakers are considered to be part of the left-turn count for the corresponding green interval, even though they may enter and depart the intersection during the yellow or red intervals

Note that there is no term in this formulation to account for sneakers, that is, for drivers completing left turns during the effective red portion of the clearance-and-change interval. This term is missing because in saturation flow rate measurements, vehicles are counted when they enter the intersection, not when they leave it. However, there is a practical minimum number of left turns that will be made on any phase, defined by sneakers.

To account for this situation, a practical minimum value must be imposed on f_m. One sneaker per cycle may be assumed as a minimum. The probability that a second sneaker will be in position at the end of the green phase will be equal to the proportion of left turns in the shared lane, P_L. The estimated number of sneakers per cycle may therefore be computed as $(1 + P_L)$. Assuming an approximate average headway of 2 s per vehicle in an exclusive lane on a protected phase, the practical minimum value of f_m may be estimated as $2(1 + P_L)/g$.

MULTILANE APPROACH WITH OPPOSING MULTILANE APPROACHES

Multilane approaches are legs of intersections with more than one approach lane

For multilane approaches, the impact of left turns on a shared lane must be extended to include their impact on the entire lane group. One might simply assume that the factor for the shared lane is f_m and that the factor for each other lane in the group is 1.0. In this assumption, however, left turns affect only the lane from which they are made. This is incorrect because vehicles typically maneuver from lane to lane to avoid left-turn congestion. Equation C16-4 provides the relationship for computing realistic f_{LT} values.

$$f_{LT} = \frac{f_m + 0.91(N - 1)}{N} \quad \text{(C16-4)}$$

where

f_{LT} = left-turn adjustment factor applied to a total lane group from which left turns are made, and

f_m = left-turn adjustment factor applied only to lane from which left turns are made.

11/16/2011 ITEM NO. 4.1

APPENDIX B

INTERSECTION COLLISION HISTORY DATA

11/16/2011 ITEM NO. 4.1

Intersection Magic VER 6.727
City of Laguna Hills, CA 04/18/2011

Accident listing
03/26/2006 - 03/25/2010
Calle De La Plata & Paseo De Valencia
Sorted by <DATE;TIME;ACC#>

CASE ID	DATE	STREET 1	STREET 2	DIST	DIR FROM	VEH 1 MOV	VEH 1 DIR	VEH 2 MOV	VEH 2 DIR	COLL	VIOL CAT	INJ
9005064	08/27/2006	PASEO DE VALENCIA	CALLE DE LA PLATA	0	Not state	Straight	NORTH	Left turn	SOUTH	Broadside	Traffic signals	0
3198208	05/03/2007	PASEO DE VALENCIA	CALLE DE LA PLATA	29	South	Straight	NORTH	Stopped	NORTH	Rear end	Unsafe speed	1
3552989	12/29/2007	PASEO DE VALENCIA	CALLE DE LA PLATA	14	South	Left turn	WEST	Not stated	EAST	Auto-ped	Ped right-of-way	2 *
3685215	03/28/2008	PASEO DE VALENCIA	CALLE DE LA PLATA	18	South	Chging lanes	SOUTH	Straight	SOUTH	Rear end	Unsafe lane chng	1
3988307	10/14/2008	PASEO DE VALENCIA	CALLE DE LA PLATA	0	Not state	Right turn	EAST	Right turn	EAST	Auto-ped	Ped right-of-way	1
4080706	01/08/2009	PASEO DE VALENCIA	CALLE DE LA PLATA	0	Not state	Backing	NORTH	Left turn	SOUTH	Other Col	Unsafe start/back	0
4129164	02/19/2009	PASEO DE VALENCIA	CALLE DE LA PLATA	0	Not state	Straight	WEST	Straight	NORTH	Broadside	Traffic signals	1
4173781	03/28/2009	PASEO DE VALENCIA	CALLE DE LA PLATA	181	South	Stopped	NORTH	Straight	NORTH	Rear end	Unsafe speed	1
4466956	11/03/2009	CALLE DE LA PLATA	PASEO DE VALENCIA	5	East	Straight	WEST	Not stated	SOUTH	Auto-ped	Not stated	0
4552139	11/21/2009	PASEO DE VALENCIA	CALLE DE LA PLATA	225	North	U turn	NORTH	Parked	Not state	Broadside	Improper turning	1
4539618	12/30/2009	PASEO DE VALENCIA	CALLE DE LA PLATA	0	Not state	Straight	NORTH	Stopped	NORTH	Rear end	Unsafe speed	0

* Considered correctible by left-turn phasing in the east-west directions.

APPENDIX C

PEAK-HOUR TURNING MOVEMENT

TRAFFIC VOLUME DATA

ITM Peak Hour Summary

Prepared by:

NDS

National Data & Surveying Services

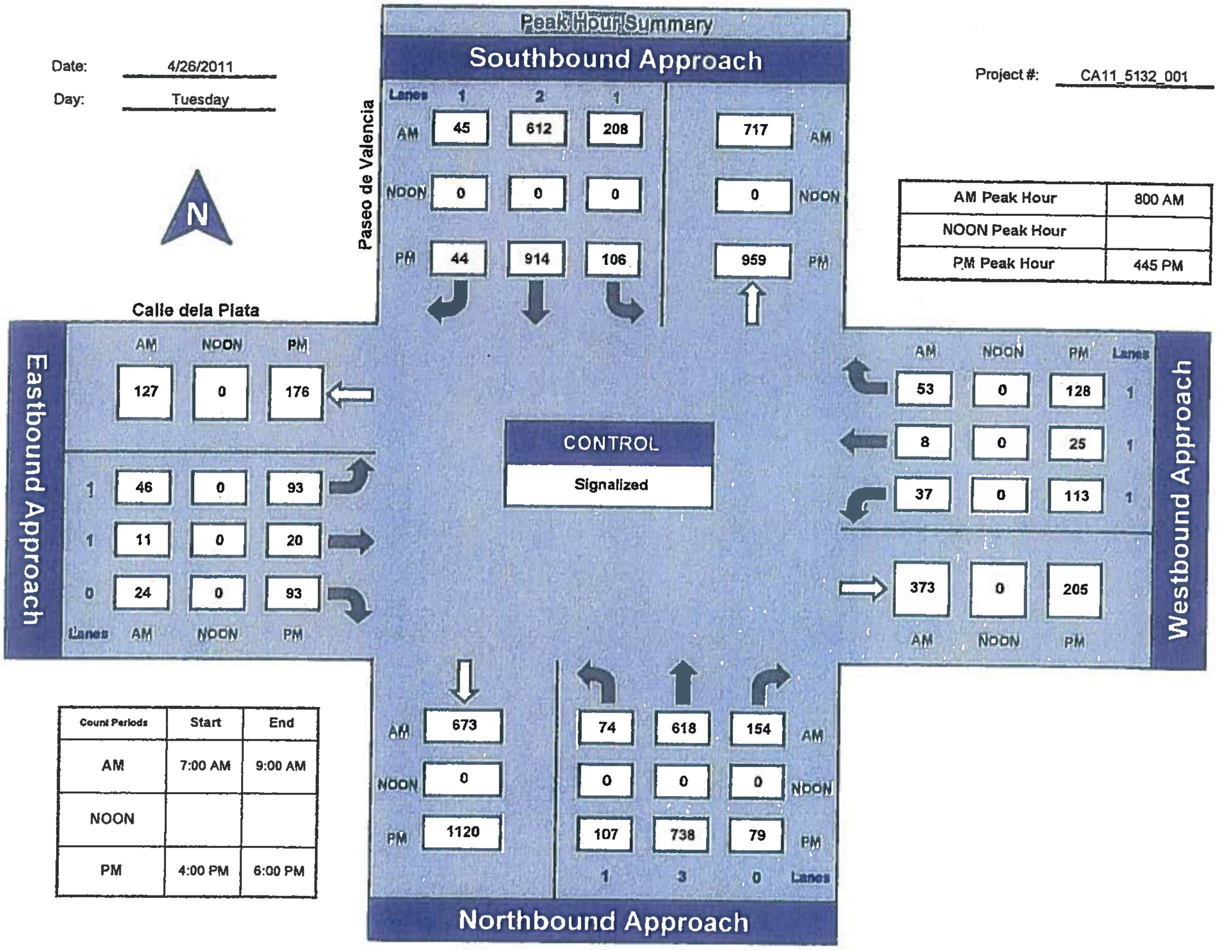
Paseo de Valencia and Calle dela Plata , City of Laguna Hills

Date: 4/26/2011

Day: Tuesday

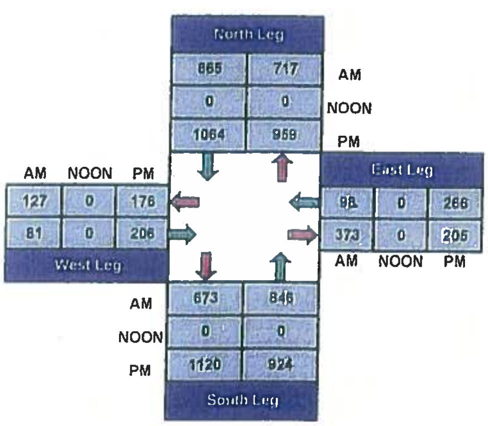
Project #: CA11_5132_001

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	445 PM

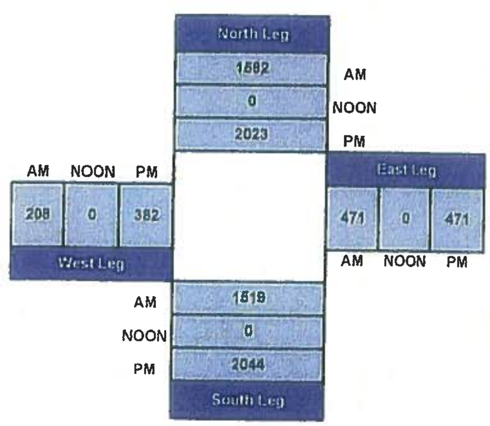


Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON		
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: CA11_5132_001 **Day:** TUESDAY

City: City of Laguna Hills **Date:** 4/26/2011

AM

NS/EW Streets:	Paseo de Valencia			Paseo de Valencia			Calle de La Plata			Calle de La Plata			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	3	0	1	2	1	1	1	0	1	1	1	
7:00 AM	5	111	12	29	111	2	4	1	2	2	1	8	288
7:15 AM	8	117	15	34	122	7	3	1	2	5	0	8	322
7:30 AM	7	155	20	30	137	4	12	1	4	6	0	9	385
7:45 AM	10	181	19	46	191	9	8	2	3	6	2	5	482
8:00 AM	18	138	32	52	135	4	7	0	6	9	1	18	420
8:15 AM	13	163	54	61	143	12	11	3	3	8	2	7	480
8:30 AM	23	146	32	49	144	12	14	0	7	10	4	19	460
8:45 AM	20	171	36	46	190	17	14	8	8	10	1	9	530
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	104	1182	220	347	1173	67	73	16	35	56	11	83	3367
APPROACH %'s :	6.91%	78.49%	14.61%	21.87%	73.91%	4.22%	58.87%	12.90%	28.23%	37.33%	7.33%	55.33%	
PEAK HR START TIME :	800 AM												TOTAL
PEAK HR VOL :	74	618	154	208	612	45	46	11	24	37	8	53	1890
PEAK HR FACTOR :		0.920			0.855			0.675			0.742		0.892

CONTROL : Signalized

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: CA11_5132_001 **Day:** TUESDAY

NS STREET: Paseo de Valencia
City: City of Laguna Hills
DATE: 4/26/2011
LOCATION: City of Laguna Hills
Date: 4/26/2011

EW STREET: Calle de La Plata
DAY: TUESDAY
PROJECT#: 11-5132-001

PM

NS/EW Streets:	Paseo de Valencia			Paseo de Valencia			Calle de La Plata			Calle de La Plata			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	3	0	1	2	1	1	1	0	1	1	1	
4:00 PM	22	158	8	27	211	6	24	4	20	17	4	23	524
4:15 PM	27	163	15	24	197	7	19	5	25	19	6	25	532
4:30 PM	33	178	14	29	173	3	22	4	21	22	9	27	535
4:45 PM	31	168	16	41	226	4	18	4	20	28	6	27	589
5:00 PM	19	198	25	21	196	4	27	5	25	38	12	43	613
5:15 PM	28	197	26	26	237	18	28	3	25	24	2	29	643
5:30 PM	29	175	12	18	255	18	20	8	23	23	5	29	615
5:45 PM	26	141	22	23	261	4	21	1	17	20	2	24	562

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	215	1378	138	209	1756	64	179	34	176	191	46	227	4613
APPROACH %'s :	12.42%	79.61%	7.97%	10.30%	86.55%	3.15%	46.02%	8.74%	45.24%	41.16%	9.91%	48.92%	
PEAK HR START TIME :	445 PM												TOTAL
PEAK HR VOL :	107	738	79	106	914	44	93	20	93	113	25	128	2460
PEAK HR FACTOR :		0.920			0.914			0.904			0.715		0.986

CONTROL : Signalized

APPENDIX D

LEFT-TURN DELAY DATA

Prepared by National Data & Surveying Services

Queue/Delay Study

Location: Paseo de Valencia & Calle de La Plata
City: Laguna Hills

Project #: 11-5132-001
Date: 4/26/2011

Cycle	Time	Number of Vehicles in Queue							
		Direction: NB		Direction: SB		Direction: EB		Direction: WB	
		Lane: Left-Turn		Lane: Left-Turn		Lane: Left-Turn		Lane: Left-Turn	
		BOG*	EOY*	BOG	EOY	BOG	EOY	BOG	EOY
1	7:00	1	0	2	0	0	0	0	0
2		1	0	2	0	0	0	1	0
3		0	0	7	0	0	0	0	0
4		1	0	1	0	0	0	0	0
5		1	0	3	0	1	0	0	0
6						1	0	0	0
7						0	0	1	0
8				3	0	0	0	0	0
9		2	0	1	0				
10				3	1				
11				1	0				
12				1	1				
13		2	0	1	3				
14				3	0				
15						1	0	0	0
16				1	0				
17				3	0				
18		1	0	2	0				
19	7:15			1	0	0	0	0	0
20				2	0				
21				1	0	0	0	0	0
22				3	0				
23				1	0				
24						0	1	2	0
25				2	0	1	0	1	0
26				1	0	0	0	1	0
27				2	0				
28		1	0	2	0	1	0	0	0
29				2	0	0	0	1	0
30				1	0	0	0	0	0
31				1	2				
32				2	1				
33				1	1				
34				1	1				
35				1	1				
36				1	0	0	0	0	0
37	7:30	1	0	1	0				
38				0	0				
39		1	0	3	0	0	0	0	0
40		1	0	5	0	1	0	0	0
41				4	0	2	0	0	0
42		2	0	1	0				
43				6	0				
44		0	0	4	0				
45				1	0	0	0	1	0
46	7:45	1	0	3	1				
47				4	0	2	0	1	0
48		2	1	1	0				
49		0	0	3	0	1	0	0	0
50				7	3	2	0	1	0
51		1	1	4	3				
52				2	1	2	0	0	0
53		3	0	3	0				
54				3	0	0	0	2	0
55				14	9	0	0	0	0
56		2	0	10	0				

57				8	2	0	0	2	0
58		3	0	3	0				
59	8:00	1	0	6	0	0	0	1	0
60				9	1	1	0	3	0
61		3	0	3	1				
62				13	5	3	0	0	0
63		1	0	5	1				
64				7	0	0	0	2	0
65		2	0	1	1				
66				9	2	1	0	1	0
67		2	0	4	0				
68				3	2	0	0	1	0
69				3	0				
70				0	0	0	0	1	0
71	8:15			9	1	0	0	1	0
72		1	0	5	0				
73				2	0	0	0	2	0
74		1	0						
75				10	0				
76		6	0			2	0	0	0
77				5	2	1	0	0	0
78				4	0				
79				8	3	4	1	1	0
80		2	0	5	0				
81				3	1	2	0	1	0
82		2	0	2	0				
83				6	1	1	0	2	0
84		1	0	3	0				
85				6	1	2	0	1	0
86	8:30	5	0	1	0				
87				2	0				
88				1	1	1	0	0	0
89		1	0	2	0	0	1	0	0
90		1	0	3	0	1	0	0	0
91		1	0			0	0	0	0
92		1	0	2	0				
93		2	0	1	0	0	0	1	0
94		2	0	5	1				
95		3	0	5	0	2	0	0	0
96		2	0	4	0	0	0	0	0
97				3	0				
98		2	0	2	1	0	0	0	0
99		1	0	1	0	1	0	0	0
100				3	0				
101	8:45	1	0	0	0				
102		1	0						
103				2	2				
104		2	0	6	0	2	0	0	0
105		1	0	7	0	0	0	1	0
106		2	0	3	0				
107		2	0			2	0	1	0
108		1	0	2	2				
109		3	0	3	0	1	0	1	0
110		2	0						
111				9	0				
112		4	0	3	0	1	0	2	0
113						3	0	1	0
114		4	0	7	1				
115		3	1	2	2				
116				3	1				
117						1	0	0	0
118		3	0	3	0				
119				3	0				

NOTES:

* BOG = Vehicles counted at beginning of green
* EOY = Vehicles counted at end of yellow.

Prepared by National Data & Surveying Services

Queue/Delay Study

Location: Paseo de Valencia & Calle de La Plata
City: Laguna Hills

Project #: 11-5132-001
Date: 4/26/2011

Cycle	Time	Number of Vehicles in Queue							
		Direction: NB		Direction: SB		Direction: EB		Direction: WB	
		Lane: Left-Turn		Lane: Left-Turn		Lane: Left-Turn		Lane: Left-Turn	
		BOG*	EOY*	BOG	EOY	BOG	EOY	BOG	EOY
1	4:00			9	2	3	0	1	1
2		6	0						
3				9	5				
4		2	2			2	0	2	0
5				12	5	5	0	1	0
6		7	0						
7						4	0	4	0
8				11	4	3	0	5	0
9		7	0						
10				8	1	5	0	2	0
11		5	0						
12				4	1	1	0	0	0
13		7	0						
14	4:15			4	0	3	0	4	0
15		1	0						
16				6	0				
17		7	0			1	0	1	0
18				6	0				
19						2	0	4	1
20		2	0	7	0				
21		1	0			6	1	2	0
22				3	0	3	0	1	0
23		7	1						
24				6	0	2	0	2	1
25		3	1						
26				5	0	2	0	4	0
27		2	0						
28	4:30			7	1	2	0	1	0
29		4	0						
30				4	0				
31		3	0			2	0	1	0
32				7	0				
33		1	0			3	0	0	0
34				6	0	1	0	3	0
35		2	1						
36				4	1	4	1	6	3
37		3	1	3	0	6	1	3	0
38				3	0				
39		4	1			3	0	4	0
40						1	0	2	0
41		4	0						
42	4:45			4	0	2	2	2	0
43		4	0						
44				4	0	1	0	2	0
45		5	0						
46				6	0				
47						1	0	6	0
48		5	1						
49				10	0	1	0	4	0
50		5	0						
51				3					
52		7	1			3	1	2	1
53				4	0	1	0	9	0
54		5	0						
55				4	2				
56		2	1			2	0	3	0

57	5:00			8	0				
58						5	1	6	0
59		7	2						
60				4	0	5	1	6	0
61		6	0						
62						6	0	5	0
63		5	0						
64				3	0				
65		5	1			5	0	4	0
66				8	2	4	0	7	0
67		4	0						
68				2	0				
69		2	1			0	0	3	1
70				3	0	4	0	7	0
71		7	0						
72	5:15			4	0				
73						5	0	4	0
74		1							
75				6	0	5	0	1	0
76		5	0						
77				5	0	3	0	3	0
78		1	0						
79				7	1				
80		4	0			2	0	4	0
81				5	0				
82		5	0			4	0	3	0
83				4	0				
84		3	0			3	1	2	0
85				6	0	5	0	3	0
86	5:30	3	0						
87		3	1	3	0	0	0	0	0
88				3	1	3	0	1	0
89		7							
90				5	0				
91		7	1			1	0	3	0
92		0		1	0				
93		3	0						
94				2	0				
95		4	0			4	0	2	0
96		3	0	2	1	0	0	4	0
97				8	0	8	0	6	0
98	5:45	8	1						
99				3	0	2	0	3	0
100		6	0						
101				6	1				
102		1	0			2	0	1	0
103				6	0				
104		5	0			5	0	4	0
105				5	0				
106		4	2			0	0	0	0
107		5	0	1	0	2	0	3	0
108		4	0	2	0	3	0	3	0
109				3	1	1	0	5	0
110		4	0						
111									
112									
113									

NOTES:

* BOG = Vehicles counted at beginning of green
* EOY = Vehicles counted at end of yellow.

HARTZOG & CRABILL, Inc.

Trammell Hartzog, President
Jerry Crabill, P.E. (Retired)
Gerald J. Stock, P.E.,
Executive Vice President

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Tustin, CA 92780

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www.hartzog-crabill.com

June 6, 2011

TO: Ken Rosenfield, Director of Public Works
City of Laguna Hills

FROM: Jerry Stock, Consulting Traffic Engineer
Hartzog & Crabill, Inc.

SUBJECT: PEDESTRIAN COUNT DATA AT THE INTERSECTION OF PASEO DE VALENCIA AND CALLE DE LA PLATA

As per the City's request, attached please find pedestrian count data taken at the intersection of Paseo de Valencia and Calle de La Plata on Thursday, May 26, 2011.

As you know there are three (3) marked crosswalks at this intersection (there is no crosswalk across the north leg of Paseo de Valencia). Pedestrian count data was collected during the morning and afternoon peak periods. In brief summary, the higher pedestrian volumes occurred across the south leg of the intersection during the PM peak period (4-6pm). During this 2-hour period, there were a total of (40) pedestrians counted.

As you know, Hartzog and Crabill, Inc. (HCI) recently prepared a left-turn phasing warrant analysis at this intersection that resulted in no warrants being satisfied; consequently, no traffic signal changes or intersection recommendations were identified. In review of the pedestrian count data, our conclusion remains that there are no other intersection improvements recommended at this time.

Attached are the pedestrian count data.

Please let us know if you may have any further questions or comments. I can be reached at (714) 731-9455.

PREPARED BY NATIONAL DATA & SURVEYING SERVICES

Pedestrian Count

PROJECT#: 11-1074-001
N/S Street: Paseo De Valencia
E/W Street: Calle La Plata
DATE: 5/26/2011
CITY: Laguna Hills

DAY: Thursday

	Start:	End:
AM	7:00	9:00
NOON		
PM	16:00	18:00

AM	0
NOON	0
PM	0

0	AM
0	NOON
0	PM

AM	NOON	PM
8	0	12

NORTH LEG

AM	NOON	PM
1	0	3

WEST LEG

EAST LEG

2	0	6
AM	NOON	PM

7	0	22
AM	NOON	PM

SOUTH LEG

AM	5
NOON	0
PM	13

15	AM
0	NOON
27	PM

PREPARED BY NATIONAL DATA & SURVEYING SERVICES

PROJECT#: 11-1074-001
N/S Street: Paseo De Valencia
E/W Street: Calle La Plata
DATE: 5/26/2011 DAY: Thursday
CITY: Laguna Hills

A M

PEDESTRIANS

TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG	
	EB	WB	EB	WB	NB	SB	NB	SB
7:00 AM	0	0	1	0	1	0	0	1
7:15 AM	0	0	0	0	1	0	0	0
7:30 AM	0	0	0	4	1	0	0	0
7:45 AM	0	0	0	4	0	1	1	1
8:00 AM	0	0	2	1	0	0	0	1
8:15 AM	0	0	0	2	0	0	1	0
8:30 AM	0	0	1	4	0	0	0	0
8:45 AM	0	0	1	0	4	0	0	5
TOTALS	**0**	**0**	**5**	**15**	**7**	**1**	**2**	**8**

P M

PEDESTRIANS

TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG	
	EB	WB	EB	WB	NB	SB	NB	SB
4:00 PM	0	0	2	7	2	0	2	1
4:15 PM	0	0	3	5	2	2	3	3
4:30 PM	0	0	0	2	4	0	1	2
4:45 PM	0	0	3	4	0	1	0	2
5:00 PM	0	0	0	5	4	0	0	0
5:15 PM	0	0	4	0	0	0	0	3
5:30 PM	0	0	1	1	1	0	0	0
5:45 PM	0	0	0	3	9	0	0	1
TOTALS	**0**	**0**	**13**	**27**	**22**	**3**	**6**	**12**


TURNING
TRAFFIC
MUST
YIELD TO
PEDESTRIANS
09/08/2011


La Plata
TURNING
TRAFFIC
MUST
YIELD TO
PEDESTRIANS
09/08/2011

CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT

ISSUE: **PROPOSED NO PARKING ANYTIME ZONES ON PLAZA POINTE DRIVE**

SUMMARY:

A business member of the community contacted staff with expressed concerns regarding big rig truck parking occurring along Plaza Pointe Drive at points that potentially created traffic conflicts. Staff evaluated the truck parking conditions, observed up to three big rig trucks parking on Plaza Pointe Drive at any one time, and identified locations where No Parking Anytime Zones are advised to be established in order to reduce conflicts with sight distance and traffic movements. It is recommended that the Traffic Commission recommend to the City Council the establishment of No Parking Anytime Zones on portions of Plaza Pointe Drive northerly of South Pointe Drive.

BACKGROUND:

Plaza Pointe Drive is an entrance street into the mixed-use zone located in the most northern area of the City just southerly of Avenida de la Carlota and terminating at South Pointe Drive. Plaza Pointe Drive is a curvilinear street with a knuckle corner with several driveway access points for various commercial and business interests in the area. There currently exists a No Parking Anytime Zone for northbound Plaza Pointe Drive southerly of Avenida de la Carlota.

Recently, a member of the business community contacted staff with expressed concerns about multiple big rig truck parking that is occurring primarily on Plaza Pointe Drive and that can create conflicts with sight distance and general traffic movements. Staff performed a field review of this location on at least six occasions and observed big rig truck parking occurring.

As shown on the attached vicinity map, the existing No Parking Anytime Zone is shown as a red line for northbound Plaza Pointe Drive south of Avenida de la Carlota. Based upon a site review of the balance of Plaza Pointe Drive, it is proposed that No Parking Anytime Zones be established as indicated by the orange lines on the attached vicinity map. These No Parking Anytime Zones would occur, beginning in the northbound direction, from 180’ north of South Pointe Drive up to and joining the existing No Parking

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RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECOMMEND TO THE CITY COUNCIL THE ESTABLISHMENT OF NO PARKING ANYTIME ZONES ON PORTIONS OF PLAZA POINTE DRIVE BETWEEN SOUTH POINTE DRIVE AND AVENIDA DE LA CARLOTA AS DESCRIBED.

Anytime Zone to Avenida de la Carlota and, in the southbound direction, beginning approximately 525' south of Avenida de la Carlota for a distance of approximately 145'. The establishment of the proposed No Parking Anytime Zones will reduce sight distance conflicts between large truck parking and vehicles exiting several driveways and will also reduce unexpected truck parking at locations that a motorist would come across after traversing a curve in the roadway.

Staff also reviewed the existing parking conditions on South Pointe Drive. There is a No Parking Anytime Zone on both sides of South Pointe Drive westerly of Plaza Pointe Drive. Parking is permitted on South Pointe Drive easterly of Plaza Pointe Drive. No truck parking was observed on South Pointe Drive and there were no apparent traffic conflicts with existing vehicular parking occurring in this area. No changes are recommended at this time for parking conditions on South Pointe Drive.

The property owners that access Plaza Pointe Drive were notified by letter of this proposed action.

FISCAL IMPACT:

The establishment of additional No Parking Anytime Zones on Plaza Pointe Drive, northerly of South Pointe Drive and southerly of Avenida de la Carlota, will require the installation of approximately eight No Parking Anytime Zone signs at an estimated cost of $1,500. Funds are available for this work in the Fiscal Year 2011-2012 Public Works Maintenance Budget.

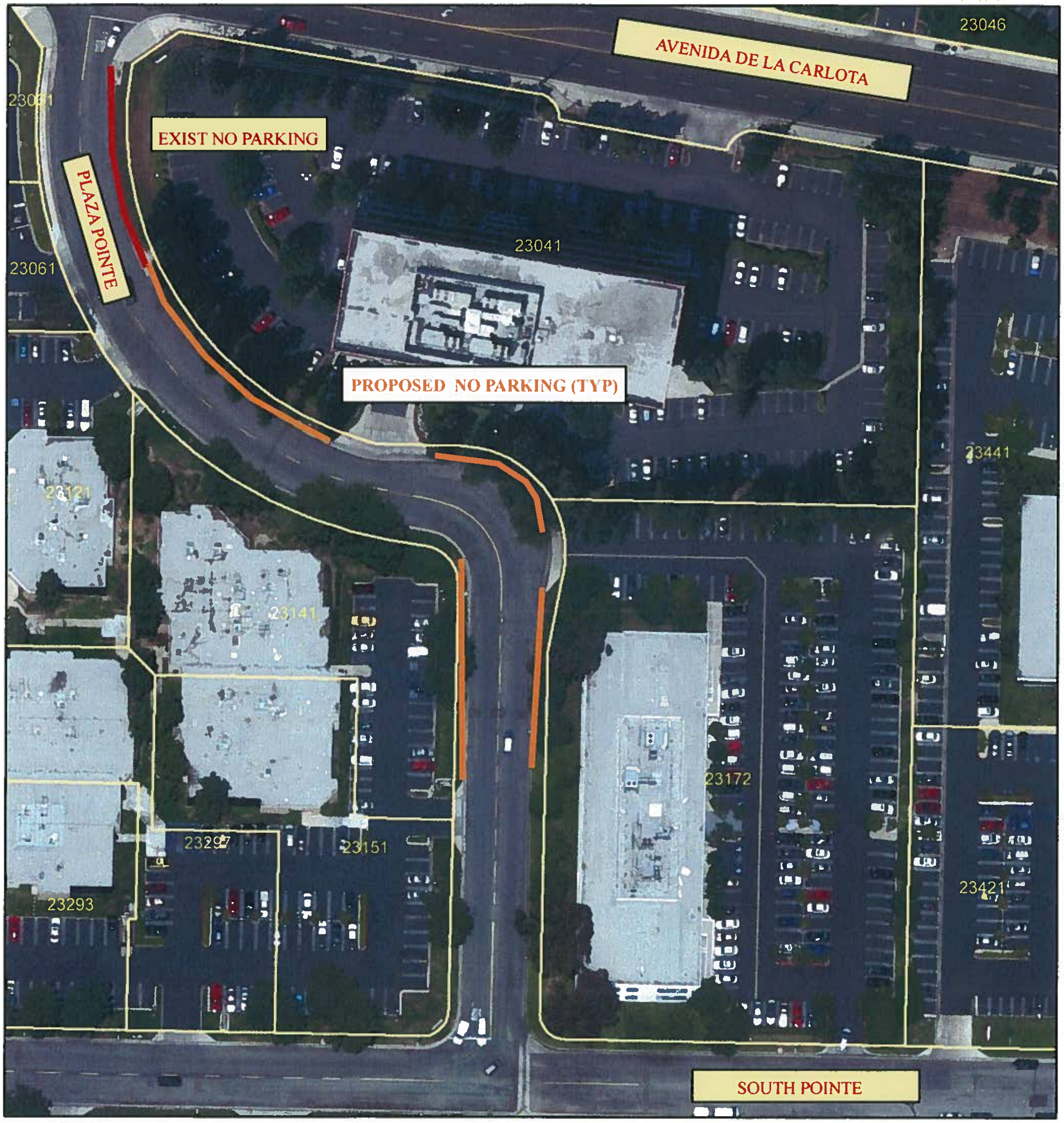
RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECOMMEND TO THE CITY COUNCIL THE ESTABLISHMENT OF NO PARKING ANYTIME ZONES ON PORTIONS OF PLAZA POINTE DRIVE BETWEEN SOUTH POINTE DRIVE AND AVENIDA DE LA CARLOTA AS DESCRIBED.

ATTACHMENTS:

- Vicinity Map

City of Laguna Hills

PLAZA POINTE DRIVE - NO PARKING



Date Created: 11/7/2011

11/16/2011 ITEM NO. 4.2

CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT

ISSUE: **PARKING CONTROLS SURVEY IN THE MANDEVILLE DRIVE AREA NEIGHBORHOOD**

SUMMARY:

At the September 21, 2011 Traffic Commission meeting, staff was requested to survey all the affected residents of the Mandeville Drive area neighborhood for a final “vote” of their parking control preference. On October 12, 2011, letters were sent out to all of the affected residents. The letters included previous survey results and the residents were requested to vote on their parking control preference. Unfortunately, similar to the previous survey, the response rate remains low at 55.7% of the affected residents, and the “majority” vote on any specific parking control preference remains at no more than 32.5% of the total affected residents. Therefore, staff is unable to recommend parking control changes for the entire neighborhood. It is recommended that the Traffic Commission receive and file this report.

BACKGROUND:

Over the past few months, residents of the Mandeville Drive area neighborhood have raised concerns that residents of the Crestline Homeowners Association continue to park overnight along Mandeville Drive impacting the parking supply and affecting the integrity of the neighborhood. In order to address this issue, on August 29, 2011, staff mailed out 124 surveys to residents of Mandeville Drive, Santa Rosa Avenue, Alta Loma Court, Sundance Avenue (herein the “Mandeville Drive area neighborhood”), La Cienega Street, and Los Cerros Street (herein the “La Cienega Street area neighborhood”), to determine parking preferences within their neighborhoods. Sixty-six (66) surveys were returned, 53% combined, from both neighborhood areas. Staff was, at that time, unable to provide a recommendation to the Traffic Commission based on a 53% response rate (as that would lead to a potential reliance of just over 25% of the entire neighborhood influencing parking control changes).

Subsequently, on October 12, 2011, staff mailed out another survey to the affected residents to obtain a final “vote” of their parking control preference. Unfortunately, out of 122 surveys, staff received only 68 surveys back, a 55.7% response rate for both neighborhoods. Specifically, for the Mandeville Drive area neighborhood, staff received

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RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECEIVE AND FILE THIS REPORT.

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44 out of 82 surveys, a 54% response rate. The highest vote was in support of a permit parking control in this neighborhood which received 17 votes, please see attached survey results. Staff is unable to recommend this preference for implementation considering this response represents only 20.7% of the entire neighborhood. For the La Cienega Street area neighborhood, staff received 24 out of 40 surveys, a 60% response rate. The highest vote was in support of a street sweeping parking control which received 13 votes, please see attached survey results. Similarly, staff is unable to recommend this preference for implementation considering this response represents only 32.5% of the entire neighborhood.

The low response rate and survey results indicate that the majority of residents in each of the neighborhoods are not interested in implementing parking controls. In order to ask the Traffic Commission to make a recommendation to the City Council, staff recommends a minimum 50% support of the entire neighborhood. The parking controls create a significant change to the neighborhood and the current response rate is not supportive of parking control changes.

Staff performed a site inspection of the Mandeville Drive area neighborhood and the La Cienega Street area neighborhood on Monday, November 7, 2011, at 9:00 p.m., to review parking conditions. The following observations were made:

Number of vehicles parked on Mandeville Drive (Moulton Parkway – Los Alamitos Avenue)	13
Number of vehicles parked on Mandeville Drive (Moulton Parkway – Santa Rosa Street)	0
Number of vehicles parked on Santa Rosa Avenue (Mandeville Drive – Alta Loma Court)	1
Number of vehicles parked on Gordon Road	6
Number of vehicles parked on Sierra Bonita Drive and La Cienega Street (Aliso Hills Drive – Los Cerros Street)	5
Number of vehicles parked on full length of Los Cerros Street	3

Staff was unable to note any major parking issues from the site inspection results as shown above. There did not appear to be out-of-neighborhood parking along Mandeville Drive and Santa Rosa Avenue. A total of three vehicles on Sierra Bonita Drive, La Cienega Street, and Los Cerros Street could have been out-of-neighborhood vehicles, but their presence was not significant. Please see attached photographs.

It was also observed that the majority of the length of Gordon Road was empty with only six vehicles parked along it. By reminding Crestline HOA residents of the parking option on Gordon Road and allowing them to park there, the out-of-neighborhood parking issue in the Mandeville Drive area neighborhood may be reduced, as staff suspects that the issue occurs irregularly and is not consistent. Staff is in the process of preparing a mailer to the residents of the Crestline development reminding them of the permit parking option on Gordon Road along with rules of parking on public streets.

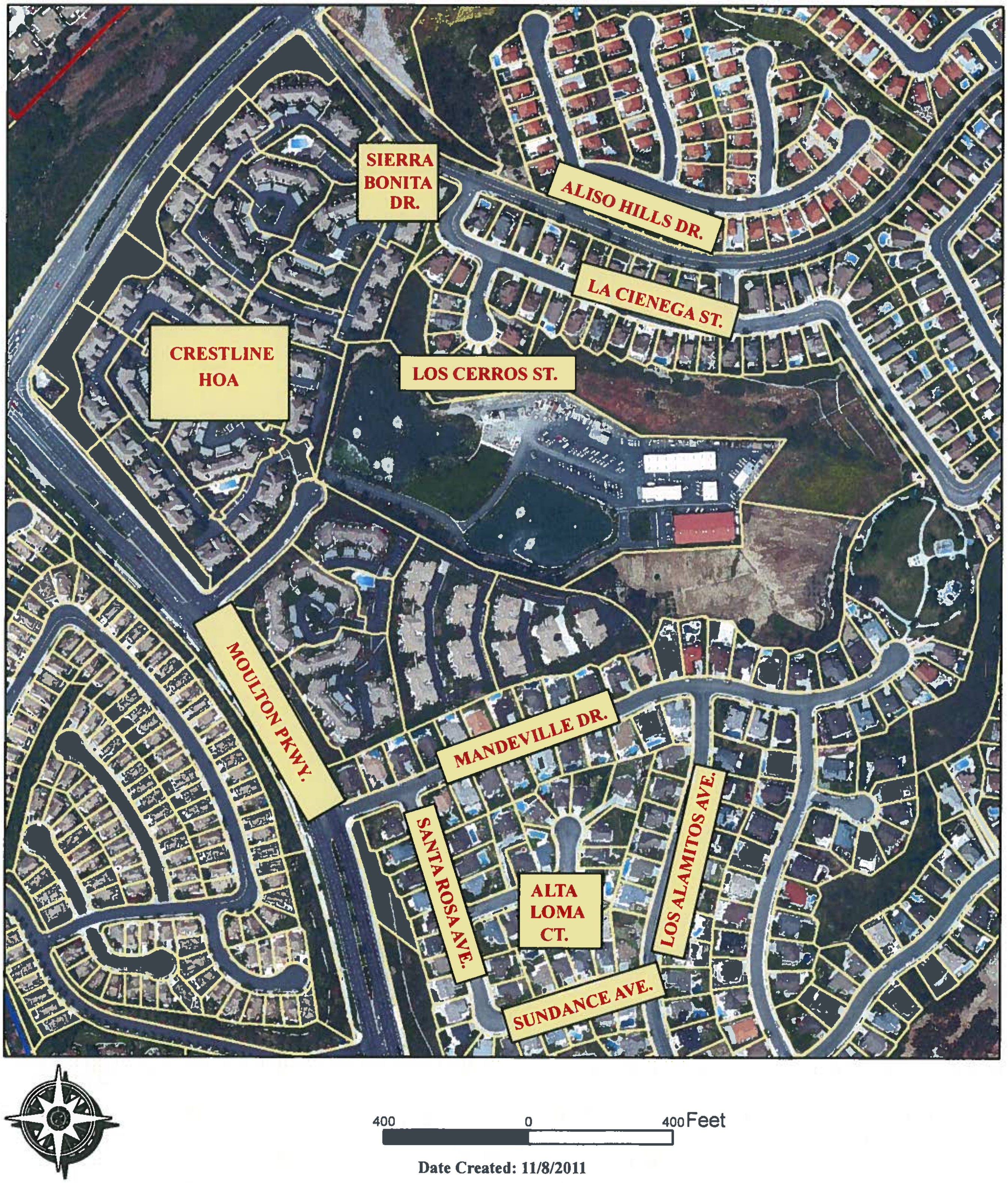
RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECEIVE AND FILE THIS REPORT.

ATTACHMENTS:

- Vicinity Map
- Survey Results
- Site inspection photos

City of Laguna Hills

VICINITY MAP



Date Created: 11/8/2011

11/16/2011 ITEM NO. 4.3

SURVEY RESULTS
MANDEVILLE DRIVE AREA NEIGHBORHOOD

82 SURVEYS MAILED/44 RECEIVED		SPECIFIC COMMENTS BY QUESTION
1. I support a "No Overnight Parking" control on my street, such as "No Parking from 2:00 a.m. to 6:00 a.m.	❑ Yes 14	
2. I support the establishment of a permit parking control on my street.	❑ Yes 17	
3. I support a no parking designation on my street during the hours and days of street sweeping.	❑ Yes 10	Prefer no restrictions but voted for this option as least restrictive.
4. Opposed to all choices	❑ No 11	

*Six surveys had multiple boxes checked.

General Comments:	Would like limited parking on neighborhood streets with residents parking in driveways. Please address parking problem. Recommend the installation of a “No Parking Here to Corner” sign where the problem exists. Crestline HOA should address this parking issue! Parking issues are on Mandeville, address issues there but please do not put controls on the other area streets. Parking controls will affect homeowner’s negatively.

SURVEY RESULTS
LA CIENEGA STREET AREA NEIGHBORHOOD

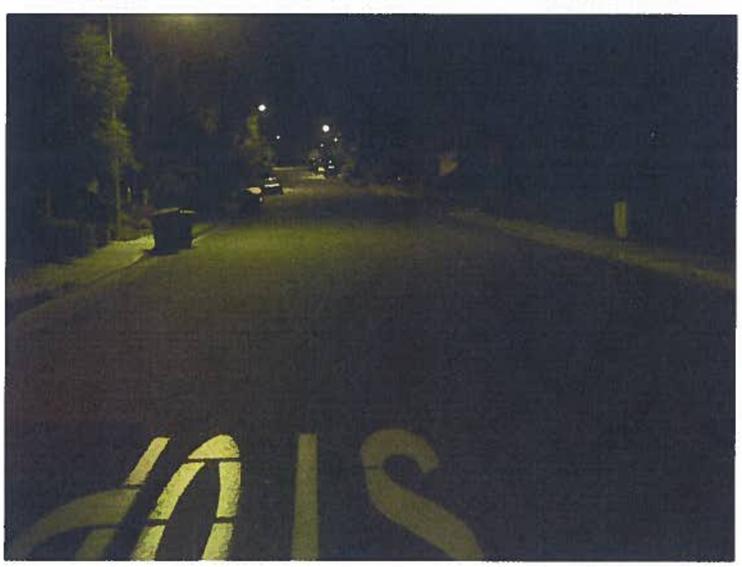
40 SURVEYS MAILED/24 RECEIVED		SPECIFIC COMMENTS BY QUESTION
1. I support a "No Overnight Parking" control on my street, such as "No Parking from 2:00 a.m. to 6:00 a.m.	❑ Yes 7	With exceptions for guests.
2. I support the establishment of a permit parking control on my street.	❑ Yes 12	Voted for all three but marked this as preferred.
3. I support a no parking designation on my street during the hours and days of street sweeping.	❑ Yes 13	
4. Opposed to all choices	❑ No 2	

*Six surveys had multiple boxes checked.

SITE INSPECTION PHOTOS
NOVEMBER 7, 2011 9:00 P.M.

At the intersection of Mandeville Dr. and Santa Rosa Ave. facing south along Santa Rosa Ave.

At the intersection of Mandeville Dr. and Santa Rosa Ave. facing west along Mandeville Dr.



At the intersection of Mandeville Dr. and Moulton Pkwy. facing east along Mandeville Dr.

At the intersection of La Cienega St. and Los Cerros St. facing east along La Cienega St.

At the intersection of La Cienega St. and Los Cerros St. facing west along La Cienega St.

At the intersection of La Cienega St. and Los Cerros St. facing south along Los Cerros St.

CITY OF LAGUNA HILLS

December 2011

RADAR TRAILER SCHEDULE

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Stageline W/O Hidden Trail 25 MPH	2	3
4	5	6 Nellie Gail Rd S/O Buckskin 25 MPH	7 Bridlewood S/O Laurel Crest 25 MPH	8 Mustang W/O Farrier 25 MPH	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26 HOLIDAY	27	28	29	30	31

CITY OF LAGUNA HILLS

January 2012

RADAR TRAILER SCHEDULE

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3 San Remo N/B Mid-block 30 MPH	4 Buckboard N/O Stetson 25 MPH	5 Rapid Falls W/O Sundowner 25 MPH	6	7
8	9	10 Santa Vittoria S/O San Remo 30 MPH	11 Lost Colt E/O Beargrass 25 MPH	12 Nellie Gail N/O Hidden Trail 25 MPH	13	14
15	16	17 Champlain Mid Block N/O Grissom 25 MPH	18 Nellie Gail W/O Rockinghorse 25 MPH	19 Santa Vittoria N/O Ridge Route 30 MPH	20	21
22	23	24 Laguna Hills Dr N/O P D Valencia 45 MPH	25 Nellie Gail N/O Hidden Trail 25 MPH	26 Santa Vittoria S/O Caminito Pacifico 30 MPH	27	28
29	30	31 Woodbluff E/O Green Hills 25 MPH				

CITY OF LAGUNA HILLS

MEMORANDUM

DATE: November 16, 2011

TO: Traffic Commissioners

FROM: Humza Javed, P.E.
Associate Civil Engineer

SUBJECT: Informational Item – Traffic Controls

Attached is an excerpt from the "Residential Street Traffic Control" report prepared by BSI Consultants, Inc., dated March 1994. All of the traffic controls in this report are valid measures available for use by the City. More current traffic control technologies have been developed since that time and include solar power radar speed limit signs, flashing beacons for various types of signs, in-roadway warning lights, updated traffic controls for bicycle facilities and schools, etc. The City utilizes all of the "tools" available in the Traffic Control "toolbox" for resolving traffic issues.

Additionally, an article named "Roadway Striping as a Traffic Calming Option" has been included as an attachment. The article is extracted from the ITE Journal (Institute of Transportation Engineers), and is authored by Mr. Robert Kahn, who happens to be one of the City's Transportation Engineering Consultants.

RESIDENTIAL STREET TRAFFIC CONTROLS

Residential traffic control methods include tools which are used to regulate, warn, and advise vehicle operators of their responsibilities in traversing the street. Generally, control of the motorist's actions are achieved by general laws, traffic control devices (passive controls), and/or geometric design features (physical controls). This report will present a review of the currently available information for the latter two types of controls which have or may be used in the residential setting.

In addition to those regulations which a motorist is required to know as part of their responsibility in obtaining a driver's license, controls are used to provide supplementary information for the general motorists and as an attempt to cause errant drivers to comply. It is expected that the reasonable driver will adhere to the "rules of the road" and respect the controls present. The unreasonable driver is most primarily brought into conformance by enforcement. Enforcement of speed related violations, for example, is typically performed by use of radar equipment which registers the speed of the vehicle. A police officer can then issue a citation to the errant driver. Enforcement is a key tool in gaining compliance with all regulations, especially for speed limits, and its use is considered integral with and necessarily applied to the controls discussed herein.

Each of the passive and positive physical controls under consideration will be described along with the experience with the effectiveness of the control on various traffic attributes. Primarily, in residential street settings, we are concerned with the speed and volume of traffic. However, other factors are sometimes also of concern including the composition of traffic, the noise generation of traffic, traffic safety, and emergency and service vehicle access. This study will focus on speed and volume effects of the controls and will mention some of these other factors when they are known to be prominent.

Generally, when a residential street is relatively long, straight, and has a downhill grade to it, it can be susceptible to an unacceptable prevailing speed of traffic. When a street is also a timesaving connector between two points of interest or is a relief valve for congestion on major streets, then volume concerns can be raised due to pass through traffic. Pass through traffic can be either or both from within or outside the community.

A residential street is defined by the California Vehicle Code in Section 515 as follows: "A 'residence district' is that portion of a highway and the property contiguous thereto, other than a business district, (a) upon one side of which highway, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures, or (b) upon both sides of which highway, collectively, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures." Under these specific conditions, a residential street has a presumed speed limit of 25 miles per hour, whether posted or not, in accordance with California Vehicle Code section 22352. Experience has shown that when the prevailing speed of traffic, the 85th percentile of measured traffic, rises above about 32 mph, then, the residents of the street have increasing concerns regarding traffic safety. Similarly, although a residential two-lane street has no practical maximum volume, when the traffic of the street tends to exceed 2,000 vehicles per day for an average 24 hour period, then resident concerns are increased about outside traffic impacting the neighborhood. These traffic speed and volume values do not necessarily relate to an actual degradation of traffic safety but appear to reach a threshold which is perceived by the residents to be adverse to their desired quality of life standard.

Upon receipt of a complaint or concern from a resident about traffic safety, the Traffic Engineer evaluates the issue and, as appropriate, collects data on speed and volume of traffic. Where applicable, the composition of traffic (percentages of buses and trucks) is also checked to see if it is contributing to a neighborhood concern. In addition to the collection of basic data, a field review of the street is performed to evaluate the need for additional traffic controls in terms of signing and striping to advise the motorist of the character of the street (i.e. a 25 mph sign) and to warn of curves or to address restricted sight distances. Following the completion of this initial review and acknowledgement, if appropriate, that there are undesirable characteristics of traffic on the roadway, then initial steps are taken to address the issues. The initial steps may be installation of speed limit signs followed by saturation enforcement of the speed limit by the police agency or similar efforts. This initial effort is often successful and the immediate concern of the residents is alleviated by improvements in traffic conditions. If these initial efforts do not return satisfactory results, then additional studies and incremental implementation of traffic controls are utilized. This incremental approach, as a policy which judiciously allocates resources, for the solution of residential traffic safety concerns is recommended. A variety of options for traffic controls are discussed in the following sections.

PASSIVE CONTROLS

Passive traffic controls primarily involve the use of signing and striping to serve as an educational device to the motorist that there is a regulation that they should respond to. The use of these controls does not physically prevent the motorist from taking an action and relies upon a response from the motorist, coupled with enforcement of regulatory signs, to result in the drivers obeying the requirements. "Passive controls are most effective in areas where general respect for all type of traffic controls is high, where there is a reasonable expectation of enforcement, or where there is little driver resentment of the specific device. Where any of these conditions do not exist, for example, where numerous stop signs are used in opposition to major traffic flows or where a turn prohibition is installed and no reasonable (from the driver's viewpoint) alternative exists, violations of the device can be expected." (Reference 1, page 62).

Motorists compliance of passive controls may be enhanced through education, community forums, and neighborhood programs. These efforts attempt to increase ones awareness of community concerns and may increase compliance of controls via peer pressure. The use of the anti-crime Neighborhood Watch forums to also address traffic safety concerns may be effective at the local level. Motorist skills and driving safety are expected to improve with increased understanding and awareness of the street that the motorist is upon.

Speed Limit Signs

Speed limit signs are posted in a residential street setting where there has been an indication of an undesirable speed occurrence by motorists. The vehicle code prescribes a 25 mph speed limit on a residential street without regard to the posting of a sign. However, a sign is occasionally posted, often supplemented with a "25" pavement legend to reinforce to the driver that this is a street that they should be particularly cognizant of the speed limit. It is not expected that a speed limit sign will change the traffic volume on the street. Traffic speed will only be affected when those drivers which are compliant and respectful of the law or which are fearful of the results of enforcement of the speed limit will respond to it. It has been demonstrated through numerous studies that motorists will drive at a speed at which they feel comfortable for the roadway conditions that they perceive. Therefore, on straight, long, wide, and, perhaps sloping, residential streets, it is not unusual to find motorists traversing the street at a speed greater than 25 mph. The use of the speed limit sign posting, however, does give additional notice to the motorist that attention should be given to their speed on the street and that the consequence of such violation may be enforcement.

Radar Trailer

One of the newer tools that has come into more common use is a device known as a "radar trailer". A radar unit is housed in a trailer and displays both the posted speed limit and the speed limit of the approaching vehicle. This device can be used in conjunction with enforcement or can be used alone. Typically, the trailers are solar panel powered with backup batteries and can remain in place for a day without service. This device is an educational device and a warning to the motorist of the speed that they are and should be traveling. It can be effective in reducing vehicular speed when occasionally and unexpectedly it is coupled with enforcement. Consistent use of the device for an initial period on a particular street, followed by random use, is recommended to have the desired effect. Enforcement of speeds in conjunction with the radar trailer should also be done at random intervals so that the motorists cannot anticipate the enforcement activity.

Stop Signs

An often requested sign for the control of traffic on a residential street is the installation of a stop sign. Resident perception is that the stop sign will slow the speed of traffic and be of such an inconvenience to the outside of neighborhood driver that they will reduce their utilization of the route and thereby reduce volume on the street.

A stop sign is a right-of-way control device that is utilized at intersections under certain standardized conditions. These conditions are found in the State of California Department of Transportation Manual and are as follows:

> "Because the STOP sign causes a substantial inconvenience to motorists, it should be used only where warranted. A STOP sign may be warranted at an intersection where one or more of the following conditions exist:
>
> 1. On the less important road at its intersection with a main road where application of the normal right of way rule is unduly hazardous as evidenced by accidents susceptible to correction by STOP signs.

2. On a country road or city street at its intersection with a state highway.
3. At the intersection of two main highways. The highway traffic to be stopped depends on approach speeds, volumes, and turning movements.
4. On a street entering a legally established through highway or street.
5. On a minor street where the safe approach speed to the intersection is less than 10 miles per hour.
6. At an unsignalized intersection in a signalized area.
7. At other intersections where a combination of high speed, restricted view, and accident record indicates a need for control by the STOP sign.

A STOP sign is not a "cure-all" and is not a substitute for other traffic control devices. Many times the need for a STOP sign can be eliminated if the sight distance is increased by removing the obstructions.

Multiway STOP signs:

The "Multiway Stop" installation may be useful at some locations. It should ordinarily be used only where the volume of traffic on the intersecting roads is approximately equal. A traffic control signal is more satisfactory for an intersection with a heavy volume of traffic.

Any of the following conditions may warrant a multiway STOP sign installation:

1. Where traffic signals are warranted and urgently needed, the multiway stop may be an interim measure that can be installed quickly to control traffic while arrangements

are being made for the signal installations.

2. An accident problem, as indicated by five or more reported accidents within a 12 month period of a type susceptible to correction by a multiway stop installation. Such accidents include right and left-turn collisions as well as right-angle collisions.

3. Minimum traffic volumes

   (a) The total vehicular volume entering the intersection from all approaches must average at least 500 vehicles per day for any 8 hours of an average day, and

   (b) The combined vehicular and pedestrian volume from the minor street or highway must average at least 200 units per day for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the maximum hour, but

   (c) When the 85-percentile approach speed of the major street traffic exceeds 40 miles per hour, the minimum vehicular volume warrant is 70 percent of the above requirements."

Numerous studies have been performed to evaluate the effectiveness of stop signs for their impact on traffic speed or volume. While a stop sign has the obvious effect of reducing speed in the immediate vicinity of the sign, (approximately within 200 feet on the approach and departure of the sign), the speed between intersections is not affected and has been documented to have the contrary effect, where traffic accelerates between the stop signs to make up for lost time. Studies in the literature (Reference 1, page 64) reflect that in the cities of Palo Alto, Walnut Creek, Pleasanton, El Monte, and La Mirada, California, the 85th percentile speed of traffic on a residential street was unaffected following the installation of stop signs.

If stop signs are installed for their appropriate right-of-way control and the residential street previously offered a marginal time saving for the motorist, then it can be expected that some reduction in traffic volume will follow from the installation of sufficient numbers of stop signs which become a travel time impediment. However, if the residential street offered significant time savings, then a volume reduction would not be expected by the installation of stop signs.

The use of multi-way stop signs also raises concerns with regards to the potential for increased accident frequency. The use of multi-way stop signs at locations which cannot be reasonably demonstrated to need them for traffic safety, can be ignored by the frequent user of the roadway which does not anticipate a conflict at the location. Numerous studies have been prepared regarding the degree to which stop signs are obeyed. "Generally, when not required to stop by cross traffic, only 5 - 20% of all drivers will come to a complete stop, 40 - 60% will come to a rolling stop below 5 mph, and 20 - 40% will pass through at higher speeds". (Reference 2, page 81).

<u>Other Regulatory Signs</u>

Other regulatory signs which have been used in certain specific cases include turn prohibition signs, one-way street designations, truck restrictions, parking controls, and access regulations. Each of these signs have potential use in specific circumstances, for example, when the major residential concern is a peak hour pass through traffic volume, then a turning restriction for all vehicles during that peak hour might aid in keeping this traffic on the arterial streets or in redirecting the pass through volume to other streets. One-way street designations can also assist in modifying the volume on a particular street but there use is somewhat limited to locations where the residential streets are in a grid pattern. Truck restrictions would only be used where there is a demonstrated violation of a residential street by trucks as a pass through route. Parking controls would typically be useful on a residential street when there is a demonstrated problem of outside commuters using the street for parking, where there is a specific instance that a visibility restriction could be improved by the installation of parking restriction, or where a commercial center may cause overflow parking to a residential street. Access regulation signs, such as "Not a Thru Street" or "Local Access Only" are appropriately used where, in fact, the street comes to an end and it is desirable to give notice to the outside motorists to avoid driving into the location. The use of a "Local Access Only" sign for a street which does connect to other streets is problematic in that it is difficult to define under what circumstances a vehicle would be found in violation of the sign. Each of the above signs described in this paragraph would cause some reduction of traffic volumes but would not be anticipated to cause any change of traffic speed.

Warning Signs

Warning signs such as curve warning advisory signs, "Watch Downhill Speed", and "Speed enforced by Radar" signs are used to advise the motorist of a need to watch their speed and that there are consequences to excessive speeding. These signs will have some initial effect on driver speed but their effectiveness will again wear off over time unless enforcement is a consequence of a violation of the warning sign and related regulatory signs. These signs are not anticipated to cause any change in traffic volume. Other signs such as "Slow" or "Caution, Children at Play" are not considered effective given that the message is vague and unenforceable. The sign does not convey a clear message to the drivers who are unlikely to change their speed unless they see some reason to do so other than the sign.

Novelty Signs

Novelty signs have been used on occasion in locations to try to get the driver's attention. An example of a novelty sign might be a speed limit sign which reads "Speed Limit 23 1/2 mph". Such signing will be noticed by the drivers the first few times they are on the street and may have the desired effect. However, over time, the effectiveness of these signs is questionable as relates to speed control.

Striping

Striping of streets provides delineation to advise traffic of their proper location on the street. As residential streets are typically two lane, low volume and low speed streets, centerline striping is not usually provided. On occasion, based upon complaints of residents having difficulty executing a left turn into their driveway as they slow down to make their turn and also experience a following driver passing them on the left, double yellow striping has been installed on some residential streets. Technically, this would prohibit the passing of a vehicle on the left. However, the striping is only as effective as the motorists will be compliant and relies upon enforcement for its effective use. A consequential use of a double yellow striped centerline is a belief that this indicates to the outside driver that this street is a collector roadway and should be used to get from one place to another and perhaps, can be traversed at a speed greater than that normal for a residential street. The use of double yellow centerline striping on residential streets is not expected to have an effect on traffic volume and may cause an increase in vehicular speed. Its use should be reserved for special conditions to provide delineation around curves, on approach to an intersection, or at locations experiencing restricted visibility.

Perception Striping

Given that the typical width of a residential street is from 36' to 40', then a half street width is from 18' to 20' wide. Parking of vehicles adjacent to the curb is presumed to utilize 8' of space (the maximum legal width of a vehicle, such as a large truck, is 8.5'), which leaves a travel lane of from 10' - 12'. A standard travel lane is 12' wide for a major roadway and they are occasionally reduced to 11' where conditions are such that narrower lanes are necessary. However, it is believed that as lanes are narrowed, vehicular speeds are reduced because of the concern of the motorist for straying outside of their lane and potentially being in conflict with adjacent obstructions or opposing traffic. If a residential street has centerline delineation, there is substantial traffic volume, and there is substantial parking along the curb, then, as the lane is narrowed, it would be expected that traffic speeds would be reduced. The use of striping to artificially create a reduced lane width may be of benefit in reducing speed. A centerline stripe coupled with a white right edge line, which potentially could be used as a parking lane or a bicycle lane, can create a travel lane width of less than 12' to create the perception of a conflict which may have the desired result of reducing traffic speed.

Also, experiments have been tried with the installation of painted white lateral bars across the street to create a perception to the driver of an usual condition which would result in a reduced speed. Typically, the bars would be spaced from 10' - 20' apart and as one approached an intersection, the bar spacing would become less and less to give the perception of increased speed regardless of actual vehicle speed. Results of these experiments have been mixed with some cases indicating a reduction of speed of a few miles per hour to no reduction in speed whatsoever. No change in traffic volume would be expected from these devices.

Angled Parking

Typically, parking on a residential street is parallel to the street and only occurs where there is insufficient on-site parking in garages and driveways or where there is high density development. While not documented in the literature, it has been observed that parking of vehicles at an angle to the curb, approximately 45 degrees, creates a condition where the motorist on the street has increased concern over the potential conflict with an unexpected backing vehicle and it is believed that speeds are then reduced. Angled parking could be employed in a residential street by striping parking spaces. Some reduction of speed would be expected and no change of traffic volume would be necessarily anticipated.

POSITIVE PHYSICAL CONTROLS

Physical Controls force the motorist to take an action which will affect their driving habits. The intent of the physical controls is either to force a reduction in speed or increase inconvenience to an extent that drivers take another route and traffic volume is reduced. These devices are largely self-enforcing and create a visual impression. However, some violations will still be experienced. They are more costly than passive controls and can have negative impacts on emergency and service vehicle access. Inconvenience to the residents of the neighborhood is also a factor to be considered in their use. Implementation of physical controls must be carefully considered so that all of these factors are weighed against the benefits to be received.

Rumble Strip[1]

As shown in Figure 1, rumble strips are patterns of raised pavement markers or roughened pavement which alert drivers to the presence of a condition or specific control device for which it is desired that they modify their driving. A series of rumble strips would create an uncomfortable and noisy ride for the driver and, coupled with other traffic control devices such as signs, would advise the motorist to, for example, reduce their speed. There is no anticipated change of traffic volume unless the route becomes

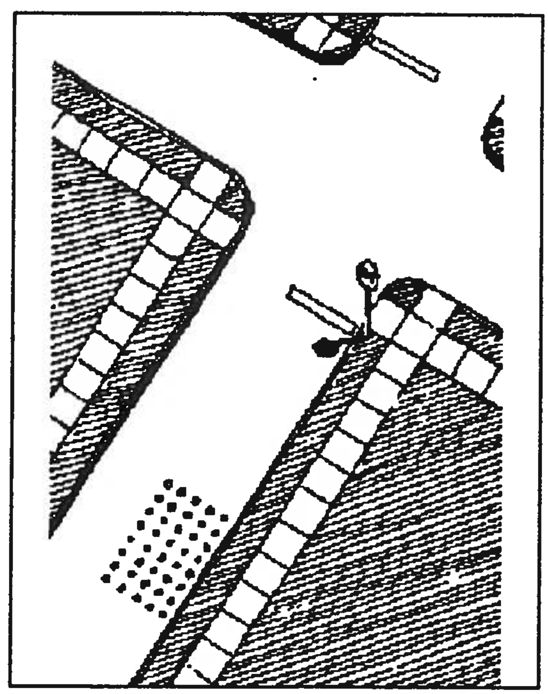


Figure 1

[1]The sketches used throughout are from Reference 1.

extremely inconvenient to drive. However, studies have evaluated the effects of these strips on speed and have shown that the upper levels of vehicular speed can be reduced by their use. Speed reduction is expected to be a few miles per hour. A very positive side effect of rumble strips, when used on the approach to stop signs, is that they have resulted in a reduction of traffic collisions. Reported noise studies on the use of rumble strips have been from the perspective of inside the vehicle. Generally, a few decibel increase of sound inside the vehicle is experienced and consequently it would be expected that adjacent residences would hear an increase in noise at the location of the rumble strips. It is not anticipated, however, that this increase in noise would exceed noise level standards.

Traffic Circle

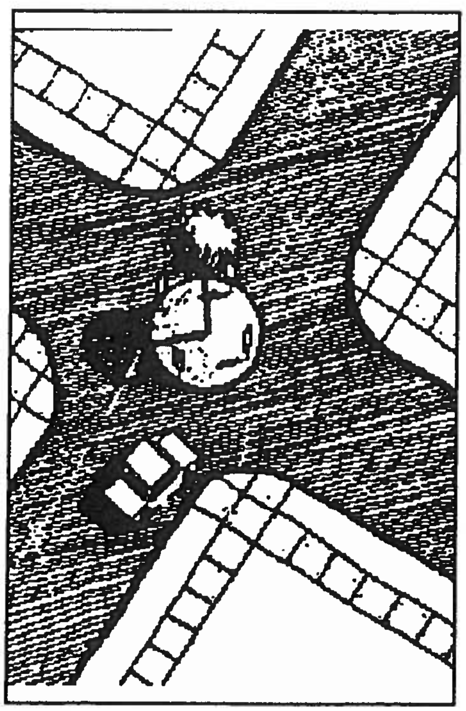


Figure 2

Traffic circles, as shown in Figure 2, are geometric design features which cause a physical barrier to be installed in the middle of an intersection which forces the motorist to turn around the circle in order to continue on their travel path. Speed reduction for these devices has been mixed but it is expected that at intersections, speed would be reduced due to the need for the driver to negotiate a physical barrier. The speed reduction appears to be related to the size of the circle that the motorist has to negotiate. Speed reduction was not observed as close as 300' to intersections in a study in San Francisco but speed was substantially reduced at the intersection. Traffic volume reductions have not been well documented for the use of this device but it is assumed that some reduction will occur due to the increased inconvenience that the motorist would experience to traverse the street.

Choker

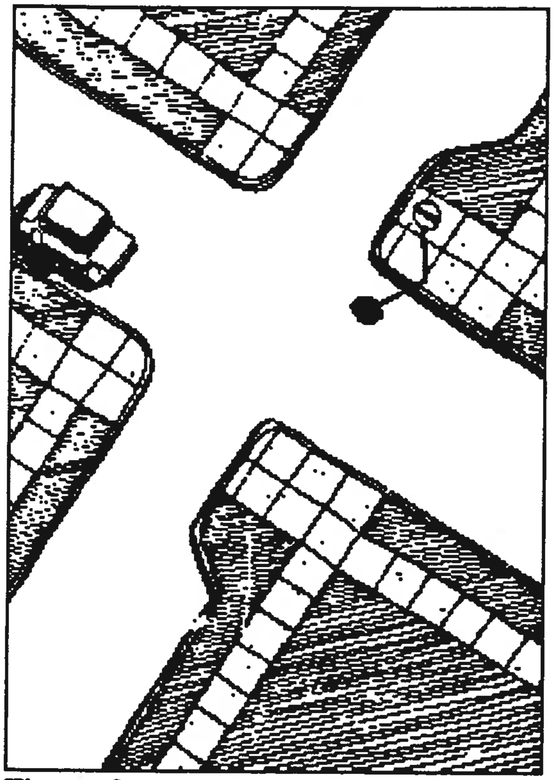


Figure 3

A choker is a narrowing of the roadway at either an intersection or at mid-block in order to reduce the width of the travelled way and physically cause the motorist to slow down due to an obstruction. As shown in Figure 3, the choker can be used by decreasing the width of the roadway or as an alternative, a median island can be installed to force a vehicle towards the curb as they approach an intersection. A series of chokers at successive intersections or along a length of the street, causing a reduction of lane width, has been shown to reduce traffic volume where they add "friction" to the drive for a considerable length of the street. Mixed results on speed reduction have been reported ranging from no impact to a few miles per hour. A side effect of chokers is that they can be used to enhance landscaping improvements in a neighborhood, become a basis for a neighborhood identity, and increase pedestrian safety at intersections where a pedestrian now has a less distance to cross a street.

Semi-diverter

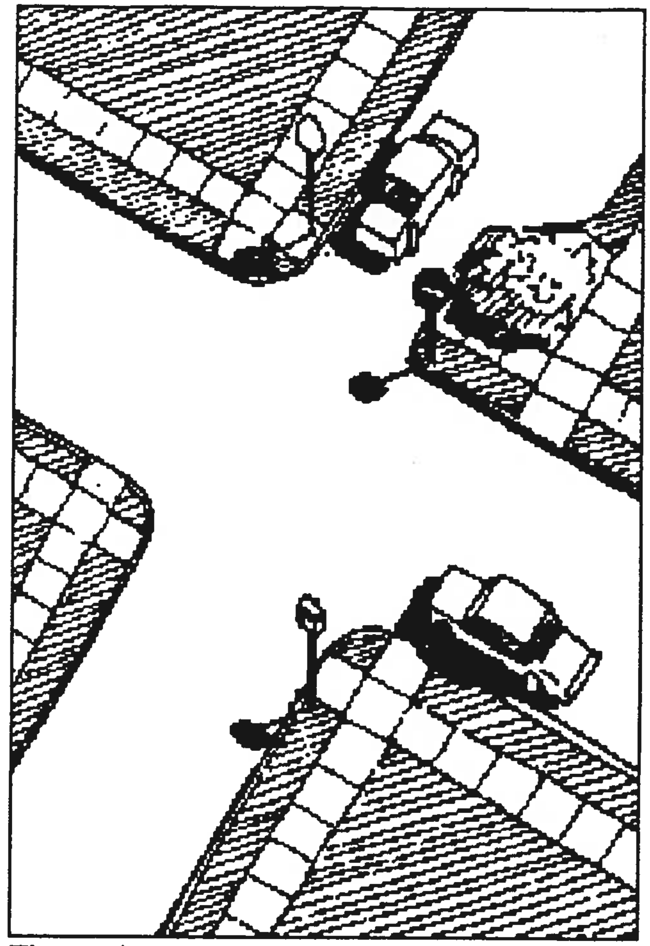


Figure 4

A semi-diverter is used to control access into a neighborhood and is similar in design to a choker, except that it actually reduces the access to one lane. A semi-diverter is a half closure of the street, as shown in Figure 4. In essence, the street becomes a one-way access street through the use of this physical device. When used at opposite ends of a through street, outside traffic is effectively eliminated from using the street as a two-way pass through route. Local access is still maintained for the residents on the street. Studies have shown that some of the diverters can make significant reductions in pass through traffic volume although the device is easily violated. This device is not considered a speed reduction device, however, if the speed issue is related to outside traffic, then some reduction in speed might result from the reduced traffic volume. The diverters would be supplemented with "Do Not Enter" signs as well as turn prohibition signs. This device is an alternative to using a one-way street designation for a block and allows the residents limited two-way travel opportunities.

Diagonal Diverter

A diagonal diverter is a physical barrier which is placed at and diagonally across an intersection to effectively convert the intersection into two unconnected streets, see Figure 5. This device will only be useable at a four-way intersection and forces the approaching vehicle to make 90 degree turns. Its primary purpose and effectiveness is to make travel through a neighborhood difficult while not actually preventing it. This device is primarily a traffic volume control device as it forces vehicles off of a particular street. In consequence, the traffic is placed on another residential street which may not be beneficial to the overall neighborhood. Diagonal diverters are typically used as multiple sets so that multiple approaches to a neighborhood are controlled. While a diagonal diverter is not a street closure device, given that it allows continuous passage, it does tend to reduce outside traffic using the street due to the now inconvenient route. Substantial reductions in traffic volumes have been experienced with the use of this device subject to the amount of pass through traffic previously encountered at the location. Traffic volume reduction studies have shown a reduction of from 20 - 70% depending on the system of devices used but, traffic volume on a non-diverted street was also shown to increase by as much as 20%. This device is not explicitly a speed control device and is only expected to reduce speeds on approach to the intersection. Emergency vehicle passage through the device must be considered with its installation.

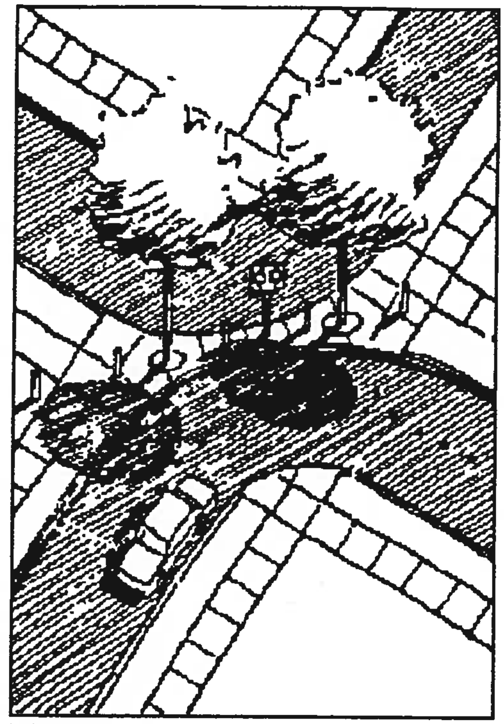


Figure 5

Forced Turn Channelization

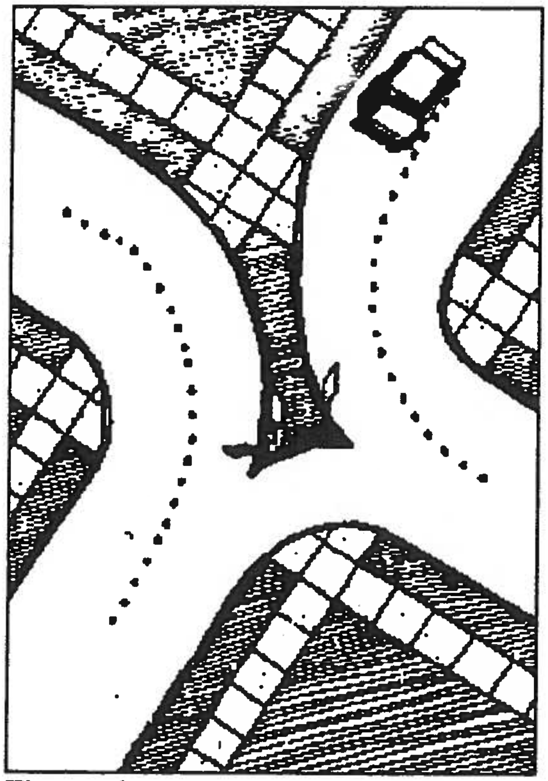


Figure 6

Forced turn channelization is a physical barrier specifically designed to prevent through traffic movement as shown in Figure 6. Its intent is to make travel on the local streets difficult but not to prevent it entirely. Some turning movement directions are preserved by this device while eliminating through movements. Another example of forced turn channelization is the installation of a "star" shaped median in the center of an intersection which forces all approaching drivers to make right turns. These devices have been shown to have an effect on traffic volume where the amount of outside pass through traffic was previously significant. Traffic speed has been found to be minimally affected by this device except at the immediate intersection where a vehicle is forced to negotiate an obstruction. However, in the case where the device reduces the traffic volume of outside pass through traffic and it was this outside pass through traffic that was increasing the prevailing speed of the street, then the actual speed reduction may be significant as an indirect cause of the installation of the device. This device does have the consequence of forcing traffic onto other residential streets which previously may not have experienced higher traffic volumes. Emergency and service vehicle passage through the device must be considered with its installation.

Median Island

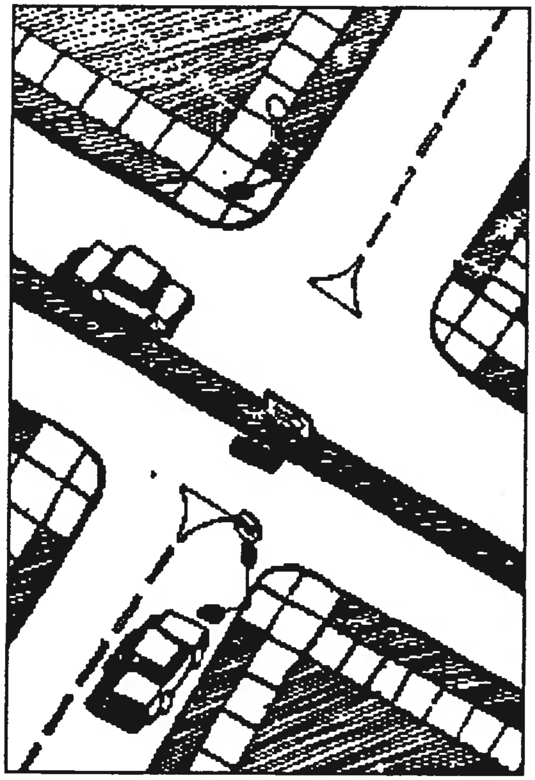


Figure 7

A median island barrier can be used at intersections to prohibit certain turning movements. A median island across the length of an intersection would not typically be used in a residential street setting but could have applications. It is common to use a median island at the intersection of a local street with an arterial highway to prohibit left turn or through turn movements as shown in Figure 7. The median barrier would be considered part of a forced turn device and also would have the effect of narrowing the lanes on the street on which the median is placed. The combination of these uses would be expected to reduce traffic volume by making the travel on the street more difficult. If, however, the median barrier reduced the potential conflict from side street traffic and residential driveway movements, then the pass through traffic could perceive the route as having less conflict or friction, relatively increased traffic safety, and then have potential for increased speed. This concept is the basis for the use of median islands on arterial highways to increase traffic flow. While increased speed is not encouraged, it is sometimes a by-product of reducing conflicts with other vehicles. Traffic volume reductions can be significant in that they prohibit certain movements. Evaluations of median barriers on speeds have only been performed where this device has been used on curves. They are not expected to have an overall effect on reducing speeds unless the median island was of such a width that it reduced the travel lane width significantly. A median island does improve traffic safety at intersections by eliminating conflicting movements.

Cul-de-Sac

Cul-de-sacs are an often used residential street device to indicate the end of a block while allowing large vehicles to turn around. Modern residential street design attempts to use as many cul-de-sacs as possible to reduce the use of a grid pattern of streets, which are often susceptible to pass through traffic volumes and speed concerns. Cul-de-sacs can be an effective device to be installed on existing residential streets at either intersections or mid-block locations subject to width restrictions. The installation of a cul-de-sac prohibits the through movement of traffic and thereby has a substantial effect on volume. To the extent that this traffic volume included motorists that exceeded an acceptable speed on the street, then traffic speed would be reduced. However, depending upon the length of the block, speed is not affected by the installation of a cul-de-sac except at its immediate location. A cul-de-sac can have an adverse effect on emergency and service vehicle access and will necessarily force traffic to use alternative routes. If the installation of cul-de-sacs is not consistent on adjacent and parallel routes, then it is anticipated that the traffic volume will move to other residential streets. Samples of cul-de-sac installation are shown in Figures 8, mid-block, and 9, intersection.

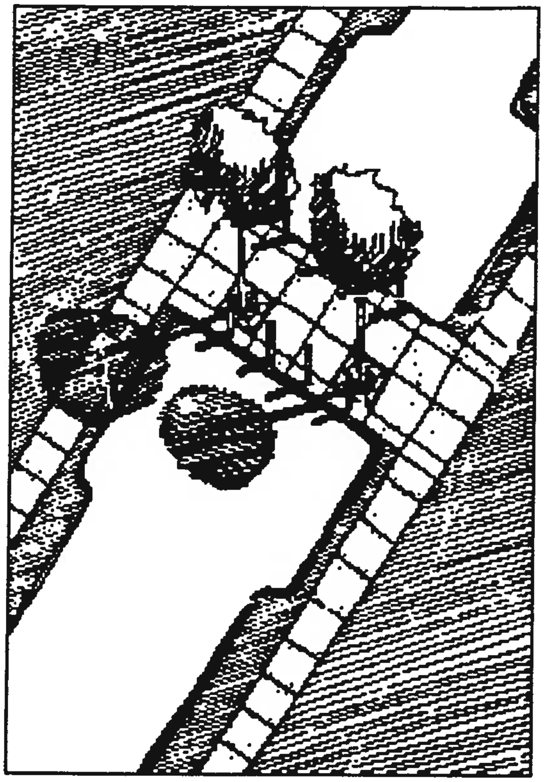


Figure 8

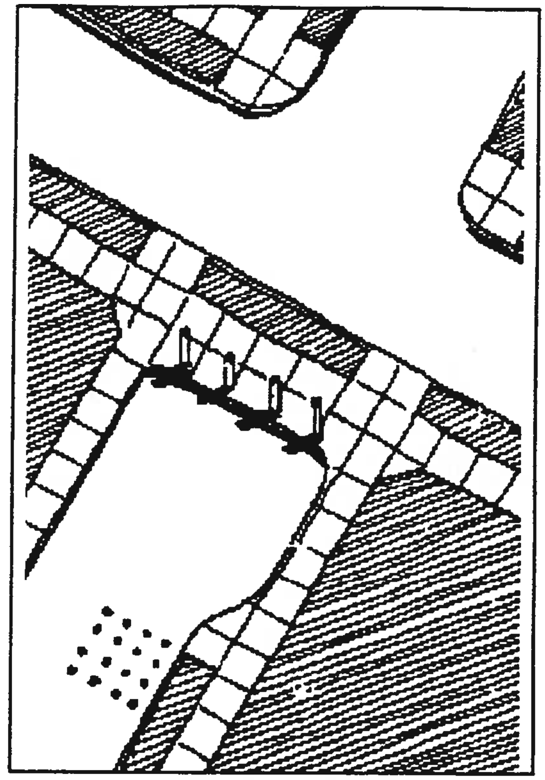


Figure 9

Speed Hump/Pavement Undulation

Speed humps or pavement undulations are devices which have been developed over the last 20 years specifically to address speed control on public streets. The device, in contrast to a speed bump, is a gently sloped hump over a length of 12' and a height of approximately 3". A speed hump is considered a pavement feature as shown in Figure 10.

Speed humps traverse the width of the roadway and have only been found to be effective when used in a consistent series spaced approximately at every 400' along the roadway length. Traffic speed at the device itself is typically reduced down to a range of 20-30 mph and, because of their closely spaced nature, the prevailing speed between the humps is anticipated to be at an acceptable speed for a residential street. Speed humps are preceded by extensive signing and striping to warn the motorist of the existence of the devices.

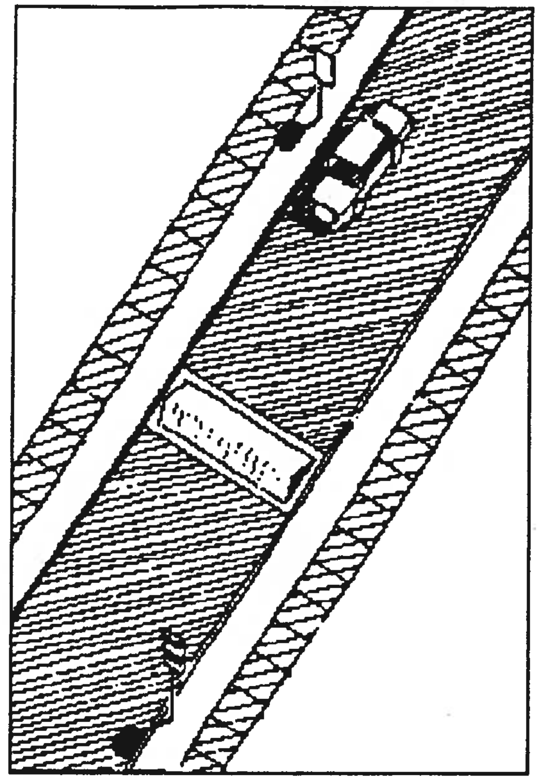


Figure 10

Due to the gentle nature of the humps, it is conceivable though, that the errant driver will disregard the discomfort experienced in crossing the hump and will occasionally traverse the street at an unacceptable speed. More severe humps or bumps are not used on public residential streets due to the concern for liabilities which may be raised due to a substantial jarring of occupants of a vehicle and impacts caused when used by motorcyclists and bicyclists.

A small reduction in traffic volume would be expected by the speed hump use due to the inconvenience factor and time increase caused for the pass through motorist. The traffic volume may be shifted to nearby parallel residential streets and the installation of speed humps on one street could then result in requests for the same device on other area streets. It has been reported in the City of Pasadena, where speed humps were used in their earlier stages of development, that the City now has approximately 600 humps installed on most of its residential streets. The careful and prudent use of speed humps to only worst case and selected streets would be advised to maintain reasonable access to all the residential streets.

Recently, the Institute of Transportation Engineers, a nationwide technical organization, issued a proposed recommended practice of guidelines for the design and application of speed humps. The local Orange County cities of Dana Point, Laguna Niguel, Mission Viejo, and San Clemente each have policies and procedures for the installation of speed humps. The cities of San Juan Capistrano, Lake Forest, and Irvine do not currently permit the use of this device. The policies and procedures of each agency are similar in respect as to the conditions under which a speed hump will be installed; that other means to address the traffic issues be exhausted first, that a public hearing would be held before the City Council before any installation, and that up to 67% of the affected properties would express a consensus support for the device. Further information on speed humps is provided in the Appendix.

Curvilinear Alignment

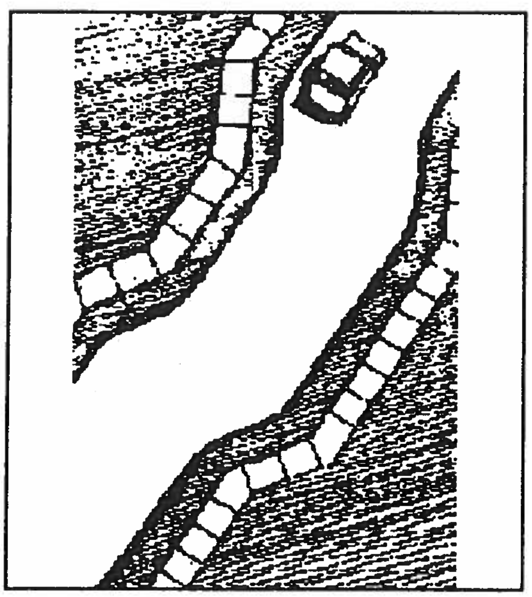


Figure 11

A final device which can be used for a street to attempt to control speed and volume is to create a curving alignment where one does not currently exist. This would result in moving curbs back and forth in order to create a street that a motorist would be forced to drive at a slower speed in order to negotiate the curves. This option may have little impact on traffic volume with some effect on speed of traffic. Width constrains and extensive cost of installation may make this option infeasible for all but selected locations. An example of a curvilinear alignment is shown in Figure 11.

Private Street

Another method to control the volume and speed of traffic on a particular residential street is to consider the elimination of the street as a public facility. The vacation of a public right-of-way is a procedure which is authorized under the Streets and Highway Code provided that there is a public purpose to be met by the abandonment of the street. In cases where a street can be made independent of the public street system and there is a commitment by the adjacent property owners to maintain the private street, then the property owners can control the design aspects of the street. Often, this leads to the installation of gates and other devices internal to the street and completely controls traffic volume on the street. Speed control is sometimes still a problem on what are now private streets but are often addressed through the installation of speed bumps. Speed bumps are relatively high and narrow obstructions in the street which force vehicles to pass over them at about 10 - 15 miles per hour or risk potential damage or injury to vehicles and/or passengers. Speed bumps are not used on public streets.

SUMMARY

A review of currently available information related to the control of speed and volume of traffic on residential streets has revealed a variety of passive and physical control options. The selection of the types of devices to be used in a community for residential traffic control must be made in consideration of the device effectiveness for speed and for volume control, neighborhood and community support for the device, cost of installation and maintenance, traffic patterns and problems shifting to other residential streets, emergency and service vehicle access, aesthetics, and noise. While this review has focused upon speed and volume control, each of the above factors should be carefully evaluated before device selection for a particular application.

The following table provides a representation of the expected results of the use of each device on speed and volume control in a residential street setting. Actual device effectiveness may vary based upon many factors.

DEVICE TYPE	SPEED CHANGE	VOLUME CHANGE
PASSIVE:		
Speed Limit Sign	Yes[2]	No
Radar trailer	Yes[2]	No
Stop Sign	No[3]	No[1]
Other Regulatory Signs (one	No	Yes
Warning Signs	Yes[2]	No
Novelty Signs	No	No
Striping	No	No
Perception Striping	Yes	No
Angled parking	Yes	No
PHYSICAL:		
Rumble Strip	Yes	Yes[1]
Traffic Circle	No[3]	No[1]
Choker	Yes[4]	Yes
Semi-diverter	No[3]	Yes
Diagonal Diverter	No[3]	Yes
Forced Turn Channelization	No[3]	Yes
Median Island	No[4]	Yes
Cul-de-sac	No[4]	Yes
Speed Hump	Yes	No[1]
Curvilinear Alignment	Yes	No
Private Street	Yes	Yes

[1] Subject to the level of time impediment caused.

[2] Subject to voluntary compliance and enforcement.

[3] Speed reduction only effective at device location, not for length of street.

[4] Subject to the length of impeded street.

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Roadway Striping as a Traffic Calming Option

IN LIEU OF TRADITIONAL TRAFFIC CALMING, ROADWAY STRIPING AS A TRAFFIC CALMING OPTION IS A VIABLE, LOW-COST ALTERNATIVE TO TRADITIONAL VERTICAL/ HORIZONTAL ROADWAY DESIGN FEATURES. THE ROADWAY STRIPING ALTERNATIVES HAVE LESS DETRIMENTAL IMPACT TO EMERGENCY SERVICES, ARE LESS COSTLY TO CONSTRUCT, AND CAN SUCCESSFULLY REDUCE SPEEDS FROM TWO TO MORE THAN SEVEN MILES PER HOUR.

BY ROBERT KAHN, P.E. AND ALLISON KAHN GOEDECKE, MBA

INTRODUCTION

Traditional traffic calming techniques include vertical and horizontal displacement of the roadway surface, which can be effective in reducing speeds and cut-through traffic on roadways. These roadway design features can include speed humps, cushions, chokers, chicanes, medians, mini traffic circles, diverters, and full/partial roadway closures. While these features can have significant benefits to a community, they are sometimes difficult to implement as a result of potential negative impacts to local residents, emergency service departments, and persons with disabilities and may not be consistent with public agency policies.

In lieu of many of the traditional traffic calming devices, roadway striping can be implemented as a traffic calming option that is a viable, low-cost alternative to vertical/horizontal displacement traffic calming features. The roadway striping alternatives

- Have less detrimental impacts upon emergency services;
- Are less costly to construct;
- Provide greater flexibility to meet future changes;
- Have no adverse impact to highway drainage;
- Are recognized by local residents as standard traffic control devices;
- Can provide bike/parking lanes;
- Can successfully reduce speeds from one to more than seven miles per hour. Even greater speed reductions have been documented in some case studies; and
- Can be implemented quickly.

A number of roadway striping calming alternatives have been successfully installed in Southern California with positive results. In many cases, these have been implemented on private streets and have resulted in reduced speeds in these communities. These private streets have been designed to public street standards. Traffic calming striping has also been used on public streets in Southern California. The calming alternatives that have been implemented follow standard *California Manual on Uniform Traffic Control Devices* (CMUTCD) requirements. These traffic calming options have been implemented in a timely and cost-effective manner and are easily understood by the local residents and driving public. They have resulted in some speed reductions, which were desired by the local residents. While more traditional traffic calming devices (e.g., speed humps) may be required in certain instances to obtain greater speed or volume reductions, roadway striping is a viable traffic calming option in many cases.

TRAFFIC STRIPING AS AN ALTERNATIVE TO STANDARD TRAFFIC CALMING TECHNIQUES

Striping as a traffic calming technique has less disruption to emergency service vehicles, since no vertical or horizontal displacement occurs within the roadway surface. Emergency service requirements are a major barrier to the installation of many traffic calming projects. Roadway striping that is used for traffic calming is universally recognized by the traveling public and emergency agencies. Traffic calming striping gives the visual impression that roadway width has been reduced, which has been shown to slow vehicles down while traveling along a roadway. This type of striping will not slow down emergency service vehicles utilizing the roadway or adversely affect traffic operations. Other types of traffic calming devices are new to some drivers, particularly out-of-the-area drivers who are not familiar with a particular area that has the traffic calming devices.

In addition, there is considerably less cost to striping than other traffic calming techniques. As opposed to $2,500-$3,500 USD per installation for speed humps or speed cushions, the same segment of roadway can be striped for only $500 to $1,000 USD. Another advantage of traffic striping as a traffic calming option is future flexibility. Traffic striping can easily be changed in the future by sandblasting the painted striping, if a particular installation is unsuccessful in meeting its goals or needs to be changed. Furthermore, traffic striping can be implemented quickly through conventional construction techniques by existing in-house public works staff or contract services.

Another significant benefit of traffic striping is that it does not adversely affect drainage. Many traffic calming devices such as speed humps, roadway chokers/curb extensions, medians, and chicanes can adversely affect roadway drainage. These devices can constrict normal drainage patterns within the roadway surface, which could affect drainage for the roadways. This can require additional roadway maintenance for local public works departments.

Traffic striping as a traffic calming device can effectively reduce speeds on a roadway. This is particularly effective on long, straight roadways where there are wide travel lanes for long distances. Before-and-after speed surveys by RK Engineering Group, Inc., with which the author is affiliated, have shown that speed reductions in the range of one to more than seven miles per hour are easily accomplished through roadway striping, especially for wide local streets with a curb-to-curb width of 36 to 40 feet. Another advantage of roadway striping is that it can provide for bike lanes or parking areas adjacent to the travel lanes as part of the "complete streets" system. These bike or parking lanes are used to define the various functions of the roadway: not only vehicular travel but also vehicle access to the neighborhood, parking, and accommodations for other modes of transportation, such as bicycles.

STRIPING ALTERNATIVES

There are numerous striping alternatives that can be used for traffic calming. The basic concept of traffic calming striping is to reduce the driver's perceived width of the roadway. By doing this, the drivers tend to reduce speed and may also be diverted from a particular route as a result of the reduced speed. The striping alternatives can consist of adding the following:

- Centerline stripe;
- Edge lines;
- Centerline plus edge line;
- Striped median;
- Striped choker or chicane;
- Striped speed hump without the raised speed hump; and
- Psycho-perceptive striping.

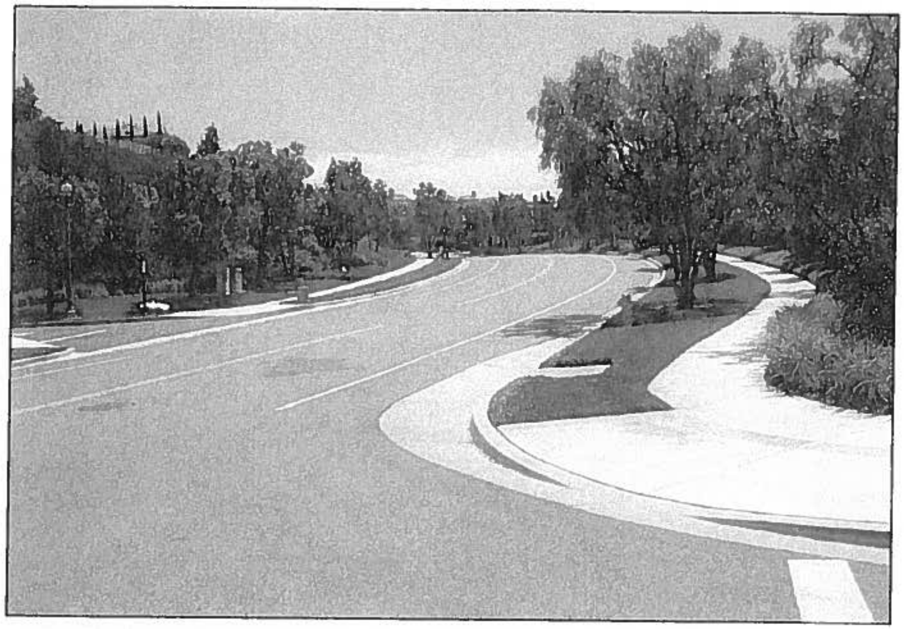

Figure 1. Typical traffic calming striping.

Centerline striping consists of adding a typical double-yellow centerline stripe or single-dash yellow line in the roadway. This separates the direction of traffic and reduces the roadway width of the travel lane to the driver. White 4-inch **edge lines** can be added to the right and left side of the roadway where there is sufficient width for the 8-foot parking lane. The parking lane can be provided and separated by the 4-inch white edge line. A combination of both centerline and edge line striping is the most effective method of reducing the overall travel way width of the roadways. This can be provided on typical local streets and will provide for 10-12 foot travel lanes and 7-8 foot parking lanes. A sample of this design is shown in Figure 1.

Another method of reducing the roadway width is by providing a **striped median**. The median can be provided by double-yellow centerline stripes or can be a two-way left-turn lane, which provides left turns from the roadway to the adjacent properties or across the roadway itself. Another option for reducing roadway width is **striping chokers or chicanes**. These can be striped with a white 8-inch channel to provide the delineation of the choker or chicane. Although not as prominent as the raised curbing of a typical choker or chicane, it does provide some of the same operational features as the raised curbing for chokers or chicanes by requiring the driver to slow while traveling the traffic calming area.

Another traffic calming option is to provide **"striped" speed humps** across the roadway. These can be effective where normal speed humps cannot be implemented, such as a hilly area or where grades exceed 8 percent. While limited operational data is available on this type of striping, it can give the impression of a speed hump in the roadway area, therefore slowing vehicles. **"Psycho-perceptive"** striping has also been used in conjunction to implementation of speed humps. This type of striping is shown in CMUTCD (Figure 3B - 31). Smaller stripes are provided, initially going to larger stripes when approaching the traffic calming device. A photo of this type of striping is included in Figure 2. The evaluation of the effectiveness of optical speed bars was presented in the November 2001 (Eric Meyers) and March 2009

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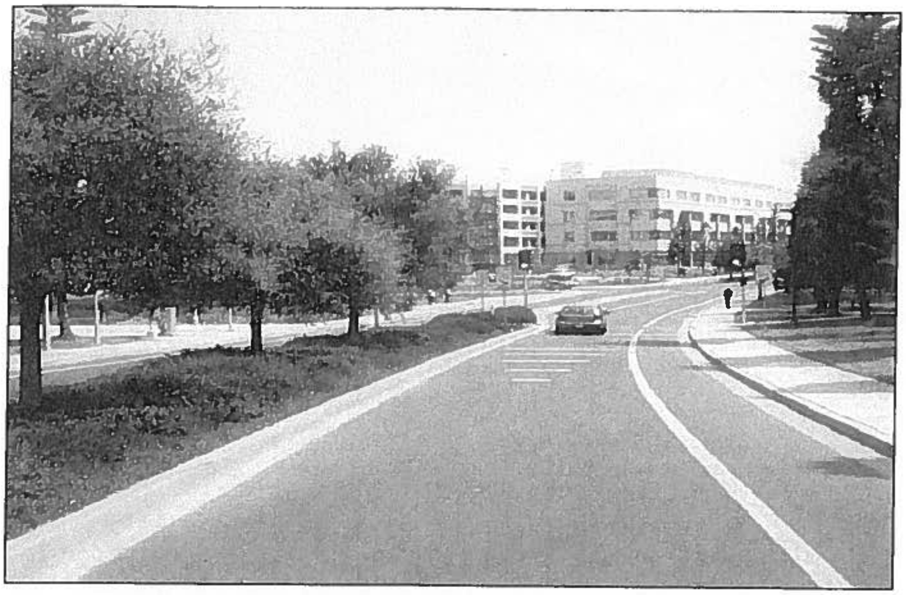

Figure 2. UCI example of psycho-perspective striping.

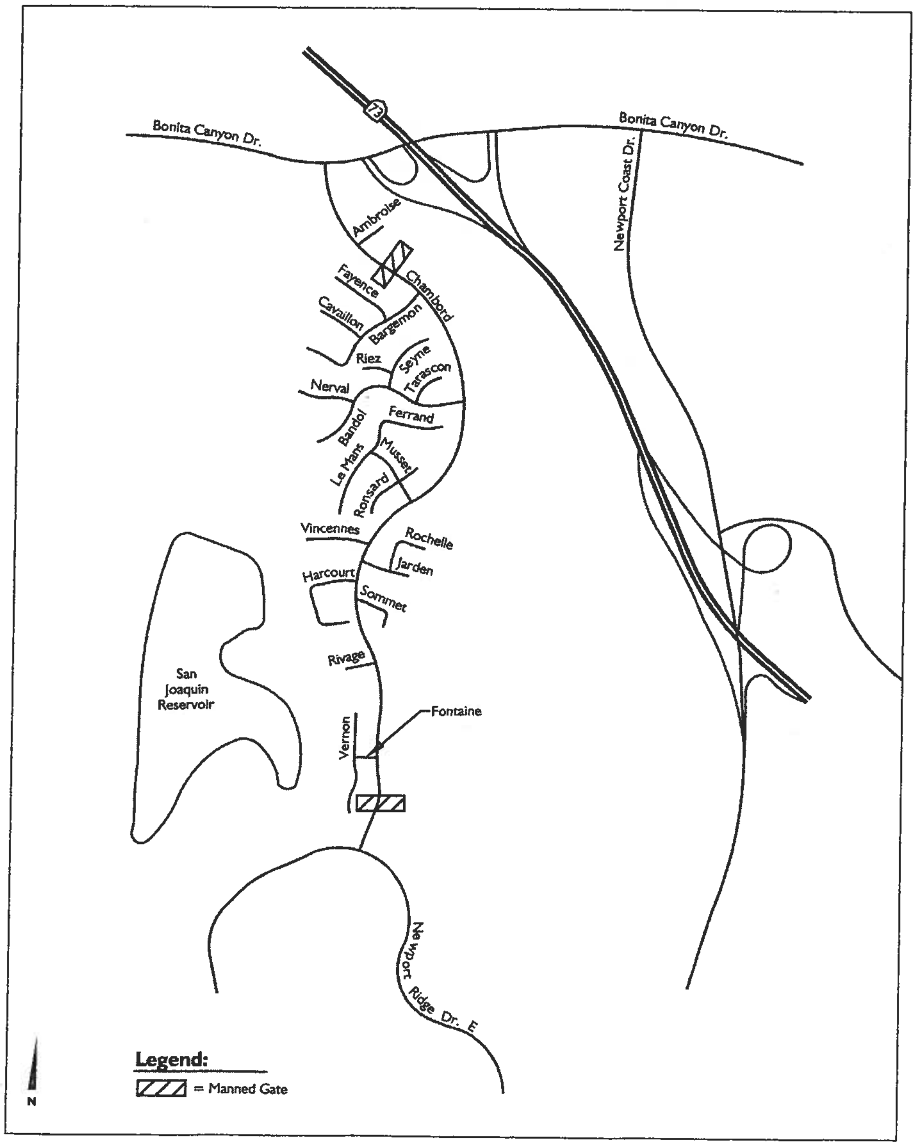

Figure 3. Newport Ridge North, Newport Beach.

(Steven P. Latoski) issues of *ITE Journal*. These studies did show promising results in speed reduction with these types of pavement markings.

TRAFFIC CALMING STRIPING CASE STUDIES

RK Engineering Group, Inc. has been involved in several case studies involving traffic calming striping as an alternative traffic calming device. These studies have been primarily completed for private communities; however, the private roadways and streets were constructed to city standards. In nearly all cases, the roadways were 36- to 40-foot curb-to-curb width and in many cases were long, straight streets, which encouraged speeding. The implementation of traffic calming striping effectively reduced speed on these roadways and had a positive reception by the community and local agencies, including emergency service departments.

Case Study No. 1 (June 2005–June 2006)

The Newport Ridge North Community is a manned-gated community in the city of Newport Beach, California, USA. The community consists of high-end, single-family detached homes, which are served by a primary collector road (Chambord Road). Chambord Road is a 40-foot curb-to-curb roadway with sidewalks on both sides of the street. The roadway is oriented in a north-south direction (as shown in Figure 3) and has a length of approximately 1.31 miles.

The steep grades along Chambord did not allow for typical traffic calming techniques, such as speed humps or speed cushions. In addition, the community was concerned with the construction of these types of traffic calming devices and their effects on traffic operations and vehicle damage. There was also pedestrian activity near the community recreation center and pool located at the center portion of Chambord Road and a community tennis court facility located on the north end of the street.

Photos of Chambord before the traffic calming striping was implemented are shown in Figure 4. This wide 40-foot curb-to-curb street with an undefined travel way encouraged speeding throughout the roadway. Before the implementation of

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traffic calming striping, the 85th percentile speed along Chambord ranged from 45 to 47 miles per hour, and the average speeds ranged from 40 to 41 miles per hour.

Traffic calming striping was implemented along the entire length of Chambord. This included a double-yellow centerline and 4-inch edge line stripes 8 feet from the curb face. After the traffic calming striping was implemented, the 85th percentile speed was reduced to 37 to 39 miles per hour and the average speed decreased to 35 to 36 miles per hour throughout the length of Chambord as shown in Table 1.

Case Study No. 2
(August 2005–December 2007)

Traffic calming striping was implemented in south Orange County within the city of San Clemente, California, USA at the Reserve Community Association. This project consists of a large number of single-detached family dwelling units with a recreation center located in the southern portion of the community. The project has four electronic gates, which provide access to an adjacent arterial highway (Camino Vera Cruz). This community had four roadways serving a series of cul-de-sacs throughout the community, both north and south of Camino Vera Cruz.

The main roadways serving the community south of Camino Vera Cruz were 40-foot curb-to-curb width streets and those roadways serving the northerly section of the community had a curb-to-curb width of 36 to 38 feet. Existing traffic volume and speeds were collected throughout the community before traffic calming was implemented. The 85th percentile speeds ranged from 23 to 34 miles per hour prior to the implementation of traffic calming striping. Before-and-after 85th percentile speeds are summarized in Table 1.

Traffic calming striping consisted of adding double-yellow centerlines and white 4-inch edge lines on the wider roadways and the striping of edge lines only for the narrower roadways. The 85th percentile was reduced to some degree after the implementation of traffic calming striping. The 85th percentile speeds were reduced to 22-33 miles per hour, with some minor reductions after the implementation of the striping. The rec-

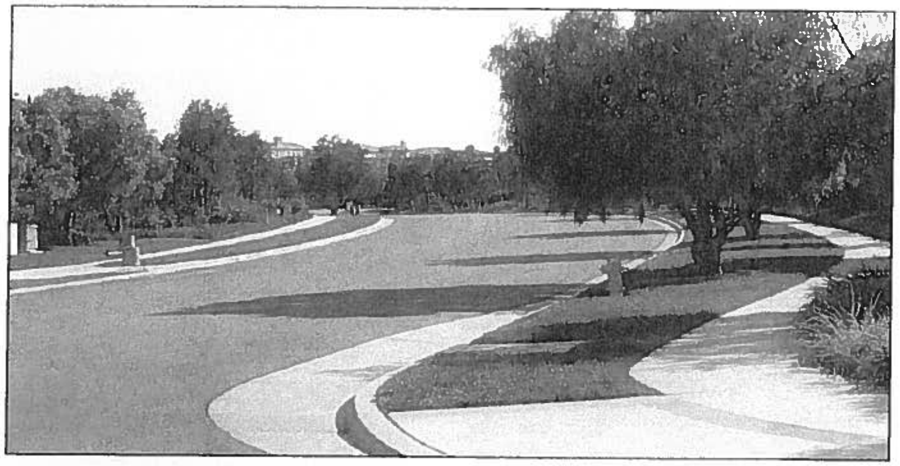

Figure 4. Chambord Road before restriping.

Table 1. Before-and-after speed surveys.

Location	Roadway	85th% Speed: Before Traffic Calming Striping (mph)	85th% Speed: After Traffic Calming Striping (mph)
Case Study #1 Newport Ridge North (Newport Beach)	• Chambord N/O Rivay	46	37
	• Chambord S/O Musset	47	39
	• Chambord S/O Baryemon	45	39
Case Study #2 The Reserve (San Clemente)	• Montana del Sol N/O Camino Vera Cruz	23	22
	• Colina Rodante S/O Camino Vera Cruz	32	30
	• Calle de Los Arboles N/O Camino Vera Cruz	27	26
	• Calle de Los Arboles S/O Camino Vera Cruz	34	33
Case Study #3 Oak Creek (Irvine)	• Eagle Creek W/O Indigo	37	31
	• Eagle Creek W/O Palm Wood	38	27
Case Study #4 Summit at Turtle Ridge (Irvine)	• Garden Terrace E/O Hedgewood	31	30
	• Crest Terrace N/O Blue Summit	29	29
	• Canyon Terrace N/O Cezanne Valley	33	31
	• Valley Terrace S/O Climbing Vine	30	28
Summit at Turtle Ridge (Irvine)	• Garden Terrace N/O Summit Park	31	30
	• Crest Terrace W/O Summit Park	29	29
	• Canyon Terrace N/O Summit Park	33	31
	• Valley Terrace N/O Summit Park	30	28
	• Summit Park Drive at Valley Terrace	46	44
	• Summit Park Drive W/O View Terrace	44	44
	• Summit Park Drive E/O Garden Terrace	43	42
	• Summit Park Drive at Garden Terrace	39	39

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ommended speed limits ranged from 25 to 35 miles per hour depending on the location and the 85th percentile speed. Although not as significant of a reduction in comparison to the Newport Ridge North Community, speeds were reduced 1 to 2 miles per hour with the traffic calming striping. The smaller reduction in speed was probably caused by the fact that the true existing speeds before the traffic calming measures were implemented were lower than the existing speeds in the Newport Ridge North Community.

Case No. 3 (June 2002–December 2009)

The Oakcreek Village Community located in the city of Irvine, California, USA also implemented traffic calming striping. This is a private community with two sets of electronic gates located at the east and west ends of the project. The roadway layout for the Oakcreek Development is a linear alignment with very little curvature. The Oakcreek Development is served by a single roadway (Eagle Creek) which has direct access to driveways and homes along its entire length of 0.50 miles. The Oakcreek Village Community is served by two electronic gates located on the northwest and southeast end of Eagle Creek.

Eagle Creek is a two-lane, undivided street with a curb-to-curb width of 36 feet with sidewalks on both sides of the street. The 85th percentile speed on Eagle Creek before traffic calming striping was 37 to 38 miles per hour. The community felt that this was excessive, since the prima facie speed limit is 25 miles per hour for this type of roadway. Also, there was a concern that the crosswalk across Eagle Creek served an adjoining elementary school where there was a significant amount of pedestrian crossing.

The traffic calming striping consisted of a double-yellow centerline stripe along with white 4-inch edge lines on both sides of the street. Initially this was constructed with a 7-foot parking lane on each side of the roadway and 11-foot travel lanes in each direction. Since the original implementation of traffic calming striping, the travelway has been reduced further to 10 feet and parking lanes were increased in width to 8 feet. The 85th percentile speed after the traffic calming ranged from 31 to 27 miles per hour (see Table 1). The traffic calming measures implemented by the community of Oak Creek Village have been successful in reducing speeds as much as 6 to 11 miles per hour. After careful review, the original recommended striping was modified to create 10-foot-wide travel lanes and an 8-foot-wide parking lane. This should further reduce traffic speeds in the area.

ANOTHER ADVANTAGE OF TRAFFIC STRIPING AS A TRAFFIC CALMING OPTION IS FUTURE FLEXIBILITY. TRAFFIC STRIPING CAN EASILY BE CHANGED IN THE FUTURE BY SANDBLASTING THE PAINTED STRIPING, IF A PARTICULAR INSTALLATION IS UNSUCCESSFUL IN MEETING ITS GOALS OR NEEDS TO BE CHANGED.

Case Study No. 4 (April 2008–April 2010)

The community of the Summit at Turtle Ridge in the city of Irvine requested traffic calming to reduce the vehicle speeds on some of its local streets. The Summit at Turtle Ridge is a private manned-gated community with a primary collector road (Summit Park Drive). This hillside community included numerous cul-de-sac streets where speeds were generally low and consistent with what would be expected in the local street system. However, the local community association felt that these speeds were too high and traffic calming options should be investigated.

For this study, RK surveyed four local streets in the community. This included Garden Terrace, where the 85th percentile speed was 31 miles per hour before the implementation of traffic calming striping and was reduced to 30 miles per hour after implementation. On Crest Terrace the 85th percentile speed was only 29 miles per hour before traffic calming striping and remained at 29 miles per hour after the implementation of the striping. Canyon Terrace was the location with the highest speeds in the community on the local streets, where the 85th percentile speed was 33 miles per hour. This speed was reduced to 31 miles per hour after the implementation of traffic calming striping. The final location where traffic calming was implemented was Valley Terrace Street. This cul-de-sac had a speed of 30 miles per hour before implementation of the striping and 28 miles per hour after traffic striping was implemented.

In the community of the Summit at Turtle Ridge, the speeds were already low and generally consistent with what would be expected for local residential streets. However, the community was concerned with the speeds; therefore, rather than placing more aggressive traffic calming devices (e.g., speed humps, chokers, and so forth), traffic calming striping was utilized as the preferred option within the community. The recommended traffic calming striping included centerline and edge line striping with parking on one or both sides of the street depending on whether the streets were 32- or 36-feet wide. Although the speed reductions were not substantial within the community, the community was satisfied with the reduction of speeds as a result of the implementation of traffic calming striping. The relationship of speed reduction with traffic calming striping can be seen in Figure 5.

One conclusion that can be reached from the various case studies is that if local streets are operating at speeds typical for

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these types of roadways (i.e. 25-32 mph), then only minor speed reductions can be obtained by traffic calming striping. Where speeds are significantly higher (i.e., more than 35 mph), then much greater speed reductions can be achieved from traffic calming striping.

COMPARISON TO OTHER TRAFFIC CALMING TECHNIQUES

The use of traffic calming striping compares favorably to other traffic calming techniques. Although speed reduction can vary from site to site, positive speed reductions can be anticipated with the traffic calming, depending on the specific roadway configurations and the width of travel way. There are significant pros and cons to all types of traffic calming devices, as summarized in Table 2.

As can be seen from Table 2, traffic calming striping can typically result in speed reductions of approximately one to seven miles per hour depending on the situation. Speed hump and speed cushions have considerable speed reduction capabilities of approximately 8 miles per hour. Chokers and chicanes can reduce speeds 3 to 6 miles per hour, and medians and pavement texture can result in 2 to 3 miles per hour reduction. When there are situations that require speed reductions on local roadways, traffic calming striping can be considered the first step in the traffic calming process. More aggressive traffic calming devices such as speed humps/speed cushions, chokers, chicanes, medians, and pavement textures can cost considerably more but can be utilized in the event that the traffic calming striping is not successful in reaching the speed-reduction goals set by the community.

COST COMPARISON

One of the major advantages of traffic calming striping is its cost. Not only can traffic calming striping be implemented less expensively than many other options, but it also can be modified or removed without major cost implications. An approximate cost comparison of various traffic calming devices is included in Table 2.

SAFETY CONSIDERATIONS

There are numerous safety considerations for implementing traffic calming devices. Anytime that the vertical or horizontal displacement of the roadway surface occurs, there is a potential for vehicles going out of control, hitting objects, or other actions which could be detrimental to the safety of the driver and passengers of the vehicle. Furthermore, impacts to emergency service vehicles can indirectly affect safety when responding to emergency events.

Generally, traffic calming striping minimizes safety considerations, since they follow standard traffic engineering practices pursuant to the CMUTCD. Drivers are familiar with these types of traffic control features and respond accordingly. This is true not only for local residents who are familiar with the traffic calming implemented in an area but also for drivers from outside the area that are unfamiliar with the traffic calming installations.

Speed humps do reduce vehicle speed if properly designed and when adequate signage/pavement markings are provided. Speed humps can have an adverse affect on safety—but only if drivers ignore them and if reduced speeds do not occur. Speed humps can also reduce travel times for emergency service vehicles, which have an indirect impact on safety.

Speed cushions have a similar effect on safety as speed humps, However, they can be traversed better by larger vehicles, including emergency service vehicles, which can travel through the speed cushions at a normal speed as opposed to a typical speed hump. This is a major advantage of speed cushions over speed humps.

Chokers can affect safety if they are hit by vehicles. Proper signage and pavement markers are necessary to ensure that this does not occur. Chokers can improve safety for pedestrians by providing a shorter walking distance for crosswalks. Chicanes, similar to chokers, can have a safety impact if a vehicle strikes them while traversing through the traffic calming device area. Implementation of sharp curb-width transitions can result in vehicle collision with the curb, causing vehicle damage and possible out-of-control vehicle operations.

Medians have been shown to improve safety by separating the direction of travel of vehicles, However, when implemented in only selective areas, vehicles can hit the ends of medians, causing damage to the

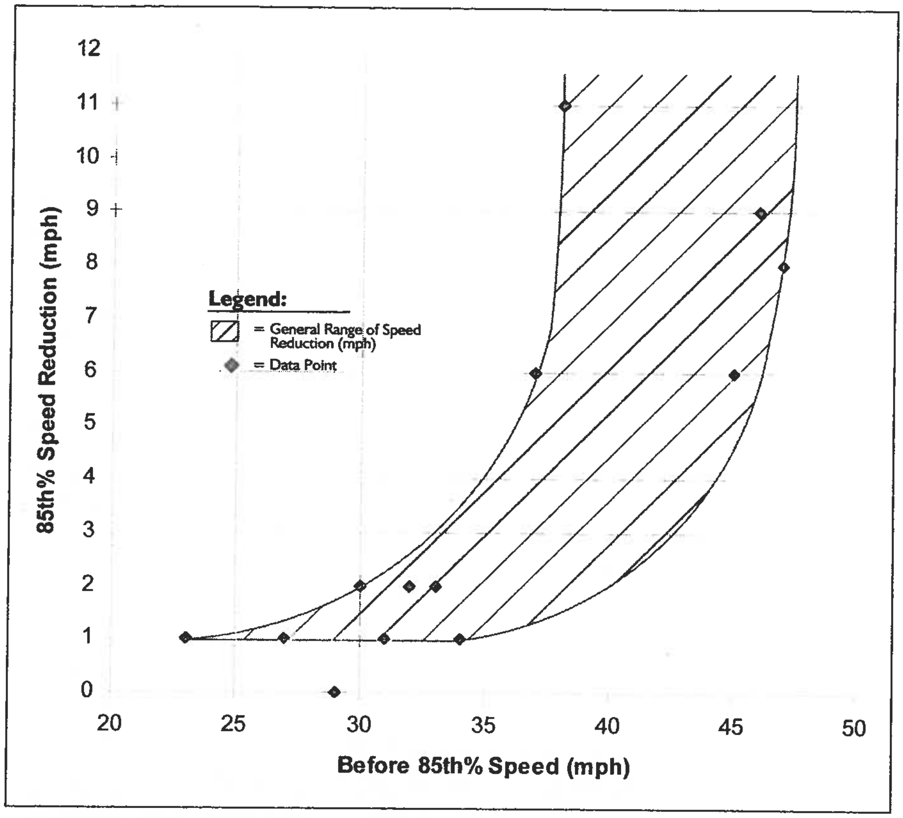

Figure 5. Speed reduction with traffic calming striping.

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Table 2. Comparison of traffic calming devices.				
Traffic Calming Technique	**Pros**	**Cons**	**Speed Reduction (mph)**	**Cost2**
Speed Hump	• Effectively reduces speed by approximately 8 mph. • Can cause some diversion of excess traffic volumes.	• Not accepted by many local jurisdictions and emergency service agencies. • Improper driving can cause vehicle damage and can cause vehicles to go out of control. • Moderate cost considerations. • Can impact bicycles/motorcycles. • Difficult to remove.	8	$1,500 to $3,000
Speed Cushion	• Effective in reducing speeds up to 5 miles per hour. • More acceptable to public agencies / emergency service agencies, because can slow normal size vehicles but allows larger emergency vehicles to pass without speed reductions.	• Some agencies and emergency service agencies do not support these devices. • Cost for construction is moderate. • Difficult to remove. • May impact bicycles/motorcycles.	5	$2,500 to $3,500
Chokers and Chicanes	• Effectively reduces traffic speeds approximately 3 miles per hour. • Can reduce roadway width to reduce walking distance for pedestrian (which is a safety benefit). • Can be enhanced with landscaping to improve aesthetics.	• Expensive to implement. • Can cause drainage issues. • Difficult to remove in the future if not effective. • Some loss of parking. • Can impact bicycles.	3–5 Up to 6	$7,000–$15,000 per pair $10,000–$15,000
Medians	• Can reduce speeds to some degree. • Can provide aesthetic benefits to the community.	• Costly to implement. • Difficult to remove if not successful. • Can cause additional maintenance costs. • Water overall on pavement. • May lose parking.	2–3	$5,000–$15,000
Pavement Texture	• Can cause minor reduction in speed. • Can be aesthetically pleasing. • Can be tied into crosswalks or intersections to define channelized areas for pedestrians.	• Costly to implement. • Difficult to remove. • Can effect some types of pedestrians crossing the street. • Can cause noise impacts.	Limited data	$5–$16 per sq. ft.
Mini Traffic Circles	• Minor reduction in speed. • Improves aesthetics. • Slows traffic through the intersection.	• Costly to implement. • Can confuse drivers regarding which way to travel through an intersection. • May affect bicycles and pedestrians. • Can impact left turns for large vehicles. • Can slow emergency service vehicles.	~~4–6~~	$10,000–$60,000
Traffic Calming Striping	• Effective in reducing speeds from 1 to 7+ miles per hour. • Accepted by many public agencies and emergency service agencies because they are standard traffic control. • Easy to change if required in the future. • Less costly option to install • Installation can be implemented quickly. • Can be removed more easily than other options (sand blast).	• Some limitations in speed reduction. • Less effective when speeds are already low.	1–7 +	$500–$1,000 per 500-feet

vehicles, driver/passenger, and can also cause vehicles to go out of control. If medians are not properly designed, they can cause water to flow into the pavement. This can cause pavement deterioration and loss of control of vehicles.

Pavement texture has limited impact on safety, although vehicles can possibly lose traction, depending on the type of texture during wet conditions. Pedestrians crossing on pavement texture can trip or slip depending on the pavement type and condition. In addition, pedestrians (especially children) may not see the textured pavement as a part of the "street," which make them less aware of traffic.

Mini traffic circles can cause vehicles to hit the curbs or cause other accidents. Also, if such traffic circles are not properly designed, trucks can have a difficult time navigating the intersection and could hit objects in the roadway.

Traffic calming striping generally has a positive impact from a traffic safety standpoint. Traffic calming striping should be implemented pursuant to the CMUTCD requirements with respect to location, type, and placement of the striping. Where used as transitions, striping should be properly designed based upon the operating speed of the vehicles on that segment roadway.

COMMUNITY ACCEPTANCE

The community acceptance of any traffic calming measure is critical in long-term implementation and effectiveness. The vast majority of the professional literature indicates that at least two-thirds of the community must support the traffic calming techniques in order for them to be implemented within the community.

In many cases, vertical and horizontal displacement of traffic calming devices are heavily resisted by the local community and driving public. This is one of the major advantages of traffic calming striping, since it is readily acceptable to the local community because it is already implemented on most roadways throughout communities. Traffic calming striping is understood by the driving public throughout local communities. It causes little damage to vehicles and drivers/pedestrians of the community. It does not adversely effect the operation of vehicles for emergency service agencies. Traffic calming striping is not permanent and can easily be changed if required in the future. As a result of this, traffic calming striping can be less controversial than more restrictive devices.

CONCLUSIONS

RK Engineering Group, Inc. has completed a review of traffic calming striping as an alternative to vertical or horizontal displacement traffic calming devices such as speed humps, speed cushions, chokers, medians, pavement textures, and other roadway design features. Traffic calming striping has been shown to reduce speeds effectively as a first step of a traffic calming process. Striping is a low-cost traffic calming solution that can have major benefits to the community compared to other vertical/horizontal displacement traffic calming devices, yet still provides substantial benefits in terms of reducing traffic speeds on the roadways.

In conclusion, traffic calming striping is an effective measure in a traffic/transportation engineer's toolbox of traffic calming devices. These roadway striping techniques follow standard design practice, which reduces future tort liability. Traffic striping is a cost-effective and efficient traffic calming method that can be implemented quickly to reduce speeds on roadways. ■

Resources for further information

1. City of Colorado Springs, *Traffic Calming Handbook*. 2003. Accessible at www.springsgov.com/files/TCHandbook.pdf.

2. Remington & Vernick Engineers, *Old Newark Traffic Calming Plan*. 2002. Accessible at www.wilmapco.org/Newark/Newark_traffic_calming_sect1.PDF.

3. Brown, Steven (Fehr Peers), *City of La Habra Traffic Management Program*. 2006. Accessible at www.lahabracity.com/article.cfm?id=191.

4. Ewing, Reid, *Traffic Calming State of the Practice*. Washington, DC: ITE/FHWA. 1999.

5. Delaware Department of Transportation. *Delaware Department of Transportation Traffic Calming Manual*. 2000. Accessible at www.deldot.gov/information/pubs_forms/manuals/traffic_calming/pdf/deldotfinal.pdf.

6. Gulden, Jeff, Reid Ewing. "New Traffic Calming Device of Choice." *ITE Journal*, Vol 79, No. 12, (December 2009): 26-31. Washington, DC: ITE. 2009.

ROBERT KAHN,

P.E. is president of RK Engineering Group, Inc. which is a full-service transportation engineering firm located in Newport Beach, California, USA. Mr Kahn has more than 40 years of professional experience and has owned his own consulting firm for 23 years. He is a registered engineer in the states of California, Colorado, and Nevada. Mr. Kahn has been involved in the practice of traffic calming since the early 1980s, when he designed some of the first speed humps in Orange County, California . He currently teaches "Fundamentals of Traffic Engineering" for the University of California and has been a guest lecturer at the University of California, Irvine. Mr. Kahn received his B.S. and M.S. in civil engineering from the University of California, Berkeley. He is a fellow of ITE.

ALLISON KAHN GOEDECKE,

MBA is a project manager with RK Engineering Group, Inc. She showed her first interest in the transportation field after completing a report, titled "Red Light, Green Light," about her father's role in helping communities as a transportation engineer back in 1981. Allison has now worked as a senior transportation planner for more than 12 years, focusing on preparing traffic impact studies for commercial, industrial, institutional, and residential projects. She graduated Phi Beta Kappa from University of California, Irvine, received her MBA from Pepperdine University, and did postgraduate work at Oxford University. She is a member of American Planning Association (APA).

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CITY OF LAGUNA HILLS

MEMORANDUM

DATE: November 16, 2011

TO: Traffic Commissioners

FROM: Humza Javed, P.E.
Associate Civil Engineer

SUBJECT: Informational Item – Double yellow striping on westbound Oso Parkway east of Cabot Road

Upon receiving multiple complaints about the confusing striping at the subject location, staff contacted Caltrans to review the striping. Upon review, Mr. Jose Hernandez, Caltrans Chief of Traffic Operations-South, communicated to City staff stating the striping was appropriate and fulfilling its purpose in creating a safe and orderly flow of traffic for vehicles turning onto northbound Cabot Road from westbound Oso Parkway. He also mentioned that the signage, along with the striping, from the I-5 off-ramp to Cabot Road is adequate. This conclusion is reportedly based on Caltrans' field investigations that have occurred during the AM and PM peak and non-peak hours at this location.

Caltrans has determined that the striping at this location will remain as is and they will continue to monitor this location.


RIGHT
TURN
ONLY
11/03/2011


RIGHT
TURN
ONLY
11/03/2011