
**TRAFFIC
COMMISSION
REGULAR
MEETING**



**JANUARY 18, 2012
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, NOVEMBER 16, 2011.

RECOMMENDATION: THAT THE TRAFFIC COMMISSION APPROVE THE MINUTES OF THE NOVEMBER 16, 2011, REGULAR MEETING.

3. PRESENTATIONS**4. ADMINISTRATIVE REPORTS**

- 4.1 PROPOSED NO PARKING ANYTIME ZONES ON PLAZA POINTE DRIVE

RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECOMMEND TO THE CITY COUNCIL THE ESTABLISHMENT OF NO PARKING ANYTIME ZONES ON PLAZA POINTE DRIVE.

- 4.2 PARKING CONTROLS SURVEY ANALYSIS IN THE MANDEVILLE DRIVE AREA NEIGHBORHOOD

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

- 4.3 SIGHT DISTANCE ANALYSIS AT SANTA VITTORIA DRIVE AND CAMINITO CRUZ

RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECOMMEND TO THE CITY COUNCIL THE CREATION OF A NO PARKING ANYTIME ZONE ALONG THE WEST SIDE OF SANTA VITTORIA FROM 40 FEET SOUTH OF CAMINITO CRUZ TO 40 FEET NORTH OF CAMINITO CRUZ.

- 4.4 MULTI-WAY STOP SIGN ANALYSIS AT SANTA VITTORIA DRIVE AT SAN REMO DRIVE

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

5. INFORMATIONAL ITEMS

- 5.1 RIDGE ROUTE DRIVE SPEED LIMIT

- 5.2 RESULTS OF THE MULTI-WAY STOP INSTALLATION ANALYSIS AT THE INTERSECTION OF SANTA MARIA AVENUE AT SAN REMO DRIVE - CITY OF LAGUNA WOODS

5.3 TRAFFIC CONTROLS

5.4 RADAR TRAILER SCHEDULE FOR FEBRUARY/MARCH

5.5 SHERIFF'S DEPARTMENT VERBAL REPORT

6. COMMISSIONER COMMENTS

7. ADJOURNMENT

The next Regular Meeting of the Traffic Commission will be March 21, 2012, at 7:00 PM, in the City Council Chamber, located at 24035 El Toro Road, Laguna Hills, California.

CERTIFICATION

I, HUMZA JAVED, Assistant Civil 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 January 13, 2012, at 5:00 PM.



HUMZA JAVED
ASSOCIATE CIVIL ENGINEER

January 13, 2012

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
NOVEMBER 16, 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 7:00 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; Cindy Sands,
Administrative Assistant

1. PUBLIC COMMENTS

2. APPROVAL OF MINUTES

IT WAS MOVED BY COMMISSIONER DONALD FROELICH,
SECONDED BY COMMISSIONER PAMELA DOW, TO APPROVE THE
MINUTES OF THE SEPTEMBER 21, 2011, TRAFFIC COMMISSION
MEETING.

The motion carried by the following vote:

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

NOES:

ABSTAIN:

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 three previous Traffic Commission meetings and briefly reviewed the background information and history of the City's actions. Staff also reported that per request of the Traffic Commission at the meeting of September 21, 2011, staff has reviewed alternative traffic control measures, including in-roadway pavement warning lights and it was determined that this intersection does not meet the standard per the California MUTCD as this type of device is not allowed in crosswalks at signalized intersections. Staff is recommending that the Traffic Commission receive and file this report.

MOTION WAS MADE BY CHAIR FRAZIER, SECONDED BY COMMISSIONER DOW, TO RECEIVE AND FILE THIS REPORT.

The motion carried by the following vote:

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

NOES:

ABSENT:

4.2 PROPOSED NO PARKING ANYTIME ZONES ON PLAZA POINTE DRIVE

Staff stated that a business member of the community had expressed safety concerns regarding big rig truck parking along Plaza Pointe Drive. As a result of this concern, staff performed field evaluations along Plaza Pointe Drive and determined that over-sized vehicles utilizing curbside parking may create sight distance constraints at certain locations. Staff requested the Traffic Commission continue this item to the meeting of January 19, 2012, in order to give staff additional time to review this report with another business member in the area that was concerned about the potential loss of on-street parking.

Dr. Alex Naghibi, a member of the business community, stated that he is in support of establishing No Parking Anytime Zones on Plaza Pointe Drive and also presented a letter to the Traffic Commission from Mr. Kevin Olson stating his support for No Parking Anytime Zones on Plaza Pointe Drive.

Mr. Kevin Akash, a member of the business community, stated that he is in opposition to the establishment of No Parking Anytime Zones on Plaza Pointe Drive and engaged in a brief discussion with staff and the Commission regarding the benefits of this additional parking to his business and to the City.

The Commission engaged in a discussion with staff and the community members regarding the various issues.

MOTION WAS MADE BY VICE CHAIR HILLIS, SECONDED BY COMMISSIONER DOW, TO CONTINUE THIS ITEM TO THE MEETING OF JANUARY 19, 2012.

The motion carried by the following vote:

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

NOES:

ABSENT:

4.3 PARKING CONTROLS SURVEY IN THE MANDEVILLE DRIVE AREA NEIGHBORHOOD

Staff stated that this was a continued item from the Traffic Commission meeting of September 21, 2011, to allow staff the time to perform a “final” survey of all residents in the Mandeville Drive and La Cienega Drive neighborhoods. Staff reviewed the results of the survey mailed on October 12, 2011, and reported that the low response rate of 55.7% indicates that the majority of residents are not interested in implementing parking controls. Staff also reviewed the results of another site inspection conducted of the Mandeville Drive and La Cienega Drive neighborhoods on the night of November 7, 2011, and reported that no significant parking issues were found along Mandeville Drive, Santa Rosa Avenue, Sierra Bonita Drive, La Cienega Street, or Los Cerros Street, and only six

vehicles were parked along Gordon Road. Staff recommends that the Traffic Commission receive and file this report.

Mr. Robert Guglielmo, a resident of Mandeville Drive, stated that in his opinion the site inspection conducted of the neighborhood on Monday, November 7, 2011, did not reveal the full story of the parking situation and stated that the parking issues occur mainly on the weekends and are a result of the Crestline HOA parking regulations. Mr. Guglielmo is in favor of parking controls in the neighborhood and suggested leaving this item "open" at this time.

Ms. Cynthia Orel, a resident of Mandeville Drive, stated that she is located near the corner and is impacted by the parking situation and reported that she has had to pick up trash, encountered rowdy behavior, and has called the police regarding cars parked for an extended amount of time. Ms. Orel is in favor of establishing parking controls.

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

Mr. Wade Taylor, a resident of Mandeville Drive, stated that he is opposed to parking controls in the neighborhood.

Mr. Rick Ciaccio, a resident of Mandeville Drive, stated that he is opposed to parking controls in the neighborhood.

Mr. Joel Vest, a resident of Mandeville Drive, stated that he is in favor of a permit parking program and stated that it is his opinion that the parking problem occurs on the weekends.

Mr. Gary Cervenka, a resident of Alta Loma Court, stated that he is in opposition of any parking controls.

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

MOTION WAS MADE BY COMMISSIONER DOW, SECONDED BY VICE CHAIR HILLIS, TO (1) REVIEW THE DATA FROM THE PERMIT PARKING CONTROLS SURVEY UP THROUGH THE SEVENTH HOUSE ON MANDEVILLE DRIVE TO VERIFY

MINIMUM SUPPORT FOR THE IMPLEMENTATION OF A PERMIT PARKING RESTRICTION ALONG THE LOWER PORTION OF MANDEVILLE DRIVE; (2) VERIFY SUPPORT OF PERMIT PARKING RESTRICTIONS ALONG SANTA ROSA AVENUE; (3) REVISIT THE CRESTLINE DEVELOPMENT TO NOTIFY RESIDENTS OF THE PERMIT PARKING OPTION AVAILABLE ON GORDON ROAD AND VERIFY ACTIVE PERMITS.

The motion carried by the following vote:

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

NOES:

ABSENT:

MOTION WAS MADE BY CHAIR FRAZIER, SECONDED BY COMMISSIONER DOW; TO SCHEDULE EMERGENCY MEETING IN DECEMBER IF NECESSARY TO ADDRESS THIS ITEM.

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

NOES:

ABSENT:

5. INFORMATIONAL ITEMS

5.1 RADAR TRAILER SCHEDULE FOR DECEMBER/JANUARY

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

Staff not available.

5.3 TRAFFIC CONTROLS

Commissioner Froelich requested deferment of this item to the meeting of January 18, 2012.

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

Staff stated that Caltrans was notified of the multiple complaints received regarding the double-yellow striping on westbound Oso Parkway east of Cabot Road and reported that Caltrans has determined that the striping and signage at this location is appropriate and will remain as is. Caltrans will continue to monitor this location. The Commission engaged in a discussion with staff regarding this item.

6. COMMISSIONER COMMENTS

The Commission engaged in a discussion regarding the double-yellow striping on westbound Oso Parkway east of Cabot Road.

7. ADJOURNMENT

There being no further business before the Traffic Commission at this session, Chair Frazier declared the meeting adjourned at 8:58 p.m. to the meeting of January 18, 2012.

Prepared by:

Approved by:

Humza Javed, P.E.
Associate Civil Engineer

Rick Frazier
Chair

**CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT**

ISSUE: PROPOSED NO PARKING ANYTIME ZONES ON PLAZA POINTE DRIVE

SUMMARY:

City staff was contacted by a business member of the community who expressed concerns regarding big rig truck parking occurring along Plaza Pointe Drive at points that potentially created traffic conflicts. Staff subsequently recommended new No Parking Zones at select locations along the street. The Traffic Commission, at the meeting of November 16, 2011, continued the matter to allow staff time to meet with an interested party. Upon performing multiple field evaluations and a site meeting with Comfort Inn staff (located at the corner of Plaza Pointe Drive and Avenida de La Carlota), City staff 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 specified No Parking Anytime Zones on portions of Plaza Pointe Drive between Avenida De La Carlota and 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 and several driveway access points for various commercial and business interests in the area. Please see the attached vicinity map.

In late 2011, 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 at driveways and with general traffic movements. Staff performed field reviews of this location on numerous occasions and did observe big rig truck parking and sight distance constraints. Staff presented a recommendation at the Traffic Commission meeting of November 16, 2011, to create multiple parking restrictions along Plaza Pointe Drive. The Traffic Commission continued

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.

this item to the next meeting so that staff could meet with the operator of the Comfort Inn to address their concerns about the likely loss of on-street parking.

City staff met with the Comfort Inn on December 20, 2011, and reviewed their concerns. Staff has modified the proposed No Parking Zones as described below:

- The existing No Parking Zone area located on the southeast end of Plaza Pointe Drive at Avenida De La Carlota (red line on the vicinity map) is in place in order to comply with the Highway Design Manual's Stopping Sight Distance on Horizontal Curves, Standard, Figure 201.6, which requires a minimum of 200 feet of unobstructed sight distance and, therefore, needs to remain in place.
- The other three proposed No Parking Zone areas (orange lines on the vicinity map) are needed in order to maintain 200 feet of unobstructed sight distance in accordance with the Highway Design Manual's Stopping Sight Distance on Horizontal Curves, Standard, Figure 201.6.
- A "No Truck Parking Zone" cannot be created instead of the No Parking Zone as any vehicle parked in the identified areas is an obstruction; and
- On-street parking demand may likely increase with increases in occupancy rates of the area buildings. Therefore, the previously proposed No Parking Zone in the knuckle area of Plaza Pointe Drive has been deleted as it does not affect sight distance of the adjacent driveways.

The attached vicinity map shows the existing and proposed No Parking Zones in red and orange, respectively. Further research of area parking restrictions revealed Resolution No. 2003-08-26-1 had established a No Parking Anytime Zone on the west side of Plaza Pointe Drive from South Pointe Drive to 305 feet northerly. The signage was not installed for unknown reasons. However, from recent field reviews, it is observed that the only segment that requires a parking restriction is the west side of Plaza Pointe Drive from 160 feet north of South Pointe Drive for a distance of 145 feet northerly. An updated Resolution will be taken to City Council for final approval to address this parking control change.

The new and amended No Parking Anytime Zones on Plaza Pointe Drive would occur at the following locations:

1. The east side of Plaza Pointe Drive starting 200' south of Avenida De La Carlota (at the existing No Parking sign) to 145' southerly to the driveway.
2. The east side of Plaza Pointe Drive from 180' north of South Pointe Drive for a length of 120' northerly to the driveway.
3. The west side of Plaza Pointe Drive from 160' north of South Pointe Drive for a length of 145' northerly to the driveway.

The City has received letters of support for creating No Parking Anytime Zones on Plaza Pointe Drive from the South Pointe I Office Owners Association and Professional Financial and Insurance Inc. located on South Pointe Drive.

The establishment of the proposed No Parking Anytime Zones will resolve sight distance conflicts between parked vehicles/trucks and vehicles exiting several driveways along Plaza Pointe Drive. Moreover, staff believes the proposed No Parking Anytime Zones will not greatly affect parking availability as 56% of Plaza Pointe Drive will still be available for parking.

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.

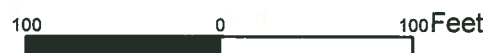
ATTACHMENTS:

- Vicinity Map



City of Laguna Hills

VICINITY MAP



Date Created: 1/5/2012

**CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT**

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

SUMMARY:

At the Traffic Commission meeting of November 16, 2011, staff was requested to review the parking control survey of October 12, 2011, to analyze support for parking controls on a segment of Mandeville Drive, along with a segment of Santa Rosa Avenue. Upon analyzing the results for Mandeville Drive, from Moulton Parkway to 500 feet easterly (up to the seventh house), it was determined that 58% of the residents are in support of a permit parking control. Upon analyzing the results for Santa Rosa Avenue, from Mandeville Drive to Alta Loma Court, it was determined that 11% of the residents are in support of either an overnight parking control or permit parking control. Staff was also requested to work with the Management Company for the Crestline Homeowners Association (HOA) to educate their residents on the existing permit parking option along Gordon Road. The City separately contacted all the Crestline HOA residents individually, by letter, reminding them of the Permit Parking Program along Gordon Road. Having Crestline HOA resident's park along Gordon Road will limit parking within the Mandeville Drive area neighborhood. It is recommended that the Traffic Commission receive and file this report.

BACKGROUND:

At the Traffic Commission of November 16, 2011, staff presented the Mandeville Drive area neighborhood survey results which revealed inadequate support to implement parking controls. Because the survey included the full length of Mandeville Drive, Sundance Avenue, Alta Loma Court, etc., the Traffic Commission decided that the results were not indicative of the parking issues that some of the residents along the west end of Mandeville Drive were experiencing. Therefore, the Traffic Commission recommended that staff analyze the survey results of a short segment of Mandeville Drive, from Moulton Parkway to approximately 500 feet easterly (up to the seventh house), and a portion of Santa Rosa Avenue, from Mandeville Drive to Alta Loma Court. Please see the attached Vicinity Map. The results indicated that 58% of the residents along the segment of Mandeville Drive support implementation of a permit parking control and 11% of the residents along the segment of Santa Rosa Avenue are in support of either an overnight

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

Agenda Report
Parking Controls Survey Analysis within
the Mandeville Drive Area Neighborhood
Page 2

parking control or permit parking control. Please see the attached Survey Results Analysis for further detail.

Staff attempted to contact the President of the Moulton/La Paz Community Association to obtain comments regarding the current parking situation in their neighborhood but did not receive a response. From the analysis of the survey results, it is apparent that the majority of the residents along Alta Loma Court are not interested in implementing parking controls.

The parking occurring along Mandeville Drive and the adjacent streets is legal and is not considered a traffic safety concern. Though it is unfortunate that it may be causing some of the residents to feel uncomfortable, that in itself is not a basis to develop parking controls. Controlling public parking along a short segment on Mandeville Drive, covering the first seven homes, will likely cause other vehicles to move up the street, including visitors to the first seven homes, possibly resulting in the City revisiting this case in the future.

On November 28, 2011, staff mailed letters to all residents of Crestline Development reminding them of the Permit Parking Program on Gordon Road along with rules of parking on public streets. Staff has also been in touch with the Crestline HOA Property Management staff and they have mentioned that information about the Permit Parking Program along Gordon Road is included in each of their monthly newsletters. Since the City's notification to Crestline HOA residents, three additional parking permits have been issued for Gordon Road.

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

ATTACHMENTS:

- Vicinity Map
- Survey Results Analysis

OCTOBER 12, 2011 SURVEY RESULTS ANALYSIS

MANDEVILLE DR. FROM MOULTON PKWY TO 500' EASTERLY (UP TO THE 7TH HOUSE)

RESULTS:

	Address	No Overnight Parking	Permit Parking	No Parking During St Sweeping
1	24441 Mandeville		1	
2	24461 Mandeville	1		
3	24471 Mandeville			
4	24491 Mandeville	1	1	1
5	24501 Mandeville	1	1	1
6	24511 Mandeville		1	
7	24531 Mandeville		1	
8	24522 Mandeville		1	1
9	24506 Mandeville	1		
10	24492 Mandeville	1	1	1
11	24482 Mandeville			
12	26341 Santa Rosa			

ANALYSIS:

<i>PARKING CONTROL</i>	<i>VOTES</i>	<i>PERCENTAGE</i>
No Overnight Parking	5/12	41.7%
Permit Parking	7/12	58.3%
No Pkg during St Sweeping	4/12	33.3%

SANTA ROSA AVE. FROM MANDEVILLE DR. TO ALTA LOMA CT. (5TH HOUSE)

RESULTS:

	Address	No Overnight Parking	Permit Parking	No Parking During St Sweeping
1	26341 Santa Rosa			
2	26351 Santa Rosa	1		
3	26371 Santa Rosa			
4	26381 Santa Rosa			
5	26391 Santa Rosa		1	
6	26382 Santa Rosa			
7	26372 Santa Rosa			
8	26362 Santa Rosa			
9	24482 Mandeville			

ANALYSIS:

<i>PARKING CONTROL</i>	<i>VOTES</i>	<i>PERCENTAGE</i>
No Overnight Parking	1/9	11.1%
Permit Parking	1/9	11.1%
No Pkg during St Sweeping	0	0%

**CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT**

ISSUE: SIGHT DISTANCE ANALYSIS AT SANTA VITTORIA DRIVE AND CAMINITO CRUZ

SUMMARY:

City staff received a request from a resident of the community to evaluate sight distance at the intersection of Santa Vittoria Drive and Caminito Cruz. The City's Consulting Traffic Engineers of Hartzog & Crabill, Inc., performed an analysis and determined that the sight distance at this intersection is adequate as long as vehicles are prevented from parking near the intersection. It is recommended that a No Parking Anytime Zone be created on the west side of Santa Vittoria Drive from 40 feet south of Caminito Cruz to 40 feet north of Caminito Cruz.

BACKGROUND:

Santa Vittoria Drive is a two-lane north-south curvilinear collector roadway with primarily residential frontage on either side of the road. Recently, staff received a request from a concerned resident to evaluate the sight distance at the intersection of Santa Vittoria Drive and Caminito Cruz. Upon receiving the complaint, staff contracted the City's Consulting Traffic Engineer's of Hartzog & Crabill, Inc. to perform a sight distance analysis. The field observations confirmed adequate stopping sight distance of 250 feet. However, it was also observed that on street parking is allowed and parked vehicles near the intersection may block sight distance. Therefore, in order to maintain proper sight distance, it is recommended that parking be restricted along the west side of Santa Vittoria from 40 feet south of Caminito Cruz to 40 feet north of Caminito Cruz. Please see attached report.

RECOMMENDATION: THAT THE TRAFFIC COMMISSION RECOMMEND TO THE CITY COUNCIL THE CREATION OF A NO PARKING ANYTIME ZONE ALONG THE WEST SIDE OF SANTA VITTORIA FROM 40 FEET SOUTH OF CAMINITO CRUZ TO 40 FEET NORTH OF CAMINITO CRUZ.

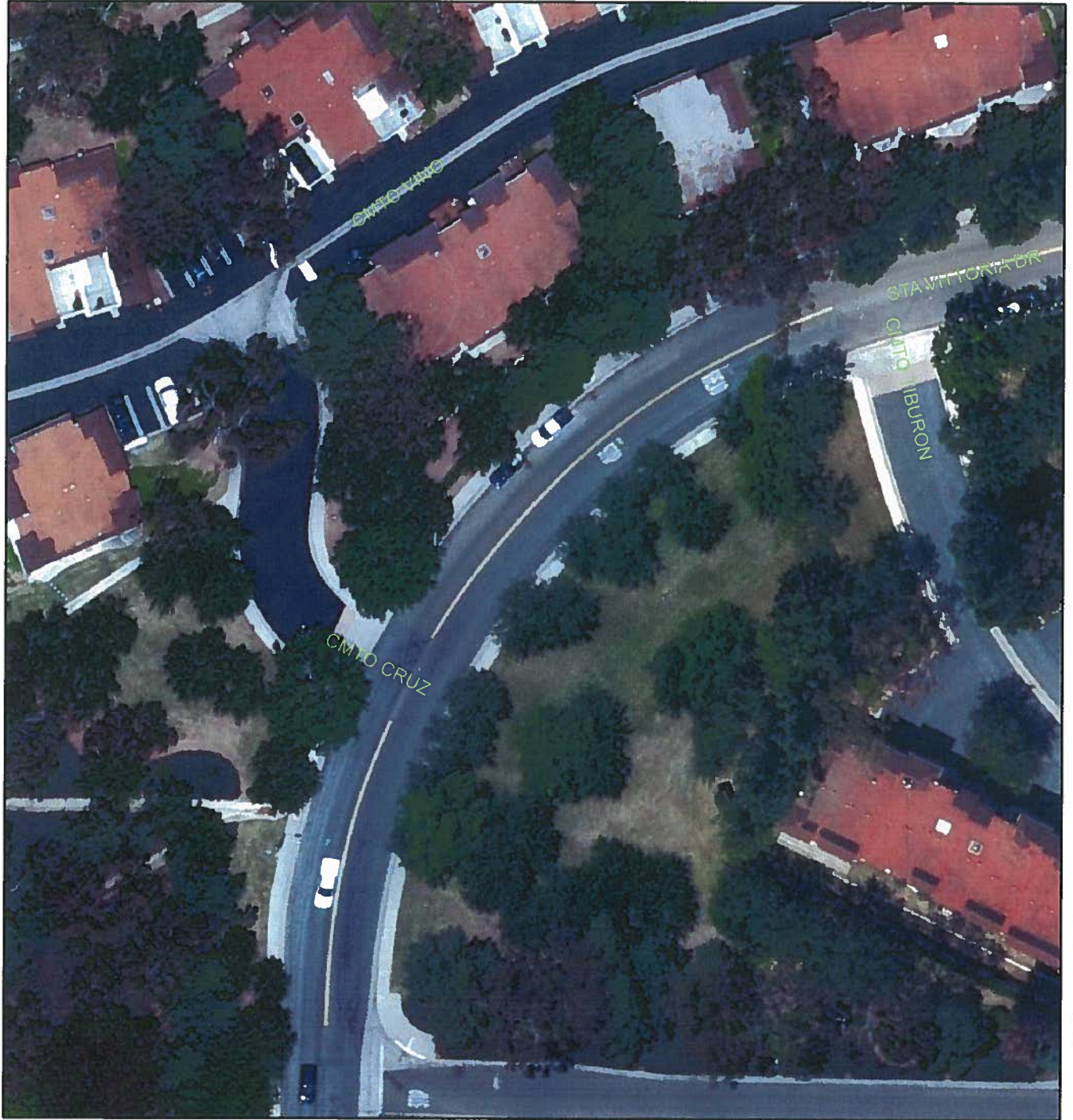
ATTACHMENTS:

- Vicinity Map
- January 10, 2012, Hartzog & Crabill, Inc. report



City of Laguna Hills

VICINITY MAP



60 0 60 Feet

Date Created: 1/12/2012

1/18/2012 ITEM NO. 4.3



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

275 Centennial Way
Suite 208
Tustin, CA 92780

Phone: (714) 731-9455
FAX: (714) 731-9498

www.hartzog-crabill.com

January 10, 2012

Mr. Kenneth H. Rosenfield, P.E.
Director of Public Services
City of Laguna Hills
24045 El Toro Road
Laguna Hills, CA 92653

**Subject: Recommendation Letter - Sight Distance Analysis at
Santa Vittoria Drive and Caminito Cruz**

Dear Mr. Rosenfield:

Pursuant to your request, Hartzog & Crabill, Inc. (HCI) has completed our field review and prepared recommendations regarding the issue of sight distance at the T-intersection of Santa Vittoria Drive and Caminito Cruz. Our field observations confirmed that a driver's visibility on Caminito Cruz at its intersection with Santa Vittoria Drive was not restricted, since there were no parked cars near the intersection.

As part of our evaluation, HCI staff field-reviewed the above location on Wednesday, January 4, 2012 to measure actual sight distance for on-coming traffic from each approach. More specifically, our staff measured the minimum stopping sight distance recommended for the 35 MPH design speed on Santa Vittoria (5 MPH above the posted speed limit of 30 MPH) as listed in the State of California Manual on Uniform Traffic Control Devices (California MUTCD) attachment. This stopping sight distance was field-measured from a typical side-street stopped vehicle location towards the near-side lanes of on-coming traffic from both north-south directions. An orange cone was set on the lane line at this distance from the stopped vehicle location. A photograph was then taken from this stopped vehicle location, just past the limit line, looking both ways.

However, sight distance may be restricted due to vehicles that may park on the west-side of Santa Vittoria Drive near the intersection. At unsignalized intersections, it is typically recommended to install parking restrictions of one or two stall length minimum, adjacent to intersections of streets that allow on-street parking, to provide for sight distance and turning clearance.

Table 1 below summarizes our recommendations based on the visibility of the cone.

Consulting Traffic Engineers to Government Agencies

Table 1

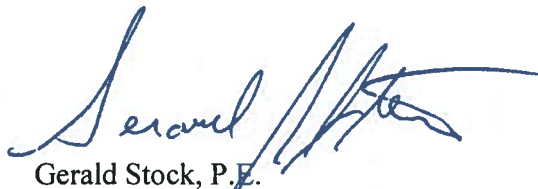
Intersection	Posted Speed Limit (mph)	Design Speed (mph)	California Stopping Sight Distance for Design Speed (feet)	Stopping Sight Distance Satisfied (Y or N)	Comments
Santa Vittoria Drive and Caminito Cruz	30	35	250	Y	There are 'NO PARKING' signs, 8am to 12pm on Fridays due to street sweeping, along the west side of Santa Vittoria Drive.

RECOMMENDATIONS:

Our field observations confirmed adequate sight distance from Caminito Cruz. However, on-street parking is allowed and parked vehicles near the intersection may block sight distance. In order to maintain proper stopping sight distance, our recommendation is to restrict parking along the west-side of Santa Vittoria Drive approximately 40 feet north and south of Caminito Cruz.

We look forward to your acceptance of our recommendation and to any additional services the City of Laguna Hills may request. If you have any questions or need more information please call me at (714) 731-9455. Thank you again for the opportunity to serve your community.

Sincerely,
HARTZOG & CRABILL, INC.



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

Attachments: Stopping Sight Distance as a Function of Speed Table (California MUTCD)
(1) Sight Distance Photo Exhibit

**Table 6C-1. ~~Suggested Advance Warning Sign Spacing~~
Suggested Minimum Advance Warning Sign Spacing**

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)* 25 mph or less	30 (100)	30 (100)	30 (100)
Urban (high speed)* 30 mph or more	100 (350)	100 (350)	100 (350)
Rural	150 (500)	150 (500)	150 (500)
Expressway / Freeway	300 (1,000)	450 (1,500)	800 (2,640)

* Speed category to be determined by highway agency

** Distances are shown in meters (feet). The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The third sign is the first one in a three-sign series encountered by a driver approaching a TTC zone.)

Table 6C-2. Stopping Sight Distance as a Function of Speed

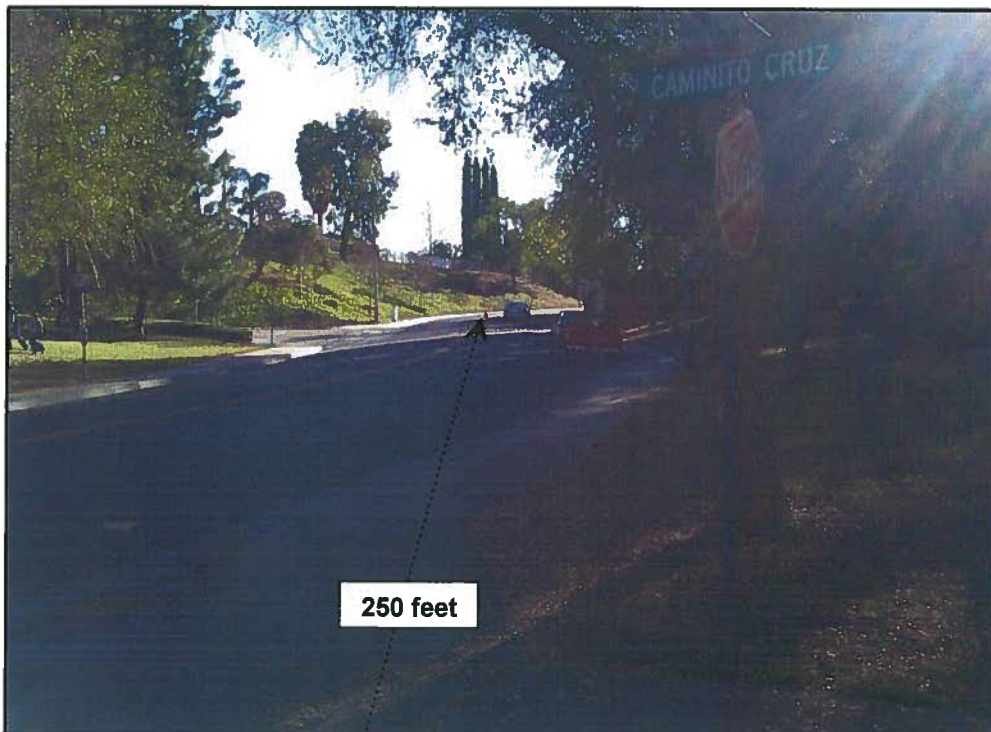
Speed* (km/h)	Distance (m)	Speed* (mph)	Distance (ft)
30	35	20	115
40	50	25	155
50	65	30	200
60	85	35	250
70	105	40	305
80	130	45	360
90	160	50	425
100	185	55	495
110	220	60	570
120	250	65	645
		70	730
		75	820

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

**STOPPING SIGHT DISTANCE
(JANUARY 4, 2012)**



CAMINITO CRUZ (LOOKING NORTH) @ SANTA VITTORIA DRIVE (DESIGN SPEED OF 35 MPH)



CAMINITO CRUZ (LOOKING SOUTH) @ SANTA VITTORIA DRIVE (DESIGN SPEED OF 35 MPH)

**CITY OF LAGUNA HILLS
TRAFFIC COMMISSION
AGENDA REPORT
TRAFFIC ENGINEER DEPARTMENT**

**ISSUE: MULTI-WAY STOP SIGN ANALYSIS AT SANTA VITTORIA DRIVE AT
 SAN REMO DRIVE**

SUMMARY:

City staff received a request from a resident of the community to evaluate the need for a three-way stop sign at the intersection of Santa Vittoria Drive at San Remo Drive. The City's Consulting Traffic Engineer's of Hartzog & Crabill, Inc., performed an analysis based upon State Guidelines and determined that multi-way stop sign controls are not justified at this intersection. It is recommended that the Traffic Commission receive and file this report.

BACKGROUND:

Santa Vittoria Drive at San Remo Drive is a T-intersection located in the northern part of the City. Both roads are two-lane curvilinear collector roadways with primarily residential frontage on both sides of the road. Santa Vittoria Drive runs north to south, and San Remo Drive runs east to west. A stop sign currently exists on San Remo Drive at Santa Vittoria Drive.

Upon receiving a request from a concerned citizen, staff contracted the consulting services of the Traffic Engineer's at Hartzog & Crabill, Inc., to perform a multi-way stop sign analysis at this intersection. In accordance with the California Manual of Uniform Traffic Control Devices (MUTCD) Multi-way Stop Application Guidance criteria, the Traffic Engineers reviewed collision history, traffic volumes, speed, and visibility. None of the guidelines were met to justify the installation of a multi-way stop sign. Please see the attached report for further detail. Staff is in concurrence with the attached report and recommends that the Traffic Commission receive and file this report.

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

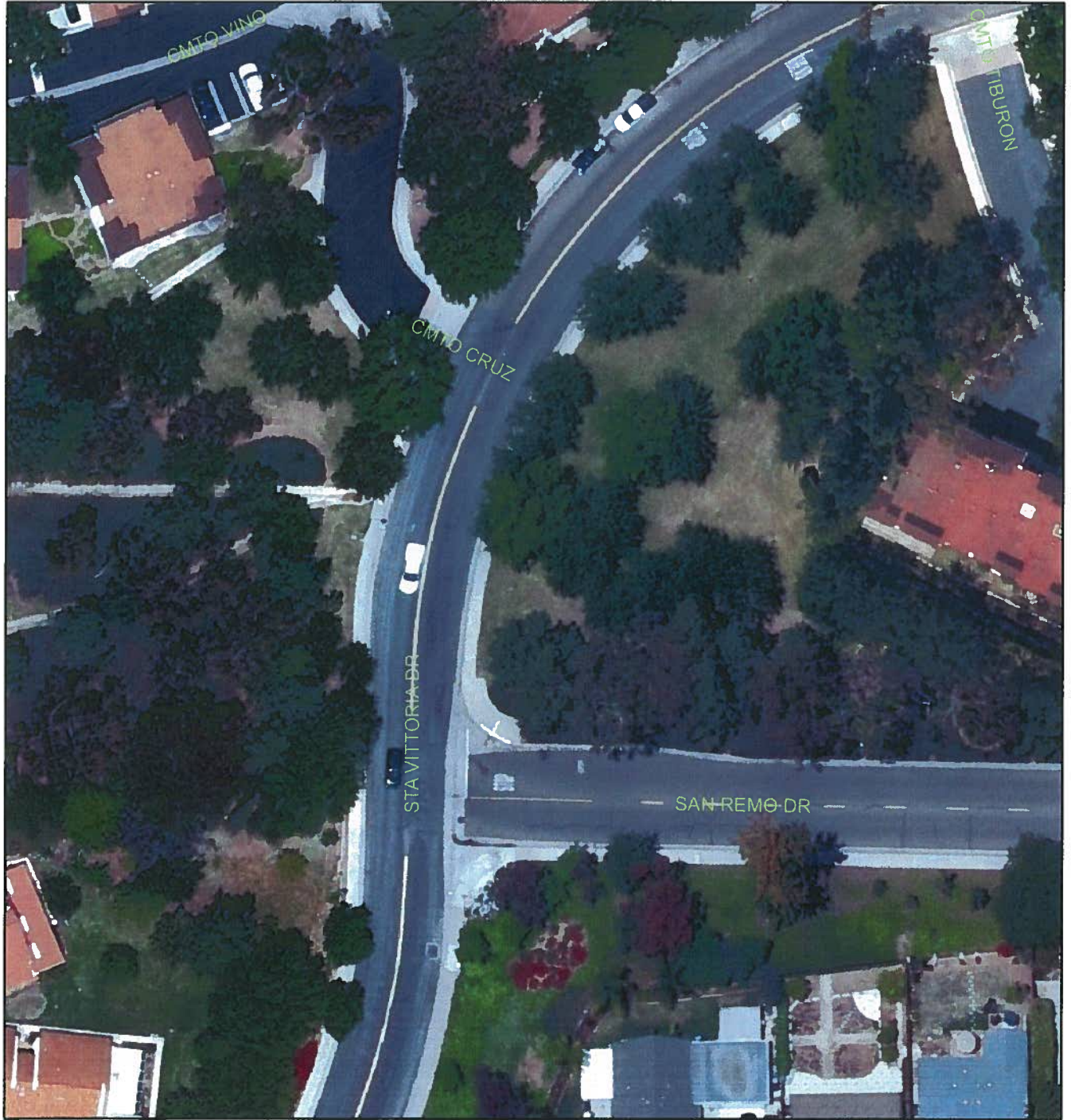
ATTACHMENTS:

- Vicinity Map
- Multi-way Stop Control Analysis, Hartzog & Crabill, Inc. report



City of Laguna Hills

VICINITY MAP



60 0 60 Feet

Date Created: 1/12/2012

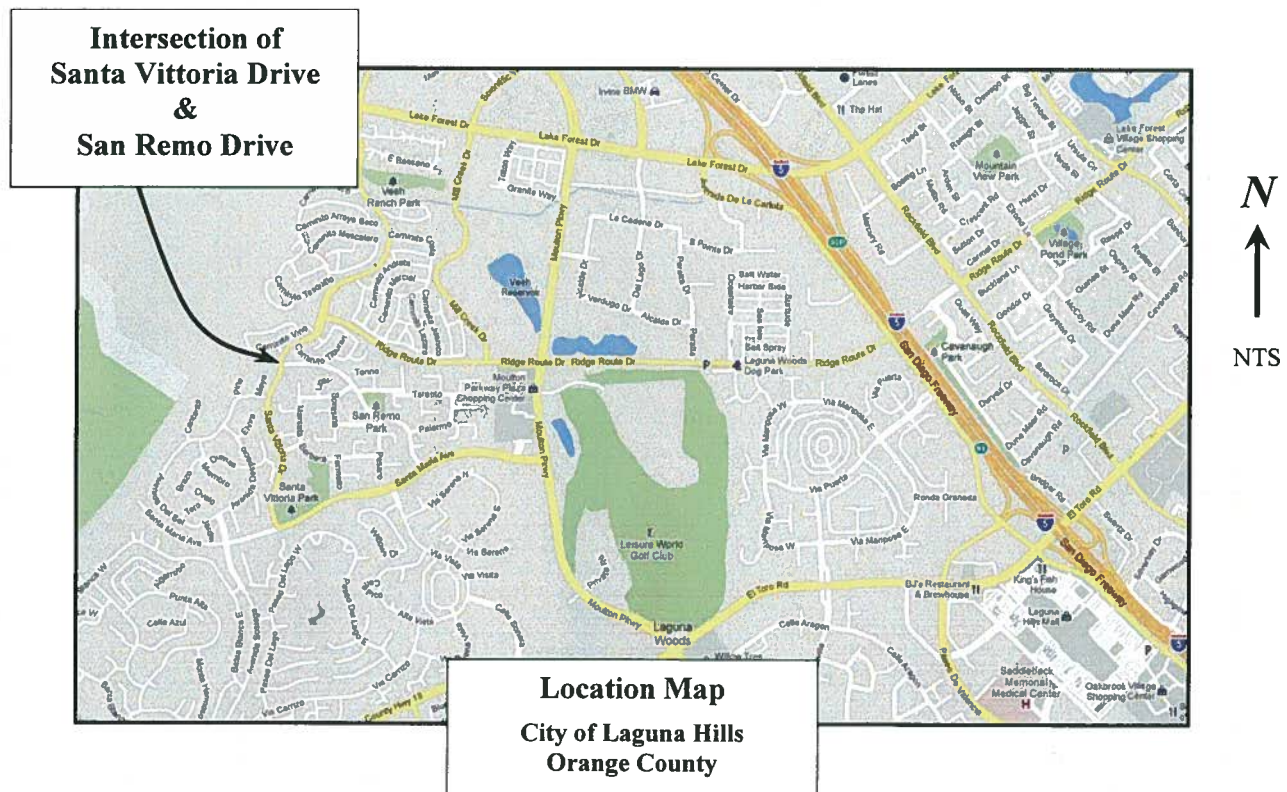
1/18/2012 ITEM NO. 4.4

MULTIWAY STOP CONTROL WARRANTS ANALYSIS SANTA VITTORIA DRIVE AT SAN REMO DRIVE IN THE CITY OF LAGUNA HILLS, CA

INTRODUCTION

The City of Laguna Hills requested Hartzog & Crabill, Inc. (HCI) to complete a Multiway Stop Warrants Analysis at the intersection of Santa Vittoria Drive at San Remo Drive. This analysis was completed in order to verify if a three-way stop sign installation is warranted and recommended based on meeting standard guidelines.

The location is a T-intersection with Santa Vittoria Drive running in the north-south directions and San Remo Drive running in the east-west directions, east of Santa Vittoria Drive. The intersection is located west of the Interstate 5 (San Diego) Freeway and south of Lake Forest Drive (*see Location Map below*). The intersection is entirely within the City of Laguna Hills' jurisdiction. At the present time there is a stop sign controlling the westbound San Remo Drive approach to the intersection.



BACKGROUND

Santa Vittoria Drive is a north-west collector roadway with primarily residential frontage on both sides of the road. At the intersection with San Remo Drive, the roadway is 38 feet wide. The two-lane roadway provides for one lane of traffic in each direction separated by a painted double yellow centerline, and is fully-improved with concrete curb, gutter, and sidewalk on both sides. Santa Vittoria Drive has a posted speed limit of 30 miles per hour (MPH). On-street parking is allowed on the west-side of the roadway. 'NO STOPPING ANYTIME' signs are posted on the east-side along Santa Vittoria Drive.

See Exhibit 1 (next page) for photo images of Santa Vittoria Drive.

San Remo Drive is an approximate 40 foot wide east-west local roadway with residential frontage on both sides. The two-lane roadway provides for one lane of traffic in each direction separated by a painted yellow single-skip centerline, and is fully-improved with concrete curb, gutter, and sidewalk on both sides. San Remo Drive has a posted speed limit of 30 MPH. There is a 'STOP' sign, pavement marking, and limit line controlling traffic using San Remo Drive as it approaches Santa Vittoria Drive in the westbound direction. On-street parking is allowed on both sides of San Remo Drive.

See Exhibit 2 (following page) for a photo image of San Remo Drive.

EXHIBIT 1

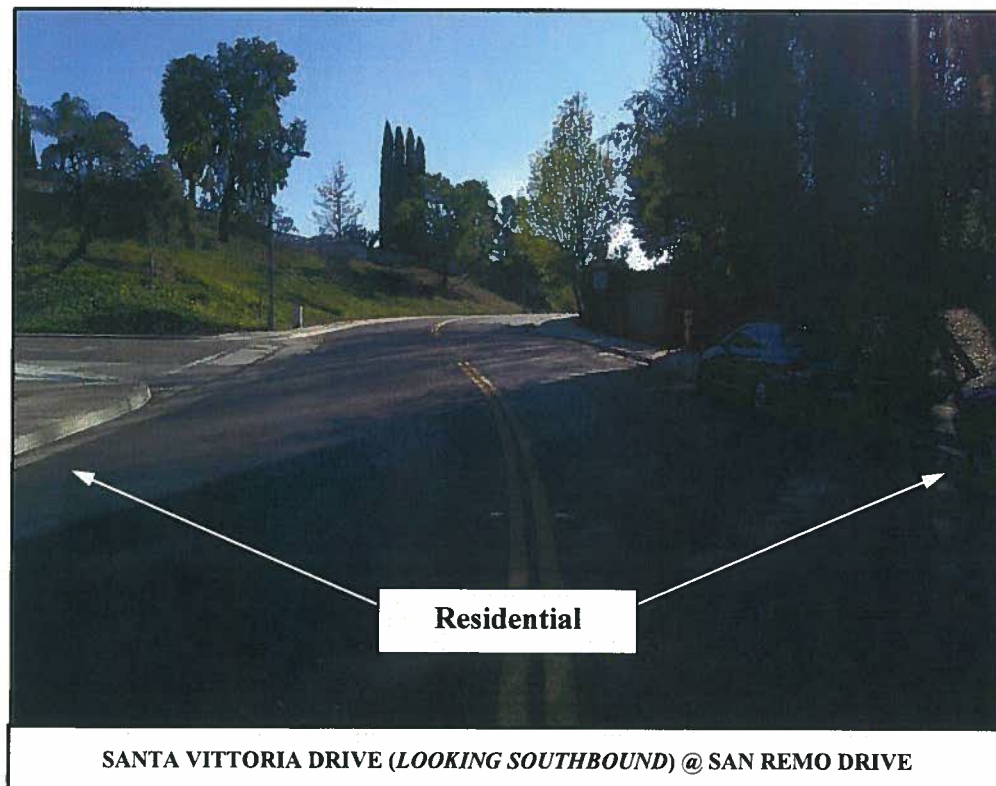
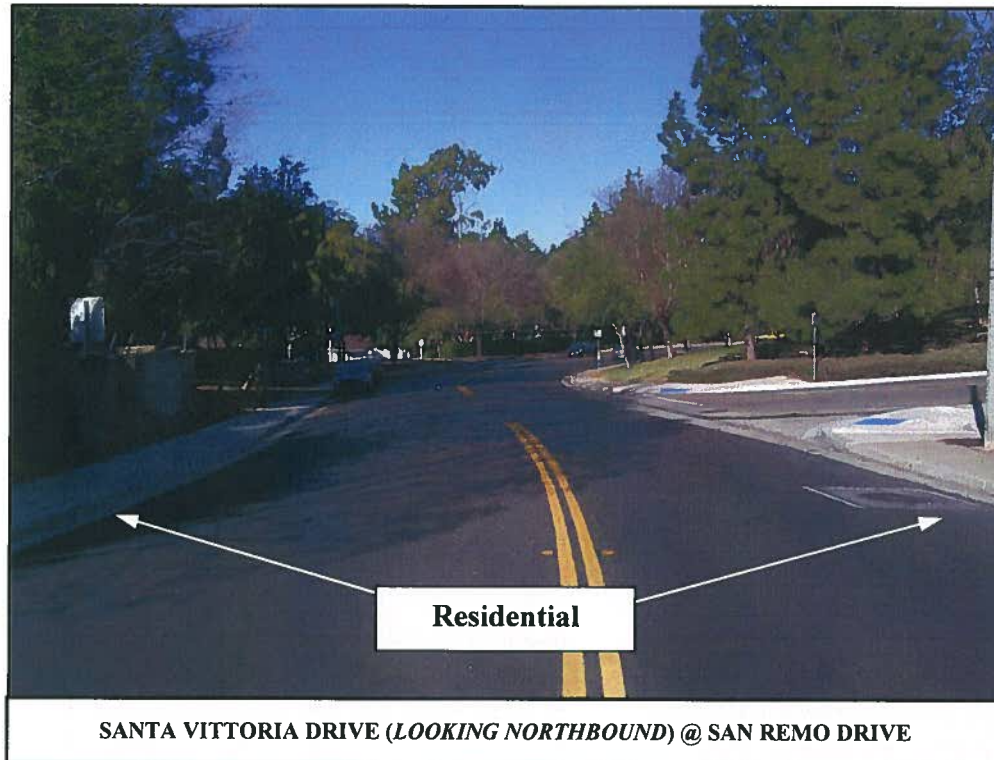
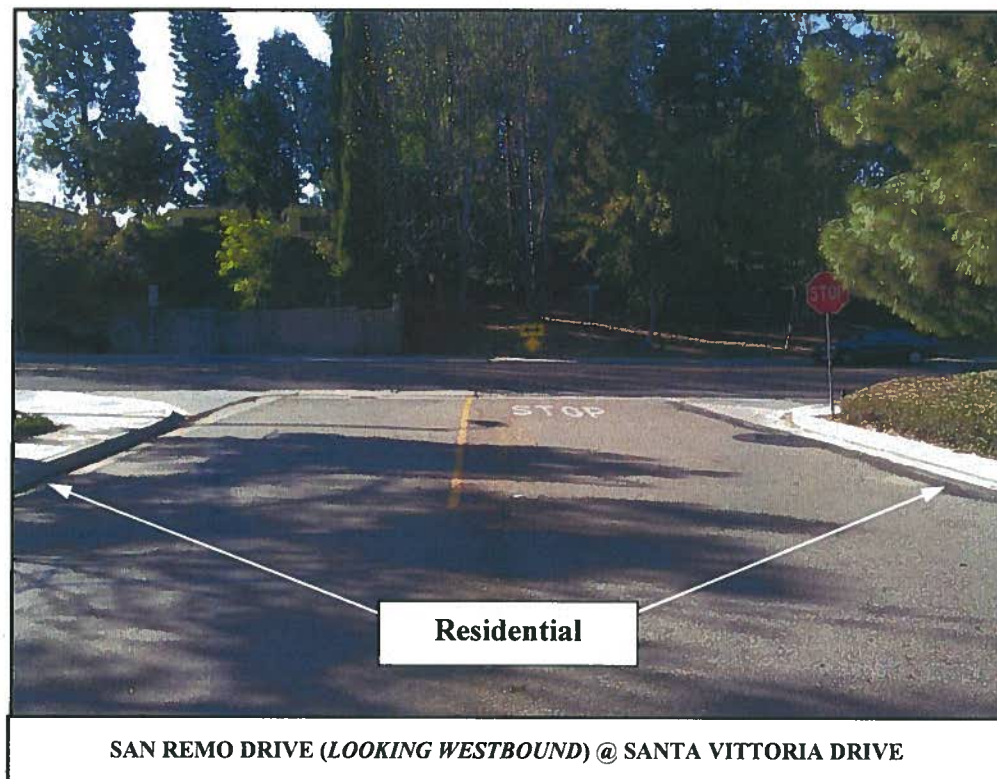


EXHIBIT 2



WARRANT GUIDELINES

As is common practice with many municipal agencies, the City of Laguna Hills follows State guidelines for determining if traffic control devices, such as multiway stop signs, should be installed. Therefore, the prevailing source used for this analysis is the State of California Manual of Uniform Traffic Control Devices (*California MUTCD*). The California MUTCD contains minimum guidelines regarding traffic volumes, collisions, speeds, visibility, and other criteria in order to satisfy the requirements, in this case, for the recommendation and installation of a multi-way stop.

The California MUTCD Multiway Stop Applications Guidance criteria are described in the following four main parts:

- 1) As an interim measure where traffic control signals are justified;
- 2) Reported crashes – five or more in a 12-month period that are susceptible to correction;
- 3) Traffic and pedestrian volumes, speeds, and delay; and,
- 4) Where a combination of the above criteria are satisfied to 80 percent.

If any one, or a combination, of these criteria is met, then a multiway stop application should be considered. If these criteria are not met, the installation of an unwarranted stop sign installation is typically not recommended as it may place the City in a position of potential liability.

The California MUTCD STOP Sign and Multiway Stop Applications guidelines are included in Appendix A.

MULTIWAY STOP ANALYSIS

The California MUTCD Multiway Stop Applications section contains guidelines, such as minimum collisions and traffic volumes necessary for the justification of a multiway stop control. The general guidelines given for a stop sign application begin with using engineering judgment for the installation of a stop sign(s) on a street entering a through highway and where high speeds on the cross street make entry difficult, or due to restricted view, or when crash records indicate a need for control by a stop sign. Further guidance criteria found in the California MUTCD include the following important statements: *“STOP signs should not be used for speed control... STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop... In most cases, the street carrying the lowest volume of traffic should be stopped... A STOP sign should not be installed on the major street unless justified by a traffic engineering study... Multiway stop control is used where the volume of traffic on the intersecting roads is approximately equal.”*

Collision History

The guidelines for Multiway Stop Applications contained in the California MUTCD regarding collisions, or crashes, require a minimum of five (5) reported crashes occurring in a 12-month period that are susceptible to correction by a multiway stop installation in order to satisfy the collision warrant. Such crashes include right- and left-turn collisions, as well as right-angle collisions (i.e., broadside). The available collision history for the subject intersection was gathered from the City of Laguna Hills to determine whether there were collisions susceptible to correction by the installation of a multiway stop. Table 1 (*next page*) provides the most recent summary of collision history occurring at or near this intersection.

All traffic collision data collected for this intersection is included in Appendix B.

Collision History (continued)

**TABLE 1
COLLISION SUMMARY**

Intersection	2007		2008		2009		2010 - 2011	
	Date	Type of Coll. / Correctible?	Date	Type of Coll. / Correctible?	Date	Type of Coll. / Correctible?	Date	Type of Coll. / Correctible?
Santa Vittoria Drive at San Remo Drive	10/30	Hit Object / No		None Reported		None Reported		None Reported

Notes: Information above is derived per a 5-year intersection traffic collision history report provided by the City of Laguna Hills.

- 1) Type of Coll. = Type of Collision (*i.e., broadside, rear-end, etc.*)
- 2) Correctible? = Yes / No.

As shown, there has only been (1) reported collision at or near the intersection during the past (5) years, which is not considered correctible. Since this warrant requires a minimum of (5) correctible reported crashes to occur within a 12-month period, and there are none reported during the past (5) years, the collision warrant is not satisfied.

Traffic Volumes

HCI collected 24-hour intersection approach vehicular counts to determine traffic volumes that use this intersection on a typical day (Wednesday, December 14, 2011). The Average Daily Traffic (ADT) count for Santa Vittoria Drive is 2,559 vehicles per day with the highest AM peak-hour volume of 242 vehicles and the highest PM peak-hour volume of 227 vehicles. The ADT count for the east leg of San Remo Drive is 937 vehicles per day with the highest AM peak-hour volume of 118 vehicles and the highest PM peak-hour volume of 73 vehicles. Table 2 below provides a breakdown of these approach volumes.

All traffic volume data collected for this intersection is included in Appendix C.

Traffic Volumes (continued)

**TABLE 2
HIGHEST 24-HOUR INTERSECTION APPROACH VEHICLE COUNTS**

Street	Direction	ADT Volume	Directional Split	Highest Hourly Volume
Santa Vittoria Drive	Northbound	873	34.1%	99 (8:00–9:00AM)
	Southbound	1,686	65.9%	173 (4:00–5:00PM)
San Remo Drive	Westbound	937	100%	118 (7:00–8:00AM)

Santa Vittoria Drive is considered the ‘through’ or ‘major’ street, due to the intersection geometry and westbound traffic on San Remo Drive is required to stop at the intersection before proceeding left or right. It is typically expected that the traffic volumes on the minor street are considerably less than those on the major street at a T-intersection. As can be seen from the table above, this is the case, as Santa Vittoria Drive carries approximately (73%) of the entire traffic entering the intersection.

A part of the California MUTCD guideline criteria also calls for a reduction in the required minimum volumes when the critical approach speed (*or 85th-percentile speed*) on the major street exceeds 40 MPH. If this is the case, the minimum vehicular volumes to be met for a multiway stop installation are reduced to 70%.

As detailed in the most recent Engineering & Traffic Speed Survey (2008), the 85th percentile speed on Santa Vittoria Drive is 34.1 MPH. Therefore, the 70% minimum volumes for stop sign analysis are not applicable.

The Engineering & Traffic Survey for Santa Vittoria Drive is included in Appendix D.

Traffic Volumes (continued)

It is important to note that the hourly vehicle traffic counts shown in Table 2 above are given for the highest hour of traffic for each direction, and serve as a good indicator to compare with the required traffic volumes in the California MUTCD multiway stop warrant. However, the average hourly minimum volumes standard for a multiway stop application [*300 vehicles per from both approaches on the major street*) are to be satisfied for **each** of eight (8) hours of an average day. Table 3 below shows the California MUTCD minimum volume guidelines for a Multiway Stop Application in comparison with the highest 8-hour traffic count data. Both Parts 1 and 2 of the minimum volume warrants below must be satisfied in order to fulfill either of these traffic volume warrants.

TABLE 3
MULTIWAY STOP SIGN WARRANT FOR MINIMUM TRAFFIC VOLUMES
SANTA VITTORIA DRIVE AT SAN REMO DRIVE

Part 1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any (8) hours of an average day, Results: No, average (184) vehicles per hour Meets 61% of required average major street hourly traffic volumes	<i>and</i>	Part 2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same (8) hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, Results: No, average (72) vehicles per hour Meets 36% of required minor street hourly traffic volumes	<i>but</i>	Part 3. If the 85th-percentile approach speed of the major-street traffic exceeds 65 km/h, or exceeds 40 mph, the minimum vehicular volume warrants are (70) percent of the above values. Results: No < 40 MPH
---	------------	--	------------	---

As shown above, the average hourly intersection approach volumes did not satisfy both Part 1 and 2 required volumes (*61% major street / 36% minor street*). Consequently, the traffic volume warrant is not considered satisfied at this time.

Speeds

As mentioned, Santa Vittoria Drive has a posted speed limit of 30 MPH, with an 85th percentile speed of 34.1 MPH. These speeds correspond to the speeds that may be expected on a two-lane collector roadway. Field observations showed that vehicles were not regularly speeding over the posted speed limit near the intersection, but were typical of a two-lane collector roadway environment.

Visibility

A driver's visibility, or sight distance, was measured from a typical stopped-vehicle location on San Remo Drive. The measured distances were applied to the stopping sight distance guidelines, based on the latest edition of A Policy on Geometric Design of Highways and Streets (American Association of State Highway and Transportation Officials (AASHTO) 2004). In this Policy, an 85th percentile speed of approximately 35 MPH recommends a minimum Stopping Sight Distance of 250 feet.

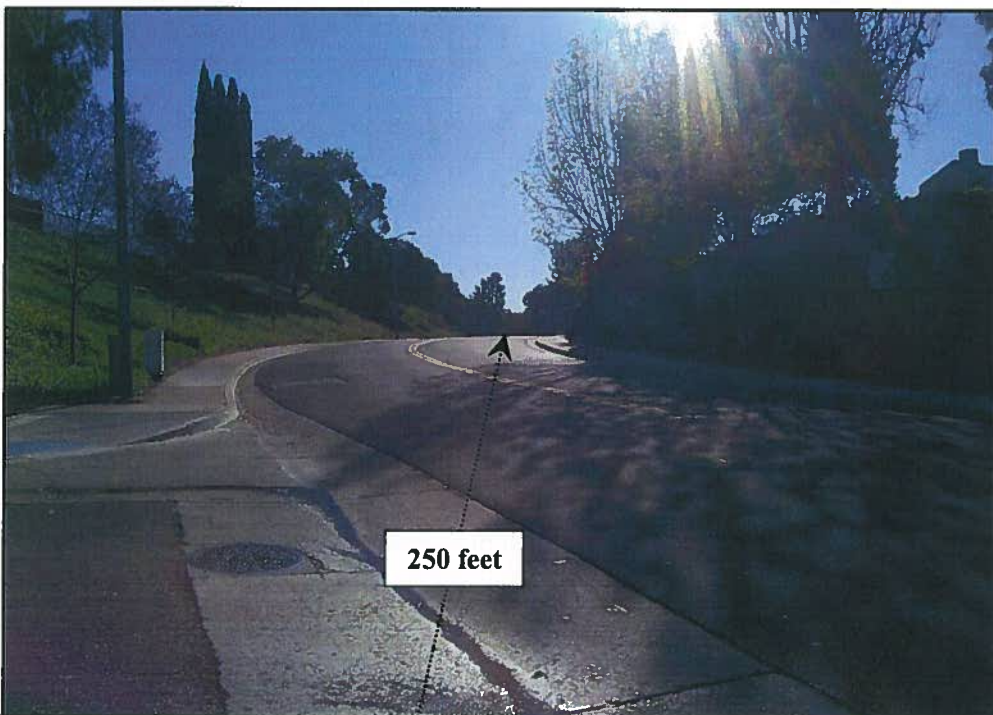
This stopping sight distance was field-measured from a typical 'stopped' vehicle location towards the near-side and far-side lanes of on-coming traffic. An orange cone was set on the lane line at this minimum distance from the side-street vehicle position. A photograph was then taken from a stopped vehicle just passed the limit line. Both directions had a clear line of sight to the cone and met the minimum required stopping sight distance.

(See sight distance photos in Exhibit 3 on the following page).

EXHIBIT 3



SAN REMO DRIVE (LOOKING NORTH) @ SANTA VITTORIA DRIVE



SAN REMO DRIVE (LOOKING SOUTH) @ SANTA VITTORIA DRIVE

MULTIWAY STOP ANALYSIS SUMMARY

The analysis of the four (4) main criteria provided in the California MUTCD regarding Multiway Stop Applications showed that this intersection did not meet the minimum guidelines to justify stopping the major roadway (Santa Vittoria Drive). The four main criteria analyzed were: 1) As an interim measure where traffic control signals are justified; 2) Reported collisions – a correctible crash problem; 3) Traffic and pedestrian volumes, speeds, and delay; and 4) Where a combination of the above criteria are satisfied to 80 percent.

In summary, the collision history at the intersection resulted in only (1) collision that was not considered correctible during the last (5) years, where the minimum guideline calls for at least five (5) correctible collisions in a 12-month period. The minimum hourly traffic volume guidelines that are to be satisfied for any eight (8) hours in an average day for a multiway stop were also not satisfied. Excessive delay to the minor roadway was not observed as this is a three-way intersection and the westbound traffic was not delayed significantly when waiting for a gap on the major roadway. Therefore, since intersection collision history and traffic volumes do not satisfy the minimum volumes, it can also be derived that a traffic signal is not justified at this intersection. The 80% combined criteria were also not met as both the collision history and the minimum traffic volumes guidelines were not satisfied to this percentage.

However, engineering judgment should always be included in any decision regarding traffic safety improvements. Further intersection information was obtained from the field and the City in regards to pedestrian and bicycle activity. This information along with field observations confirmed a moderate activity of both. Additionally, intersection lighting was verified and found to be adequate as there was typical roadway lighting on one street light pole located on the southeast corner.

CONCLUSION / RECOMMENDATION

In overall consideration of the current one-way stop sign condition at the intersection of Santa Vittoria Drive and San Remo Drive, as opposed to the evaluation of a three-way stop installation, a multi-way stop sign installation is not recommended. There are no other recommendations to the intersection at this time.

APPENDIX A

**MULTIWAY STOP APPLICATIONS
GUIDELINES:**

CALIFORNIA MUTCD

Signs larger than those shown in Table 2B-1 may be used (see Section 2A.12).

Section 2B.04 STOP Sign (R1-1)

Standard:

When a sign is used to indicate that traffic is always required to stop, a STOP (R1-1) sign (see Figure 2B-1) shall be used.

The STOP sign shall be an octagon with a white legend and border on a red background. Secondary legends shall not be used on STOP sign faces. If appropriate, a supplemental plaque (R1-3 or R1-4) shall be used to display a secondary legend. Such plaques (see Figure 2B-1) shall have a white legend and border on a red background. If the number of approach legs controlled by STOP signs at an intersection is three or more, the numeral on the supplemental plaque, if used, shall correspond to the actual number of legs controlled by STOP signs.

At intersections where all approaches are controlled by STOP signs (see Section 2B.07), a supplemental plaque (R1-3 or R1-4) shall be mounted below each STOP sign.

Option:

The ALL WAY (R1-4) supplemental plaque may be used instead of the 4-WAY (R1-3) supplemental plaque.

Support:

The design and application of Stop Beacons are described in Section 4K.05.

A STOP (R1-1) sign is not a "cure-all" and is not a substitute for other traffic control devices. Often, the need for a STOP (R1-1) sign can be eliminated if the sight distance is increased by removing obstructions.

Through Highways

Option:

STOP (R1-1) signs may be installed either at or near the entrance to a State highway, except at signalized intersections, or at any location so as to control traffic within an intersection. Refer to CVC 21352 and 21355. See Section 1A.11 for information regarding this publication.

Support:

When STOP (R1-1) signs or traffic control signals have been erected at all entrances, a highway constitutes a through highway. Refer to CVC 600.

Authority to place STOP (R1-1) signs facing State highway traffic is delegated to the Department of Transportation's District Directors.

Option:

Local authorities may designate any highway under their jurisdiction as a through highway and install STOP (R1-1) signs in a like manner. Refer to CVC 21354.

Standard:

No local authority shall erect or maintain any STOP (R1-1) sign or other traffic control device requiring a stop, on any State highway, except by permission of the Department of Transportation. Refer to CVC 21353.

Support:

The Department of Transportation will grant such permission only when an investigation indicates that the STOP (R1-1) sign will benefit traffic.

Section 2B.05 STOP Sign Applications

Guidance:

STOP signs should be used if engineering judgment indicates that one or more of the following conditions exist:

- A. Intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;
- B. Street entering a through highway or street;
- C. Unsignalized intersection in a signalized area; and/or
- D. High speeds, restricted view, or crash records indicate a need for control by the STOP sign.

Standard:

Because the potential for conflicting commands could create driver confusion, STOP signs shall not be installed at intersections where traffic control signals are installed and operating except as noted in Section 4D.01.

Portable or part-time STOP signs shall not be used except for emergency and temporary traffic control zone purposes.

Guidance:

STOP signs should not be used for speed control.

STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop. At intersections where a full stop is not necessary at all times, consideration should be given to using less restrictive measures such as YIELD signs (see Section 2B.08).

Once the decision has been made to install two-way stop control, the decision regarding the appropriate street to stop should be based on engineering judgment. In most cases, the street carrying the lowest volume of traffic should be stopped.

A STOP sign should not be installed on the major street unless justified by a traffic engineering study.

Support:

The following are considerations that might influence the decision regarding the appropriate street upon which to install a STOP sign where two streets with relatively equal volumes and/or characteristics intersect:

- A. Stopping the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
- B. Stopping the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds;
- C. Stopping the direction that has the longest distance of uninterrupted flow approaching the intersection; and
- D. Stopping the direction that has the best sight distance to conflicting traffic.

The use of the STOP sign at highway-railroad grade crossings is described in Section 8B.08. The use of the STOP sign at highway-light rail transit grade crossings is described in Section 10C.04.

Section 2B.06 STOP Sign Placement

Standard:

The STOP sign shall be installed on the right side of the approach to which it applies. When the STOP sign is installed at this required location and the sign visibility is restricted, a Stop Ahead sign (see Section 2C.29) shall be installed in advance of the STOP sign.

The STOP sign shall be located as close as practical to the intersection it regulates, while optimizing its visibility to the road user it is intended to regulate.

STOP signs and YIELD signs shall not be mounted on the same post.

If other signs are grouped with a STOP sign, except for ONE WAY (R6-1 & R6-2) signs and Street Name (D3-1 or G7-1(CA)) signs (see Sections 2B.37 & 2D.38), they shall be installed below the STOP sign.

Guidance:

Other than a DO NOT ENTER sign, no sign should be mounted back-to-back with a STOP sign in a manner that obscures the shape of the STOP sign.

Support:

Section 2A.16 contains additional information about separate and combined mounting of other signs with STOP signs.

Guidance:

Stop lines, when used to supplement a STOP sign, should be located at the point where the road user should stop (see Section 3B.16).

If only one STOP sign is installed on an approach, the STOP sign should not be placed on the far side of the intersection.

Where two roads intersect at an acute angle, the STOP sign should be positioned at an angle, or shielded, so that the legend is out of view of traffic to which it does not apply.

Where there is a marked crosswalk at the intersection, the STOP sign should be installed in advance of the crosswalk line nearest to the approaching traffic.

Option:

At wide-throat intersections or where two or more approach lanes of traffic exist on the signed approach, observance of the stop control may be improved by the installation of an additional STOP sign on the left side of the road and/or the use of a stop line. At channelized intersections, the additional STOP sign may be effectively placed on a channelizing island.

Support:

Figure 2A-2 2A-2(CA) shows examples of some typical placements of STOP signs.

Standard:

When a required stop is to apply at the entrance to an intersection from a one-way street with a roadway of 9.1 m (30 ft) or more in width, stop signs shall be erected both on the left and the right sides of the one-way street at or near the entrance to the intersection. Refer to CVC 21355.

Section 2B.07 Multiway Stop Applications

Support:

Multiway stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multiway stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multiway stop control is used where the volume of traffic on the intersecting roads is approximately equal.

The restrictions on the use of STOP signs described in Section 2B.05 also apply to multiway stop applications.

Guidance:

The decision to install multiway stop control should be based on an engineering study.

The following criteria should be considered in the engineering study for a multiway STOP sign installation:

- A. Where traffic control signals are justified, the multiway stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
- B. A crash problem, as indicated by 5 or more reported crashes in a 12-month period that are susceptible to correction by a multiway stop installation. Such crashes include right- and left-turn collisions as well as right-angle collisions.
- C. Minimum volumes:
 1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day, and
 2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but
 3. If the 85th-percentile approach speed of the major-street traffic exceeds 65 km/h or exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.
- D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Option:

Other criteria that may be considered in an engineering study include:

- A. The need to control left-turn conflicts;
- B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
- C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the intersection unless conflicting cross traffic is also required to stop; and
- D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multiway stop control would improve traffic operational characteristics of the intersection.

APPENDIX B

CITY OF LAGUNA HILLS

5-YEAR COLLISION HISTORY

FOR

SANTA VITTORIA DRIVE AT SAN REMO DRIVE

From: Ken Rosenfield [mailto:krosenfield@ci.laguna-hills.ca.us]
Sent: Tuesday, January 03, 2012 2:08 PM
Subject: RE: Traffic Engineering Studies on Santa Vittoria Drive

Only one TC in last 5 years through 12/31/2010. See below.

CASE ID 3445190
STREET 1 SANTA VITTORIA DR
STREET 2 SAN REMO DR
BLOCK 1 0
BLOCK 2 0
MILE 1 0.000
MILE 2 0.000
DATE 10/30/2007
TIME 11:25
DISTANCE 16
ULONG TNA~ULONG~
UWORD TNA~UWORD~
JURSDCTN 0
DAY Tuesday
DIR FROM INT North
INTERSECT Not stated
ROUTE 0
LOC TYPE 0
SEVERITY Complaint of pain
KILL 0
INJURY 1
VIOL CAT Unsafe speed
HIT RUN Not hit run
COLL TYPE Hit object
INVOLVED WITH Fixed object
PED ACTION No ped involved
ROAD SURF Dry
ROAD COND No unusual
WEATHER Clear
LIGHTING Daylight
CONTROLS None
VEH 1 AGE 36
VEH 2 AGE 0
VEH 3 AGE 0
VEH 1 SOBER HNBD (not)

APPENDIX C

AVERAGE DAILY TRAFFIC (ADT)
INTERSECTION COUNT DATA
FOR
SANTA VITTORIA DRIVE
AT
SAN REMO DRIVE

Prepared by NDS/ATD

Volumes for: Wednesday, December 14, 2011						City: Laguna Hills		Daily Totals						Total	
Location: Santa Vittoria Dr & San Remo Dr						Project: 11-1189-001		NB	SB	EB	WB				
								873	1,686	0	937	3,496			
AM Period	NB	SB		EB	WB	PM Period	NB	SB		EB	WB				
00:00	1	2			0	12:00	14	27			8				
00:15	1	2			1	12:15	17	26			16				
00:30	0	4			0	12:30	12	30			15				
00:45	1	3	5	13	1	2	18	12:45	13	56	17	100	16	55	211
01:00	1	1			0	13:00	7	23			14				
01:15	3	2			0	13:15	19	23			15				
01:30	0	3			0	13:30	7	34			13				
01:45	0	4	1	7	0	11	13:45	23	56	56	136	12	54	246	
02:00	0	1			0	14:00	39	43			33				
02:15	0	0			0	14:15	24	27			14				
02:30	0	0			0	14:30	15	29			12				
02:45	0	1		2	0	2	14:45	10	88	30	129	14	73	290	
03:00	0	0			0	15:00	14	22			13				
03:15	0	0			0	15:15	14	34			13				
03:30	0	0			2	15:30	7	30			10				
03:45	0	1		1	0	2	3	15:45	16	51	44	130	16	52	233
04:00	0	1			0	16:00	13	41			9				
04:15	0	0			1	16:15	12	52			14				
04:30	1	0			0	16:30	13	36			18				
04:45	2	3	0	1	3	4	8	16:45	8	46	44	173	11	52	271
05:00	2	0			3	17:00	29	46			19				
05:15	6	2			5	17:15	15	43			12				
05:30	4	2			10	17:30	9	45			21				
05:45	4	16	2	6	15	33	55	17:45	9	62	31	165	18	70	297
06:00	8	4			12	18:00	12	45			8				
06:15	10	3			11	18:15	8	25			14				
06:30	15	6			17	18:30	3	23			8				
06:45	10	43	6	19	30	70	132	18:45	6	29	22	115	10	40	184
07:00	11	17			25	19:00	7	21			12				
07:15	12	22			27	19:15	8	21			8				
07:30	24	41			28	19:30	5	19			10				
07:45	44	91	71	151	38	118	360	19:45	4	24	18	79	17	47	150
08:00	46	22			31	20:00	5	19			6				
08:15	21	15			24	20:15	8	26			5				
08:30	20	12			15	20:30	0	18			7				
08:45	12	99	12	61	15	85	245	20:45	1	14	6	69	6	24	107
09:00	14	16			14	21:00	1	11			5				
09:15	11	11			14	21:15	5	8			5				
09:30	6	17			15	21:30	3	10			4				
09:45	15	46	17	61	8	51	158	21:45	1	10	8	37	3	17	64
10:00	16	18			6	22:00	2	11			1				
10:15	16	10			19	22:15	0	10			4				
10:30	19	25			7	22:30	0	10			3				
10:45	17	68	26	79	9	41	188	22:45	0	2	14	45	4	12	59
11:00	20	19			5	23:00	1	8			3				
11:15	12	12			7	23:15	1	5			2				
11:30	17	25			14	23:30	0	7			0				
11:45	9	58	26	82	3	29	169	23:45	2	4	5	25	1	6	35

Total Vol.	431	483	435	1349		442	1203		502	2147
Daily Totals :						NB	SB	EB	WB	Total
						873	1,686	0	937	3,496
AM					PM					
Split %	31.9%	35.8%	32.2%	38.6%		20.6%	56.0%		23.4%	61.4%
AM					PM					
Peak Hr.	07:30	07:15	07:15	07:15	Peak Hr.	13:45	16:15		13:15	13:45
Volume	135	156	124	406	Volume	101	178		73	327
P.H.F.	0.734	0.549	0.816	0.663	P.H.F.	0.647	0.856		0.553	0.711
7 - 9 Vol.	190	212	203	605	4 - 6 Vol.	108	338		122	568
Peak Hr.	07:30	07:15	07:15	07:15	Peak Hr.	16:30	16:15		17:00	16:15
Volume	135	156	124	406	Volume	65	178		70	302
P.H.F.	0.734	0.549	0.816	0.663	P.H.F.	0.560	0.856		0.833	0.803

APPENDIX D

ENGINEERING & TRAFFIC SPEED SURVEY SUMMARY

FOR

SANTA VITTORIA AVENUE

SUMMARY OF RECOMMENDATIONS

STREET LOCATION	EXISTING SPEED LIMIT	RECOMMEND ED SPEED LIMIT	85 TH PERCENTILE SPEED	AVERAGE SPEED	10 MPH PACE RANGE	PERCENT OF VEHICLES IN PACE	RECOMMENDATION - JUSTIFICATION
<u>SAN REMO DRIVE</u>							
SANTA VITTORIA DR TO SANTA MARIA AVE	30	30	33.5	29.6	26-35	85.4	NO CHANGE - 10 MPH PACE / LIMITED SIGHT DISTANCE CONDITIONS NOT READILY APPARENT TO THE DRIVER
<u>SANTA MARIA AVENUE</u>							
SAN REMO DR TO SANTA VITTORIA DR	45	45	45.4	40.5	37-46	69.5	NO CHANGE - 85 TH PERCENTILE
<u>SANTA VITTORIA</u>							
LAKE FOREST DR TO RIDGE ROUTE DR	30	30	33.9	29.1	26-35	83.8	NO CHANGE - 10 MPH PACE / LIMITED SIGHT DISTANCE CONDITIONS NOT READILY APPARENT TO THE DRIVER
RIDGE ROUTE DR TO SANTA MARIA AVE	30/25*	30/25*	34.1	29.4	25-34	80.0	NO CHANGE - 10 MPH PACE / LIMITED SIGHT DISTANCE CONDITIONS NOT READILY APPARENT TO THE DRIVER
<u>VISTA VIEJO</u>							
DEVONSHIRE RD TO EAST CITY LIMITS	30	30	33.0	29.0	25-34	86.5	NO CHANGE - 10 MPH PACE / RESIDENTIAL AREA / LIMITED SIGHT DISTANCE / CONDITIONS NOT READILY APPARENT TO DRIVER

*25 = 25 MPH "WHEN CHILDREN PRESENT" (SCHOOL ZONE)
 NB = NORTHBOUND
 EB = EASTBOUND
 SB = SOUTHBOUND
 WB = WESTBOUND



CITY OF LAGUNA HILLS

December 23, 2011

Jiun G. and Lilian Keng
2377-C Via Mariposa W
Laguna Woods, CA 92637-8152

SUBJECT: RIDGE ROUTE DRIVE SPEED LIMIT

Dear Mr. and Mrs. Keng,

Thank you, for your letter dated November 5, 2011, including the signatures of many of your neighbors. In your letter, you requested consideration for changing the speed limit on Ridge Route Drive from its existing limit of 45 mph to a new limit of 35 mph. Your expressed concern in making this request was primarily listed as noise from traffic. We have reviewed your request and offer the following information.

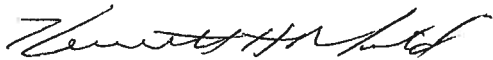
Speed limit setting on California public streets is governed by provisions of the California Vehicle Code, the State Traffic Manual and the Federal Manual of Uniform Traffic Control Devices. These documents prohibit the City from arbitrarily setting speed limits that are to be enforced. The City is constrained to set the speed limit of a public street based upon several factors including the prevailing speed of the traffic (the speed at which 85% of the motorist are traveling at or below when driving on the street), traffic collision history, roadway geometrics and any unusual conditions. The Traffic Engineer is obligated to take all of these factors into account but is still required by the above regulations to post the speed limit at the closest speed relative to the 85th percentile speed. Noise generation is not a factor in setting of speed limits.

In the case of Ridge Route Drive, the City's speed surveys of record reveal the 85th percentile speed as 46.4 mph within the segment from Peralta Drive to Avenida de la Carlota and 47.2 mph within the segment from Moulton Parkway to Peralta Drive. A review of traffic collision history found it to be minimal and the roadway geometrics were not a factor. Hence, the speed limit had to be set at 45 mph. The next time speed limits are planned for review on these sections of Ridge Route Drive is in 2014. The speed limit will be set at that time based upon current conditions.

December 23, 2011
Jiun G. and Lilian Keng
Ridge Route Drive Speed Limit
Page 2

I would also note that the City does have a future project to resurface Ridge Route Drive which will smooth the surface and may have a side effect of reducing traffic noise. The combination of the roadway resurfacing project and the verification or re-setting of the speed limit in the future may help with your concerns. Thank you, for corresponding with us and please share this letter with your neighbors.

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth H. Rosenfield".

Kenneth H. Rosenfield, P.E.
Director of Public Services

RECEIVED

NOV 10 2011

CITY OF LAGUNA HILLS

City Council
City of Laguna Hills
24035 El Toro Road
Laguna Hills, CA

November 5, 2011

Dear City Council Members,

We are a group of residents who reside in Laguna Woods Village and have enjoyed the calm, safe and pleasant environments.

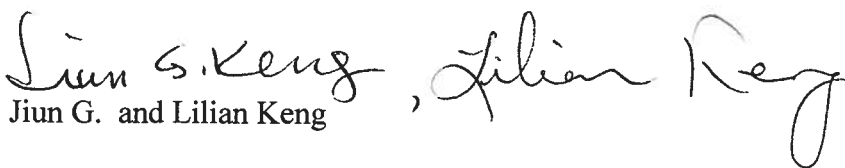
Our manors are on the south side of Ridge Route Drive and adjacent to a new people's park recently constructed. The current speed limit of 45mph which may help the commuters during the traffic hours is now deemed too high and dangerous for pedestrians and dog walkers. Furthermore, the cars move at that speed generate a high level of noise which affects our quite enjoyment and sleep during evenings and nights. We often are awakened by heavy and fast traffic, the noise is so unbearable and there are times, we would stay awake throughout the night.

We humbly request your consideration to reduce the speed limit, specifically between Moulton Parkway and Avenue Carlota, down to 35mph. We believe this will be very helpful to improve pedestrians safety and to reduce the traffic noises.

Our manor numbers are 2403, 2404, 2370, 2371, 2377, 2378, 2379, 2380, 2381, 2383, 2356, 2358, 2359, 2361, 2369, 2245, 2251, 2241 and 2244. Each these address consists of four or 24 manors. If this request is granted, there are at least sixty (60) manors/over 100 residents are benefited from this change.

If you need any further information, please not to hesitate to contact me on 949-581-0168 or jgkeng@yahoo.com

Sincerely yours,


Jiun G. and Lilian Keng

We, the undersigned, petition to have the speed limit of Ridge Route between Moulton Parkway and Avenue Carlota reduced from 45mph to 35mph. We believe this will be very helpful to reduce the traffic noises and to improve the pedestrian safety along Ridge Route Drive.

Name (print and signature)

Address

1. JUAN G. KENG Juan G. Keng 2377 C Via Mariposa W.
2. Joel Breding 2404 Via Mariposa W #1F
3. SHIRLEE SINGER Shirlee Singer 2404-1C " " LW
4. Doris Applegate 2404-1H " " "
5. Henry Roat 2404 2D " " 2D
6. Jean Baklan 2404-3F " "
7. Betty Bordemay 2407-D " "
8. Agnes 2377A VIA MARIPOSA W. 92637
Laguna Woods, CA
9. Mary Emer 2377B Laguna Via Mariposa
Laguna Woods, CA 92637
10. Juan Palau - 2378- 201A Mariposa West - 92637
11. Pat A. Steffen 2378C VIA MARIPOSA W. 92637
12. Jim Goin 2378 Via Mariposa W. 92637
13. John Goin 2379 VIA Mariposa W. 92637
14. Mary E. Gailon 2379 " " " " 92637
15. Gonzalo C. Bell 2359 C Via Mariposa E 92637
16. John C. Bell 2359 C Via Mariposa E. 92637
17. Lynn Bell 2359 D Via Mariposa E. 92637
18. Marta Green 2250 A Mariposa E
19. Kate Silverstein
20. Beverly Portlock 2379-B Via Mariposa West
21. Susan ... 2380 Via Mariposa East Unit C

Name (print and signature)

Address

22. Lilian Keng *Lilian Keng* 2377-C Via Mariposa W.
23. JOANNE HURTADO *Joanne Hurtado* 2405-1A VIA MARIPOSA W,
24. Al Hurtado *Al Hurtado* 2405-1A VIA MARIPOSA W
25. D. Davis *Gary Davis* 2405-1C Via Mariposa
26. Sam Ravesh *Sam Ravesh* 2405-1E
27. MARTIN GILBERT *Martin Gilbert* 2405-1F
28. Phyllis Kaplan *Phyllis Kaplan* 2405-1G
29. Mehri Shapourian *Mehri Shapourian* 2405-1H
30. *Gerardo E. Fanning* 2405-2A Mariposa West
31. IRENE EHEN *Irene Ehen* 2405-2A " " "
32. WILLIAM SHOAF } 2405 VIA MARIPOSA W, 2C
33. VICKI SHOAF }
34. PHYLLIS GRAY *Phyllis Gray* 2405 VIA MARIPOSA W 3E
35. Constance H. and Frank L. Clark 2405 Via Mariposa W 3A
36. *George Sabiric* 2405 VIA MARIPOSA W 3A
37. Jo Fisher *Jo Fisher* 2358-A Via Mariposa
38. Johanna Holmes *Johanna Holmes* 2360-D Via Mariposa A
39. Monnie DeChaine *Monnie DeChaine* 2360 Via Mariposa Unit B
40. Maryann Frame *Maryann Frame* 2341 Via Mariposa E Unit C
41. ROBERT THOMAS *Robert Thomas* 2250A VIA MARIPOSA HA R Roman
42. Teresa Shaffer *Teresa Shaffer* 2251 VIA MARIPOSA
43. Jim (James) Shaffer *Jim (James) Shaffer* 2251 VIA MARIPOSA (OWNER)
44. Evelyn Blustein *Evelyn Blustein* 2263 D Via Mariposa East

Name (print and signature)

Address

- | Name (print and signature) | Address |
|----------------------------|------------------------------|
| 45. Lucretia C Hair | 2380 Via Mariposa East Fldg. |
| 46. Beverly King | 2381 Via Mariposa W 3E |
| 47. Rose Mowton | 2375 Mariposa W B |
| 47. Amy C. King | 2379 D Via Mariposa W |
| 48. Lo-Jaf Chen | 2363 #A VIA MARIPOSA |
| 49. Kuo Jow Lee | 2363 VIA MARIPOSA #C |
| 50. JANNY Lee | 2363 VIA Mariposa #1C |
| 51. yi-gao | 2378 Via Mariposa #D |
| 52. Lian Chen | 2375 Via Mariposa #D |
| 53. Susan Aldrup | 2372 Via Mariposa #A |
| 54. Angelo Desouki | 2373 Via Mariposa W. |
| 55. Jo Deanna | 2273 ... |
| 56. Richard A. Noddy | 2382-D Mariposa West |
| 57. Emogene Studer | 2382-C " " |
| 58. PEIHSUN TUNG | 2371-A Mariposa West |
| 59. Chun Man Tung | " " |
| 60. James Che | 2375 Via Mariposa #D |
| 61. | |
| 62. | |
| 63. | |
| 64. | |
| 65. | |
| 66. | |
| 67. | |



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

275 Centennial Way
Suite 208
Tustin, CA 92780

Phone: (714) 731-9455
FAX: (714) 731-9498

www.hartzog-crabill.com

December 5, 2011

Mr. Dennis Nelson, P.E.
City Engineer
City of Laguna Woods
24264 El Toro Road
Laguna Woods, CA 92637

**Subject: Results of the Multiway Stop Installation Analysis at the
Intersection of Santa Maria Avenue at San Remo Drive**

Dear Mr. Nelson:

Hartzog & Crabill, Inc. (HCI) has completed the Multiway Stop Warrant Analysis at the intersection of Santa Maria Avenue at San Remo Drive. This analysis was completed in response to the City of Laguna Woods' request to verify if a multiway stop sign installation is warranted and recommended based on meeting standard guidelines. The California Manual of Uniform Traffic Control Devices (*California MUTCD*) was used for defining the requirements for a multiway stop application.

Based on the findings of the attached study, the installation of a multiway stop was found not warranted at this time. Therefore, our recommendation to the City of Laguna Woods is for denial on the request for installation of a three-way stop at this intersection.

It has been our pleasure preparing this analysis for the City of Laguna Woods. If you have any questions or need additional information, please feel free to call me at (714) 731-9455.

Very truly yours,
HARTZOG & CRABILL, INC.

A handwritten signature in black ink that reads 'Scott Ma'.

Scott Ma, P.E., T.E.
Senior Engineer

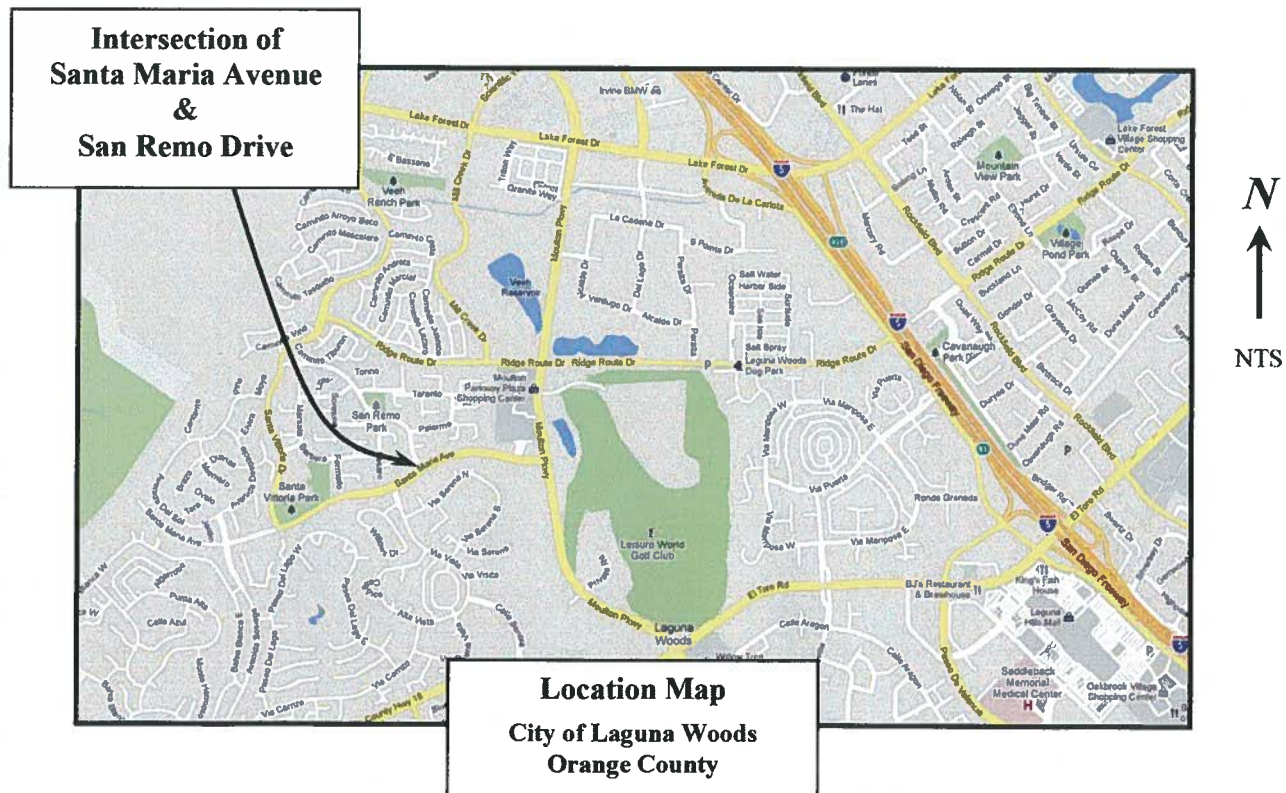
Attach: Analysis Report

MULTIWAY STOP CONTROL WARRANTS ANALYSIS SANTA MARIA AVENUE AT SAN REMO DRIVE IN THE CITY OF LAGUNA WOODS, CA

INTRODUCTION

The City of Laguna Woods requested Hartzog & Crabill, Inc. (HCI) to complete a Multiway Stop Warrants Analysis at the intersection of Santa Maria Avenue at San Remo Drive. This analysis was completed in order to verify if a three-way stop sign installation is warranted and recommended based on meeting standard guidelines.

The location is a T-intersection with Santa Maria Avenue running in the east-west directions and San Remo Drive running in the north-south directions, north of Santa Maria Avenue. The intersection is located west of the Interstate 5 (San Diego) Freeway and north of El Toro Road (*see Location Map below*). The intersection is shared jurisdictionally between the Cities of Laguna Hills and Laguna Woods. At the present time there is a stop sign controlling the southbound San Remo Drive approach to the intersection.



BACKGROUND

Santa Maria Avenue is an east-west collector roadway with primarily residential frontage on both sides of the road. At the intersection with San Remo Drive, the roadway is 72 feet wide. The four-lane roadway provides for two lanes of traffic in each direction separated by a raised landscaped center median, and is fully-improved with concrete curb, gutter, and sidewalk on both sides. There is an 11-foot wide concrete multi-modal path running parallel and adjacent to the south side of the roadway. Santa Maria Avenue has a posted speed limit of 45 miles per hour (MPH). On-street parking is allowed only on the north-side of the roadway, as signs are posted to prohibit parking on the south-side along the entire length of Santa Maria Avenue.

See Exhibit 1 (next page) for photo images of Santa Maria Avenue.

San Remo Drive is an approximate 36-foot wide north-south local roadway with residential frontage on the west side and a park on the east side of the road. The two-lane roadway provides for one lane of traffic in each direction separated by a painted yellow single-skip centerline, and is fully-improved with concrete curb, gutter, and sidewalk on both sides. San Remo Drive has a posted speed limit of 30 MPH. There is a 'STOP' sign, pavement marking, and limit line controlling traffic using San Remo Drive as it approaches Santa Maria Avenue in the southbound direction. On-street parking is allowed along both sides of San Remo Drive.

See Exhibit 2 (following page) for a photo image of San Remo Drive.

EXHIBIT 1



EXHIBIT 2



WARRANT GUIDELINES

As is common practice with many municipal agencies, the City of Laguna Woods follows State guidelines for determining if traffic control devices, such as multiway stop signs, should be installed. Therefore, the prevailing source used for this analysis is the State of California Manual of Uniform Traffic Control Devices (*California MUTCD*). The California MUTCD contains minimum guidelines regarding traffic volumes, collisions, speeds, visibility, and other criteria in order to satisfy the requirements, in this case, for the recommendation and installation of a multi-way stop.

The California MUTCD Multiway Stop Applications Guidance criteria are described in the following four main parts:

- 1) As an interim measure where traffic control signals are justified;
- 2) Reported crashes – five or more in a 12-month period that are susceptible to correction;
- 3) Traffic and pedestrian volumes, speeds, and delay; and,
- 4) Where a combination of the above criteria are satisfied to 80 percent.

If any one, or a combination, of these criteria is met, then a multiway stop application should be considered. If these criteria are not met, the installation of an unwarranted stop sign installation is typically not recommended as it may place the City in a position of potential liability.

The California MUTCD STOP Sign and Multiway Stop Applications guidelines are included in Appendix A.

MULTIWAY STOP ANALYSIS

The California MUTCD Multiway Stop Applications section contains guidelines, such as minimum collisions and traffic volumes necessary for the justification of a multiway stop control. The general guidelines given for a stop sign application begin with using engineering judgment for the installation of a stop sign(s) on a street entering a through highway and where high speeds on the cross street make entry difficult, or due to restricted view, or when crash records indicate a need for control by a stop sign. Further guidance criteria found in the California MUTCD include the following important statements: *“STOP signs should not be used for speed control... STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop... In most cases, the street carrying the lowest volume of traffic should be stopped... A STOP sign should not be installed on the major street unless justified by a traffic engineering study... Multiway stop control is used where the volume of traffic on the intersecting roads is approximately equal.”*

Collision History

The guidelines for Multiway Stop Applications contained in the California MUTCD regarding collisions, or crashes, require a minimum of five (5) reported crashes occurring in a 12-month period that are susceptible to correction by a multiway stop installation in order to satisfy the collision warrant. Such crashes include right- and left-turn collisions, as well as right-angle collisions (i.e., broadside). The available collision history for the subject intersection was gathered from the Cities of Laguna Hills and Laguna Woods to determine whether there were collisions susceptible to correction by the installation of a multiway stop. Table 1 (*next page*) provides the most recent summary of collision history occurring at or near this intersection.

All traffic collision data collected for this intersection is included in Appendix B.

Collision History (continued)

**TABLE 1
COLLISION SUMMARY**

Intersection	2007		2008		2009		2010 - 2011	
	Date	Type of Coll. / Correctible?	Date	Type of Coll. / Correctible?	Date	Type of Coll. / Correctible?	Date	Type of Coll. / Correctible?
Santa Maria Avenue at San Remo Drive	1/30	Broadside / Yes	5/1	Broadside / Yes	11/16	Rear End / No		None Reported
	8/1	Broadside / Yes	11/11	Broadside / Yes				
	10/2	Hit Object / No						

Notes: Information above is derived per 4-year intersection traffic collision history reports provided by the City of Laguna Hills, and the City of Laguna Woods through the Orange County Sheriff's Department.

- 1) Type of Coll. = Type of Collision (*i.e., broadside, rear-end, etc.*)
- 2) Correctible? = Yes / No.

As shown, there have been a total of six (6) reported collisions at or near the intersection during the past (5) years. There were only two crashes occurring in a 12-month period that are considered susceptible to correction by a multiway stop installation. Therefore, the collision warrant is not considered satisfied.

Traffic Volumes

HCI collected 24-hour intersection approach vehicular counts to determine traffic volumes that use this intersection on a typical day (Wednesday, September 28, 2011). The Average Daily Traffic (ADT) count for Santa Maria Avenue is 8,730 vehicles per day with the highest AM peak-hour volume of 686 vehicles and the highest PM peak-hour volume of 713 vehicles. The ADT count for the north leg of San Remo Drive is 1,439 vehicles per day with the highest AM peak-hour volume of 179 vehicles and the highest PM peak-hour volume of 141 vehicles. Table 2 below provides a breakdown of these approach volumes.

All traffic volume data collected for this intersection is included in Appendix C.

Traffic Volumes (continued)

**TABLE 2
HIGHEST 24-HOUR INTERSECTION APPROACH VEHICLE COUNTS**

Street	Direction	ADT Volume	Directional Split	Highest Hourly Volume
Santa Maria Avenue	Eastbound	3,731	42.7%	353 (12:00–1:00PM)
	Westbound	4,999	57.3%	425 (3:00–4:00PM)
San Remo Drive	Southbound	1,439	100%	179 (7:00–8:00AM)

Santa Maria Avenue is considered the ‘through’ or ‘major’ street, due to the lane geometry and also southbound traffic on San Remo Drive is required to stop at the intersection before proceeding left or right. It is typically expected that the traffic volumes on the minor street are considerably less than those on the major street at a T-intersection. As can be seen from the table above, this is the case, as Santa Maria Avenue carries approximately (86%) of the entire traffic entering the intersection.

A part of the California MUTCD guideline criteria also calls for a reduction in the required minimum volumes when the critical approach speed (*or 85th-percentile speed*) on the major street exceeds 40 MPH. If this is the case, the minimum vehicular volumes to be met for a multiway stop installation are reduced to 70%.

As detailed in the most recent Engineering & Traffic Speed Survey (2007), the 85th percentile speed on Santa Maria Avenue is 44.2 MPH. Therefore, the 70% minimum volumes for stop sign analysis were reviewed.

The Engineering & Traffic Survey for Santa Maria Avenue is included in Appendix D.

Traffic Volumes (continued)

It is important to note that the hourly vehicle traffic counts shown in Table 2 above are given for the highest hour of traffic for each direction, and serve as a good indicator to compare with the required traffic volumes in the California MUTCD multiway stop warrant. However, the average hourly minimum volumes standard for a multiway stop application [*300 vehicles per from both approaches on the major street*) are to be satisfied for each of eight (8) hours of an average day. Table 3 below shows the California MUTCD minimum volume guidelines for a Multiway Stop Application in comparison with the highest 8-hour traffic count data. Both Parts 1 and 2 of the minimum volume warrants below must be satisfied in order to fulfill either of these traffic volume warrants.

**TABLE 3
MULTIWAY STOP SIGN WARRANT FOR MINIMUM TRAFFIC VOLUMES
SANTA MARIA AVENUE AT SAN REMO DRIVE**

Part 1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any (8) hours of an average day, Results: Yes, average (608) vehicles per hour Meets 100% of required average major street hourly traffic volumes	<i>and</i>	Part 2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same (8) hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, Results: No, average (114) vehicles per hour Meets 57% of required minor street hourly traffic volumes	<i>but</i>	Part 3. If the 85th-percentile approach speed of the major-street traffic exceeds 65 km/h, or exceeds 40 mph, the minimum vehicular volume warrants are (70) percent of the above values. Results: Yes > 40 MPH No, average (114) vehicles per hour Meets 81% of the (70) percent required minor street hourly traffic volumes
---	------------	---	------------	---

As shown above, the average hourly intersection approach volumes did not satisfy both Part 1 and 2 required volumes (*100% major street / 81% minor street*). Consequently, the traffic volume warrant is not considered satisfied at this time.

Speeds

As mentioned, Santa Maria Avenue has a posted speed limit of 45 MPH, with an 85th percentile speed of 44.2 MPH. These speeds correspond to the speeds that may be expected on a four-lane urban collector roadway. Field observations showed that vehicles were not regularly speeding over the posted speed limit near the intersection, but were typical of a four-lane collector roadway environment. Speed compliance can be attributed to the close proximity to the three-way stop controlled intersection of Santa Maria Avenue and Via Vista (*located approximately 460 feet away*).

Visibility

A driver's visibility, or sight distance, was measured from a typical stopped-vehicle location on San Remo Drive. The measured distances were applied to the stopping sight distance guidelines, based on the latest edition of A Policy on Geometric Design of Highways and Streets (American Association of State Highway and Transportation Officials (AASHTO) 2004). In this Policy, an 85th percentile speed of approximately 45 MPH recommends a minimum Stopping Sight Distance of 360 feet.

This stopping sight distance was field-measured from a typical 'stopped' vehicle location towards the near-side and far-side lanes of on-coming traffic. An orange cone was set on the lane line at this minimum distance from the side-street vehicle position. A photograph was then taken from a stopped vehicle just passed the limit line. Both directions had a clear line of sight to the cone and met the minimum required stopping sight distance.

(See sight distance photos in Exhibit 3 on the following page).

EXHIBIT 3



MULTIWAY STOP ANALYSIS SUMMARY

The analysis of the four (4) main criteria provided in the California MUTCD regarding Multiway Stop Applications showed that this intersection did not meet the minimum guidelines to justify stopping the major roadway (Santa Maria Avenue). The four main criteria analyzed were: 1) As an interim measure where traffic control signals are justified; 2) Reported collisions – a correctible crash problem; 3) Traffic and pedestrian volumes, speeds, and delay; and 4) Where a combination of the above criteria are satisfied to 80 percent.

In summary, the collision history at the intersection resulted in only (2) collisions that were considered correctible within a recent 12-month period during the last (5) years, where the minimum guideline calls for at least five (5) correctible collisions in a 12-month period. The minimum hourly traffic volume guidelines that are to be satisfied for any eight (8) hours in an average day for a multiway stop were also not satisfied. Excessive delay to the minor roadway was not observed as this is a three-way intersection and the southbound traffic was not delayed significantly when waiting for a gap on the major roadway. Therefore, since intersection collision history and traffic volumes do not satisfy the minimum volumes, it can also be derived that a traffic signal is not justified at this intersection. The 80% combined criteria were also not met as both the collision history and the minimum traffic volumes guidelines were not satisfied to this percentage.

However, engineering judgment should always be included in any decision regarding traffic safety improvements. Further intersection information was obtained from the field and the cities in regards to pedestrian and bicycle activity. This information along with field observations confirmed a moderate activity of both. Additionally, intersection lighting was verified and found to be adequate as there were typical roadway lighting on two poles with double fixtures located in the center median on Santa Maria Avenue illuminating the road near the intersection.

CONCLUSION / RECOMMENDATIONS

In overall consideration of the current one-way stop sign condition at the intersection of Santa Maria Avenue and San Remo Drive, as opposed to the evaluation of a three-way stop installation, a multi-way stop sign installation is not recommended. There are no other recommendations to this intersection at this time.

APPENDIX A

MULTIWAY STOP APPLICATIONS GUIDELINES:

CALIFORNIA MUTCD

Signs larger than those shown in Table 2B-1 may be used (see Section 2A.12).

Section 2B.04 STOP Sign (R1-1)

Standard:

When a sign is used to indicate that traffic is always required to stop, a STOP (R1-1) sign (see Figure 2B-1) shall be used.

The STOP sign shall be an octagon with a white legend and border on a red background. Secondary legends shall not be used on STOP sign faces. If appropriate, a supplemental plaque (R1-3 or R1-4) shall be used to display a secondary legend. Such plaques (see Figure 2B-1) shall have a white legend and border on a red background. If the number of approach legs controlled by STOP signs at an intersection is three or more, the numeral on the supplemental plaque, if used, shall correspond to the actual number of legs controlled by STOP signs.

At intersections where all approaches are controlled by STOP signs (see Section 2B.07), a supplemental plaque (R1-3 or R1-4) shall be mounted below each STOP sign.

Option:

The ALL WAY (R1-4) supplemental plaque may be used instead of the 4-WAY (R1-3) supplemental plaque.

Support:

The design and application of Stop Beacons are described in Section 4K.05.

A STOP (R1-1) sign is not a "cure-all" and is not a substitute for other traffic control devices. Often, the need for a STOP (R1-1) sign can be eliminated if the sight distance is increased by removing obstructions.

Through Highways

Option:

STOP (R1-1) signs may be installed either at or near the entrance to a State highway, except at signalized intersections, or at any location so as to control traffic within an intersection. Refer to CVC 21352 and 21355. See Section 1A.11 for information regarding this publication.

Support:

When STOP (R1-1) signs or traffic control signals have been erected at all entrances, a highway constitutes a through highway. Refer to CVC 600.

Authority to place STOP (R1-1) signs facing State highway traffic is delegated to the Department of Transportation's District Directors.

Option:

Local authorities may designate any highway under their jurisdiction as a through highway and install STOP (R1-1) signs in a like manner. Refer to CVC 21354.

Standard:

No local authority shall erect or maintain any STOP (R1-1) sign or other traffic control device requiring a stop, on any State highway, except by permission of the Department of Transportation. Refer to CVC 21353.

Support:

The Department of Transportation will grant such permission only when an investigation indicates that the STOP (R1-1) sign will benefit traffic.

Section 2B.05 STOP Sign Applications

Guidance:

STOP signs should be used if engineering judgment indicates that one or more of the following conditions exist:

- A. Intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;
- B. Street entering a through highway or street;
- C. Unsignalized intersection in a signalized area; and/or
- D. High speeds, restricted view, or crash records indicate a need for control by the STOP sign.

Standard:

Because the potential for conflicting commands could create driver confusion, STOP signs shall not be installed at intersections where traffic control signals are installed and operating except as noted in Section 4D.01.

Portable or part-time STOP signs shall not be used except for emergency and temporary traffic control zone purposes.

Guidance:

STOP signs should not be used for speed control.

STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop. At intersections where a full stop is not necessary at all times, consideration should be given to using less restrictive measures such as YIELD signs (see Section 2B.08).

Once the decision has been made to install two-way stop control, the decision regarding the appropriate street to stop should be based on engineering judgment. In most cases, the street carrying the lowest volume of traffic should be stopped.

A STOP sign should not be installed on the major street unless justified by a traffic engineering study.

Support:

The following are considerations that might influence the decision regarding the appropriate street upon which to install a STOP sign where two streets with relatively equal volumes and/or characteristics intersect:

- A. Stopping the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
- B. Stopping the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds;
- C. Stopping the direction that has the longest distance of uninterrupted flow approaching the intersection; and
- D. Stopping the direction that has the best sight distance to conflicting traffic.

The use of the STOP sign at highway-railroad grade crossings is described in Section 8B.08. The use of the STOP sign at highway-light rail transit grade crossings is described in Section 10C.04.

Section 2B.06 STOP Sign Placement

Standard:

The STOP sign shall be installed on the right side of the approach to which it applies. When the STOP sign is installed at this required location and the sign visibility is restricted, a Stop Ahead sign (see Section 2C.29) shall be installed in advance of the STOP sign.

The STOP sign shall be located as close as practical to the intersection it regulates, while optimizing its visibility to the road user it is intended to regulate.

STOP signs and YIELD signs shall not be mounted on the same post.

If other signs are grouped with a STOP sign, except for ONE WAY (R6-1 & R6-2) signs and Street Name (D3-1 or G7-1(CA)) signs (see Sections 2B.37 & 2D.38), they shall be installed below the STOP sign.

Guidance:

Other than a DO NOT ENTER sign, no sign should be mounted back-to-back with a STOP sign in a manner that obscures the shape of the STOP sign.

Support:

Section 2A.16 contains additional information about separate and combined mounting of other signs with STOP signs.

Guidance:

Stop lines, when used to supplement a STOP sign, should be located at the point where the road user should stop (see Section 3B.16).

If only one STOP sign is installed on an approach, the STOP sign should not be placed on the far side of the intersection.

Where two roads intersect at an acute angle, the STOP sign should be positioned at an angle, or shielded, so that the legend is out of view of traffic to which it does not apply.

Where there is a marked crosswalk at the intersection, the STOP sign should be installed in advance of the crosswalk line nearest to the approaching traffic.

Option:

At wide-throat intersections or where two or more approach lanes of traffic exist on the signed approach, observance of the stop control may be improved by the installation of an additional STOP sign on the left side of the road and/or the use of a stop line. At channelized intersections, the additional STOP sign may be effectively placed on a channelizing island.

Support:

Figure 2A-2 2A-2(CA) shows examples of some typical placements of STOP signs.

Standard:

When a required stop is to apply at the entrance to an intersection from a one-way street with a roadway of 9.1 m (30 ft) or more in width, stop signs shall be erected both on the left and the right sides of the one-way street at or near the entrance to the intersection. Refer to CVC 21355.

Section 2B.07 Multiway Stop Applications

Support:

Multiway stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multiway stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multiway stop control is used where the volume of traffic on the intersecting roads is approximately equal.

The restrictions on the use of STOP signs described in Section 2B.05 also apply to multiway stop applications.

Guidance:

The decision to install multiway stop control should be based on an engineering study.

The following criteria should be considered in the engineering study for a multiway STOP sign installation:

- A. Where traffic control signals are justified, the multiway stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
- B. A crash problem, as indicated by 5 or more reported crashes in a 12-month period that are susceptible to correction by a multiway stop installation. Such crashes include right- and left-turn collisions as well as right-angle collisions.
- C. Minimum volumes:
 1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day, and
 2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but
 3. If the 85th-percentile approach speed of the major-street traffic exceeds 65 km/h or exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.
- D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Option:

Other criteria that may be considered in an engineering study include:

- A. The need to control left-turn conflicts;
- B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
- C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the intersection unless conflicting cross traffic is also required to stop; and
- D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multiway stop control would improve traffic operational characteristics of the intersection.

APPENDIX B

CITIES OF LAGUNA HILLS & LAGUNA WOODS

4-YEAR COLLISION HISTORY

FOR

SANTA MARIA AVENUE AT SAN REMO DRIVE

- Via Vista at Santa Maria Avenue
 - Santa Vittoria Drive at Santa Maria Avenue
 - San Remo Drive at Santa Maria Ave
- January 1, 2007 through September 27, 2011

Report No	No Injured	No Killed	HR	Date	DOW	Street No	Street	At Location	Distance	Direction	PCF CVC	Type Of Collision	Intersection	City
08219492	0	0		11/11/2008 16:25	TUE		SANTA MARIA	SAN REMO		AT	21802a	D- broadside	SAN REMO & SANTA MARIA	LW
07019335	0	0		1/30/2007 19:30	TUE		SANTA MARIA	SAN REMO DR		AT	21802a	D- broadside	SAN REMO DR & SANTA MARIA	LW
07149632	2	0		8/1/2007 16:00	WED		SANTA MARIA	SAN REMO DR		AT	21802a	D- broadside	SAN REMO DR & SANTA MARIA	LH
07195269	0	0		10/2/2007 17:00	TUE		SANTA MARIA	SAN REMO DR	100 E		22107	E- Hit Object	SAN REMO DR & SANTA MARIA	LH
08079311	1	0		5/1/2008 18:10	THU		SANTA MARIA	SAN REMO DR		AT	21802a	D- broadside	SAN REMO DR & SANTA MARIA	LH
09215520	1	0		11/16/2009 10:35	MON		SANTA MARIA	SAN REMO DR		AT	22350	C- rear end	SAN REMO DR & SANTA MARIA	LW
	4	0		Total persons injured/killed										
11017189	0	0		1/28/2011 15:55	FRI		SANTA MARIA	SANTA VITTORIA DR		AT	21802a	D- broadside	SANTA MARIA & SANTA VITTORIA DR	LH
10037168	0	0		2/28/2010 15:00	SUN		SANTA VITTORIA DR	SANTA MARIA	150 N		22350	E- Hit Object	SANTA MARIA & SANTA VITTORIA DR	LH
	0	0		Total persons injured/killed										
09105803	1	0		6/12/2009 11:40	FRI	22450	SANTA MARIA		108 W		Private Prop	E- Hit Object	SANTA MARIA & VIA VISTA	LW
07109084	0	0		6/10/2007 9:25	SUN		SANTA MARIA	VIA VISTA	113 E		21658a	B- side swipe	SANTA MARIA & VIA VISTA	LH
11003082	0	0		1/6/2011 14:40	THU		SANTA MARIA	VIA VISTA	731 W		22107	B- side swipe	SANTA MARIA & VIA VISTA	LH
11120707	2	0		7/8/2011 11:25	FRI		SANTA MARIA	VIA VISTA	35 W		22450a	D- broadside	SANTA MARIA & VIA VISTA	LH
11158409	0	0		8/30/2011 11:15	TUE		VIA VISTA	SANTA MARIA	25.4 S		22107	E- Hit Object	SANTA MARIA & VIA VISTA	LW
	3	0		Total persons injured/killed										

Prepared by: Sandy Murphy
Orange County Sheriff's Department
Traffic Bureau

Intersection Magic VER 6.727
City of Laguna Hills, CA 09/28/2011

Accident listing

06/01/2007 - 07/31/2010

San Remo Wy & Santa Maria Av

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 TYPE
3308198	08/01/2007	SANTA MARIA AV	SAN REMO WY	0	Not state	Straight		WEST	Left turn	SOUTH	Broadside - INJ
3727917	05/01/2008	SANTA MARIA AV	SAN REMO WY	0	Not state	Left turn		SOUTH	Straight	WEST	Broadside - INJ

Intersection Magic VER 6.727
City of Laguna Hills, CA 09/28/2011

Accident listing

06/01/2007 - 07/31/2010

San Remo Dr & Santa Maria Av

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 TYPE
3395038	10/02/2007	SANTA MARIA AV	SAN REMO DR	100	East	Straight		WEST	Not stated	Not state	Hit object - PDO

.....

Intersection Magic VER 6.727
City of Laguna Hills, CA 09/28/2011

Accident listing

06/01/2007 - 07/31/2010

Santa Maria Av & Santa Vittoria Dr

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 TYPE
4610249	02/28/2010	SANTA VITTORIA DR	SANTA MARIA AV	150	North	Right turn		NORTH	Not stated	Not state	Hit object - PDO

.....

No reports for Santa Maria at Via Vista

APPENDIX C

AVERAGE DAILY TRAFFIC (ADT)
INTERSECTION COUNT DATA
FOR
SANTA MARIA AVENUE
AT
SAN REMO DRIVE

Prepared by NDS/ATD

VOLUME

San Remo Dr @ Santa Maria Ave

Day: Wednesday

Date: 9/28/2011

City: Laguna Woods

Project #: CA11_1145_003

DAILY TOTALS					NB	SB						EB	WB	Total
					0	1,439						3,731	4,999	
AM Period	NB	SB	EB	WB	TOTAL		PM Period	NB	SB	EB	WB	TOTAL		
00:00		1	2	7	10		12:00		10	85	76	171		
00:15		1	2	5	8		12:15		13	96	93	202		
00:30		0	0	3	3		12:30		10	86	87	183		
00:45		3	5	1	8	23	12:45		18	51	86	194	750	
01:00		3	0	1	4		13:00		19	86	93	198		
01:15		3	0	4	7		13:15		16	83	95	194		
01:30		1	0	1	2		13:30		17	73	90	180		
01:45		0	7	0	2	8	13:45		18	70	67	211	783	
02:00		1	0	1	2		14:00		58	79	95	232		
02:15		0	2	1	3		14:15		33	81	106	220		
02:30		1	1	1	3		14:30		16	72	99	187		
02:45		1	3	0	3	3	14:45		34	141	71	198	837	
03:00		0	0	2	2		15:00		22	84	108	214		
03:15		1	0	1	2		15:15		32	56	98	186		
03:30		1	1	1	3		15:30		31	66	102	199		
03:45		1	3	0	5	9	15:45		18	103	46	181	780	
04:00		0	2	0	2		16:00		27	70	96	193		
04:15		1	0	1	2		16:15		21	63	109	193		
04:30		3	2	0	5		16:30		27	72	113	212		
04:45		3	7	1	6	3	16:45		17	92	66	179	777	
05:00		3	4	1	8		17:00		18	55	86	159		
05:15		4	5	1	10		17:15		30	58	104	192		
05:30		8	3	3	14		17:30		22	46	96	164		
05:45		3	18	7	15	10	17:45		26	96	53	169	684	
06:00		9	4	5	18		18:00		25	38	99	162		
06:15		12	10	11	33		18:15		10	44	101	155		
06:30		25	22	14	61		18:30		23	41	110	174		
06:45		15	61	25	70	60	18:45		17	75	49	130	621	
07:00		27	45	31	103		19:00		18	53	61	132		
07:15		36	51	42	129		19:15		11	33	57	101		
07:30		55	50	76	181		19:30		16	27	61	104		
07:45		61	179	63	226	639	19:45		17	62	16	95	432	
08:00		46	74	54	174		20:00		13	17	52	82		
08:15		36	73	45	154		20:15		10	26	50	86		
08:30		25	63	52	140		20:30		11	9	58	78		
08:45		26	133	84	169	637	20:45		10	44	20	90	336	
09:00		19	62	71	152		21:00		5	27	45	77		
09:15		21	65	57	143		21:15		5	24	55	84		
09:30		25	65	78	168		21:30		6	9	34	49		
09:45		20	85	91	189	652	21:45		11	27	15	57	267	
10:00		32	100	88	220		22:00		4	11	23	38		
10:15		15	65	62	142		22:15		4	8	28	40		
10:30		7	87	67	161		22:30		10	4	20	34		
10:45		20	74	72	177	700	22:45		2	20	4	19	131	
11:00		17	75	99	191		23:00		2	5	13	20		
11:15		26	80	83	189		23:15		2	5	12	19		
11:30		19	92	86	197		23:30		1	1	16	18		
11:45		16	78	90	187	764	23:45		5	4	15	8	65	
TOTALS		653	1541	1512	3706		TOTALS		786	2190	3487	6463		
SPLIT %		17.6%	41.6%	40.8%	36.4%		SPLIT %		12.2%	33.9%	54.0%	63.6%		

DAILY TOTALS					NB	SB	EB	WB	Total
					0	1,439	3,731	4,999	10,169
AM Peak Hour	07:15	11:30	10:45	11:00	PM Peak Hour	14:00	12:15	15:45	13:45
AM Pk Volume	198	363	353	764	PM Pk Volume	141	354	435	850
Pk Hr Factor	0.811	0.945	0.891	0.970	Pk Hr Factor	0.608	0.922	0.929	0.916
7 - 9 Volume	312	503	461	1276	4 - 6 Volume	188	483	790	1461
7 - 9 Peak Hour	07:15	08:00	07:30	07:30	4 - 6 Peak Hour	17:00	16:00	16:00	16:00
7 - 9 Pk Volume	198	294	277	735	4 - 6 Pk Volume	96	271	414	777
Pk Hr Factor	0.811	0.875	0.679	0.813	Pk Hr Factor	0.800	0.941	0.916	0.916

APPENDIX D

ENGINEERING & TRAFFIC SPEED SURVEY SUMMARY

FOR

SANTA MARIA AVENUE

SUMMARY OF RECOMMENDATIONS

STREET LOCATION	EXISTING SPEED LIMIT	RECOMMENDED SPEED LIMIT	85 TH PERCENTILE SPEED	AVERAGE SPEED	10 MPH PACE RANGE	PERCENT OF VEHICLES IN PACE	JUSTIFICATION / COMMENTS
<u>EL TORO ROAD</u>							
ALISO CREEK RD TO CALLE CORTA	50	50	49.5	44.0	39-48	73.1	NO CHANGE – 85 TH PERCENTILE
CALLE CORTA TO CALLE SONORA	50	50	49.9	45.8	41-50	76.2	NO CHANGE – 85 TH PERCENTILE
CALLE SONORA TO MOULTON PKWY	45	45	45.1	40.3	37-46	64.3	NO CHANGE – 85 TH PERCENTILE
MOULTON PKWY TO AVD. SEVILLA	40	40	41.0	36.2	32-41	74.9	NO CHANGE – 85 TH PERCENTILE
AVD. SEVILLA TO PASEO DE VALENCIA	35	35	39.7	34.8	32-41	75.4	NO CHANGE – 85 TH PERCENTILE
<u>MOULTON PARKWAY</u>							
SANTA MARIA AVE TO EL TORO RD	45	45	45.2	40.3	36-45	70.3	NO CHANGE – 85 TH PERCENTILE
EL TORO RD TO CALLE CORTEZ	45	45	47.0	41.9	38-47	68.1	NO CHANGE – 85 TH PERCENTILE
CALLE CORTEZ TO SOUTH CITY LIMITS	45	45	45.2	40.8	37-46	70.9	NO CHANGE – 85 TH PERCENTILE
<u>RIDGE ROUTE DRIVE</u>							
MOULTON PKWY TO 4,065 FEET EAST	45	45	46.2	40.1	36-45	68.5	NO CHANGE – 85 TH PERCENTILE
<u>SANTA MARIA AVENUE</u>							
AVD. SOSIEGA TO MOULTON PKWY	45	45	44.2	39.7	36-45	71.9	NO CHANGE – 85 TH PERCENTILE

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).

Other Regulatory Signs

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 their 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 unusual 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 Strip¹

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

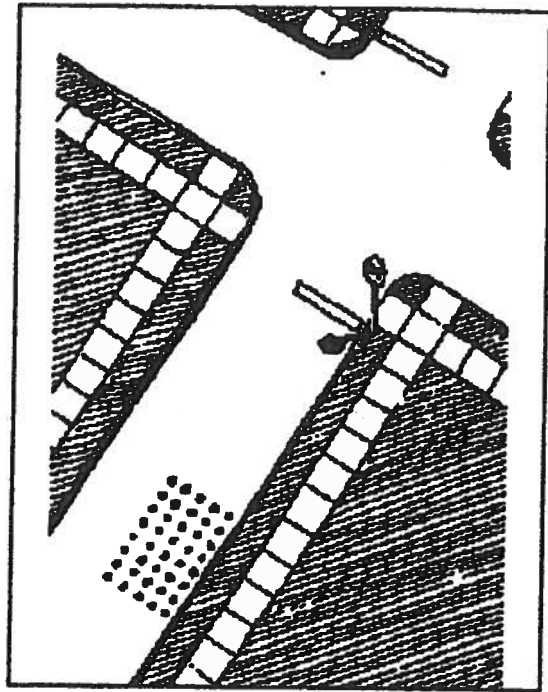


Figure 1

¹The 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

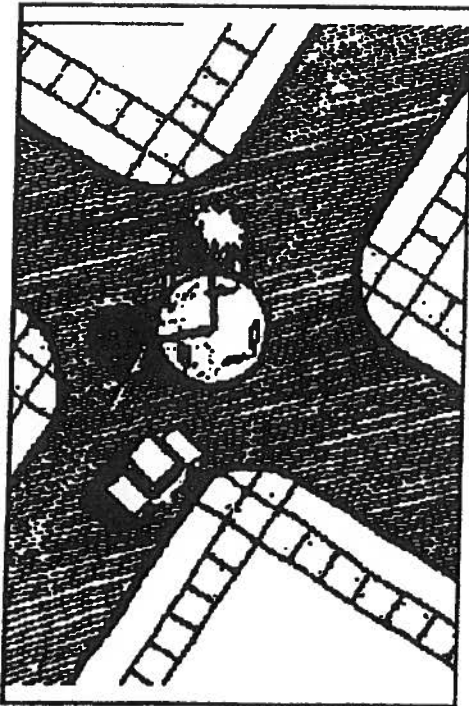


Figure 2

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

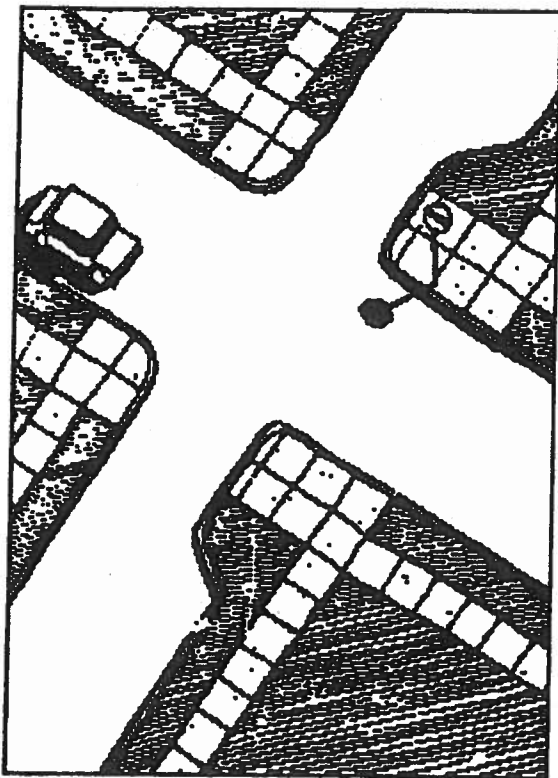


Figure 3

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

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

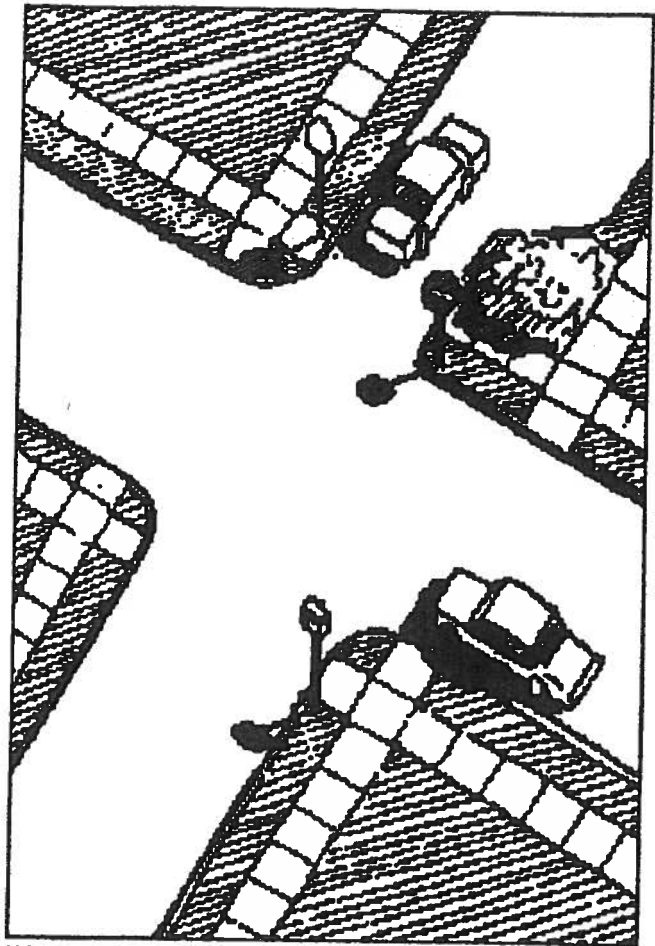


Figure 4

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

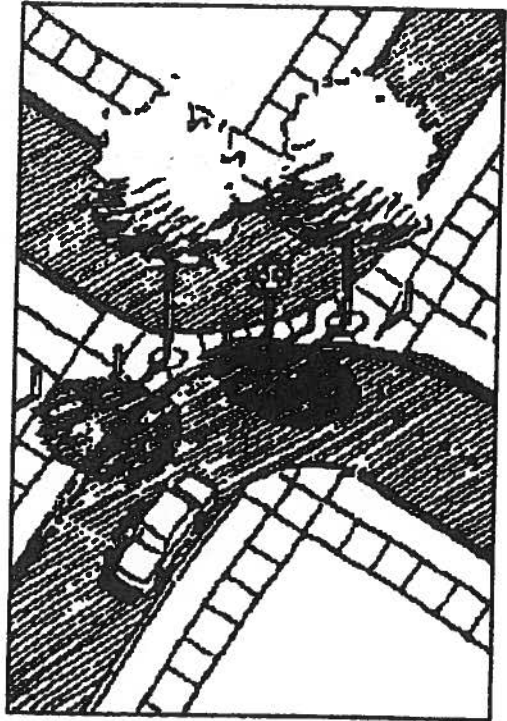


Figure 5

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.

Forced Turn Channelization

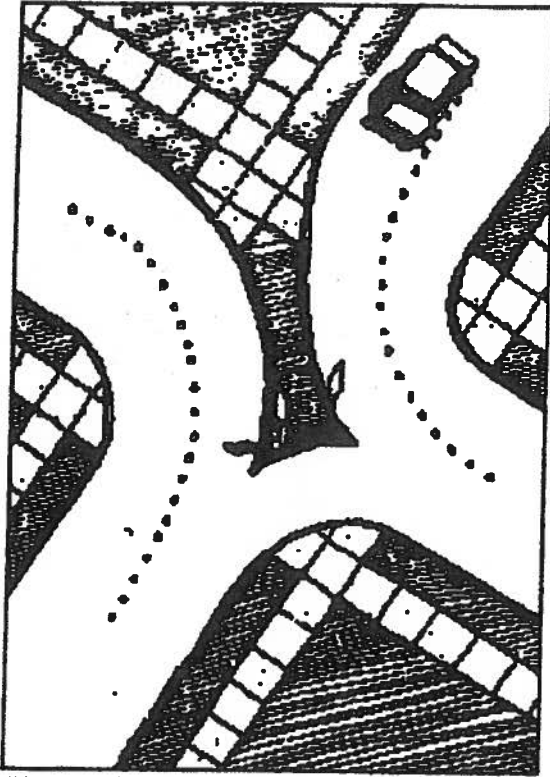


Figure 6

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

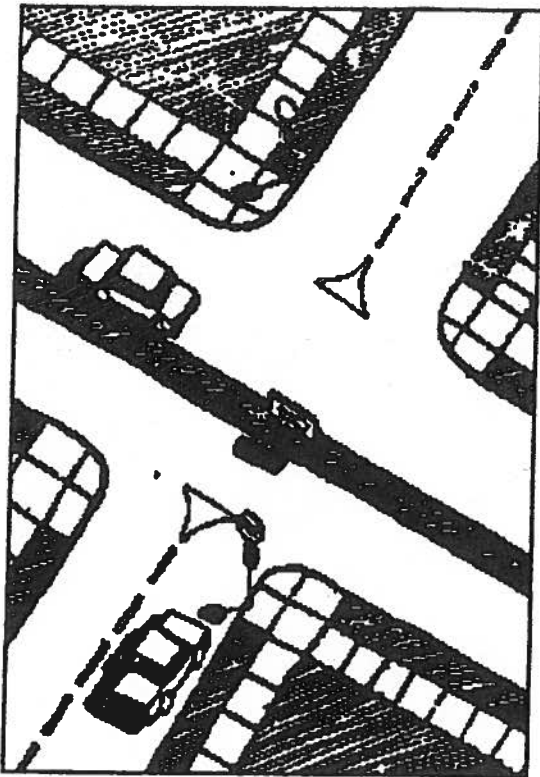


Figure 7

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.

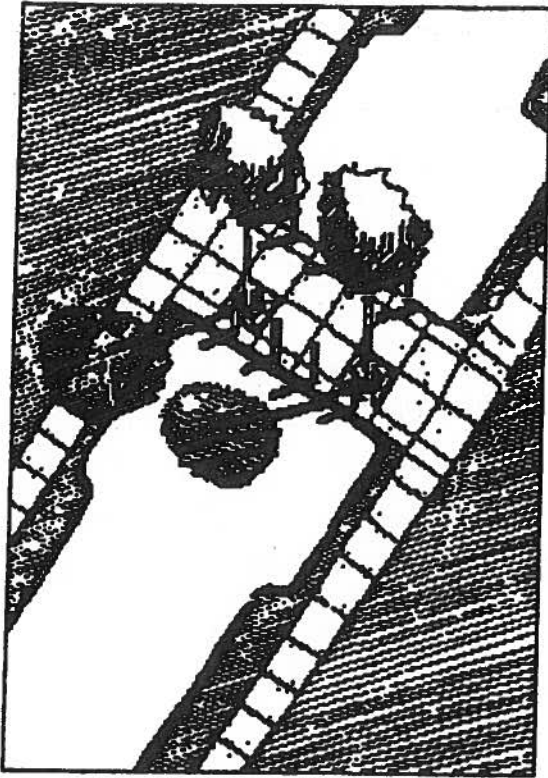


Figure 8

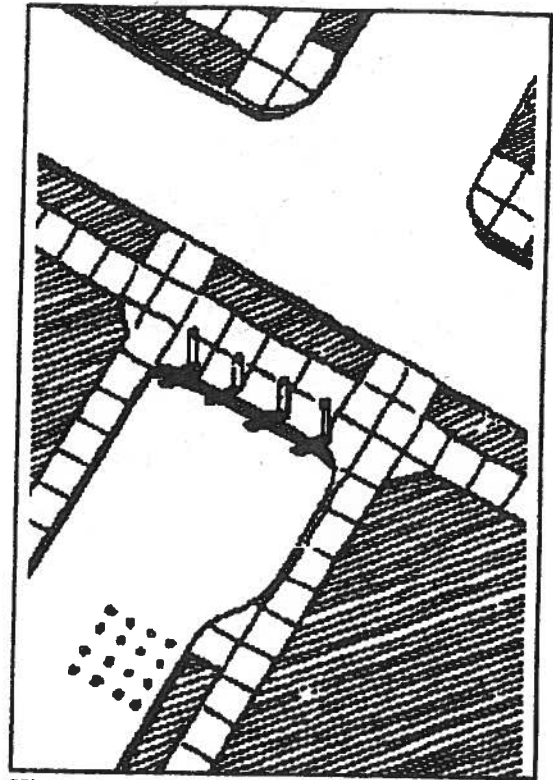


Figure 9

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.

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

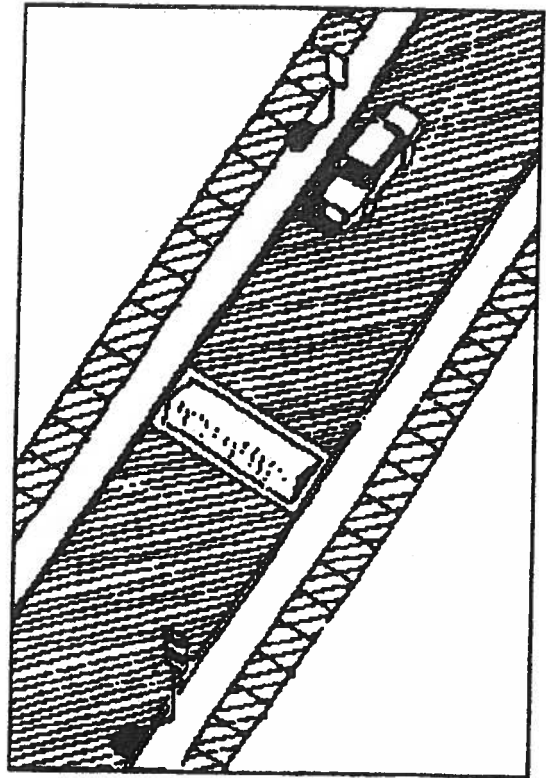


Figure 10

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

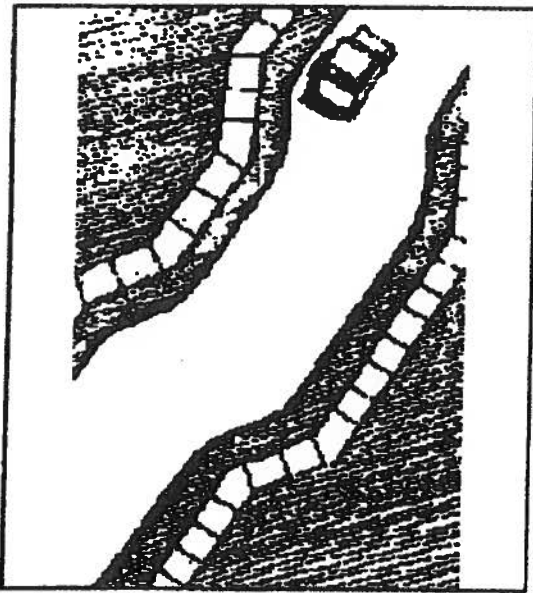


Figure 11

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.

REFERENCES

1. Smith, Jr., Daniel T., et al. *State of the Art Residential Traffic Management*. FHWA, December, 1980.
2. Homburger, Wolfgang S., et al. *Residential Street Design and Traffic Control*. Institute of Transportation Engineers, 1989.
3. Appleyard, Donald. *Livable Streets, Protected Neighborhoods*. University of California Press, 1981.
4. *Guidelines for the Design and Application of Speed Humps*. Institute of Transportation Engineers. March, 1993.
5. Noyes, Patricia B. "Responding to Citizen Requests for Multiway Stops." *ITE Journal*, January 1994.
6. Cline, Edward. "*Design of Speed Humps ... or the Kinder, Gentler Speed Hump*," a paper presented at the 45th California Transportation Symposium. May 1993.

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.

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 pub-

lic 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

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

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

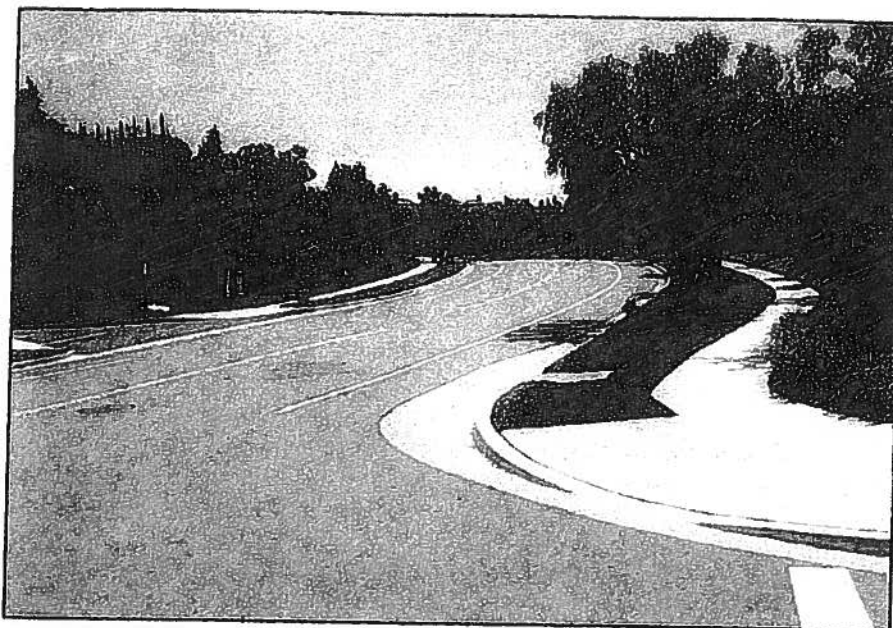


Figure 1. Typical traffic calming striping.

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.

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

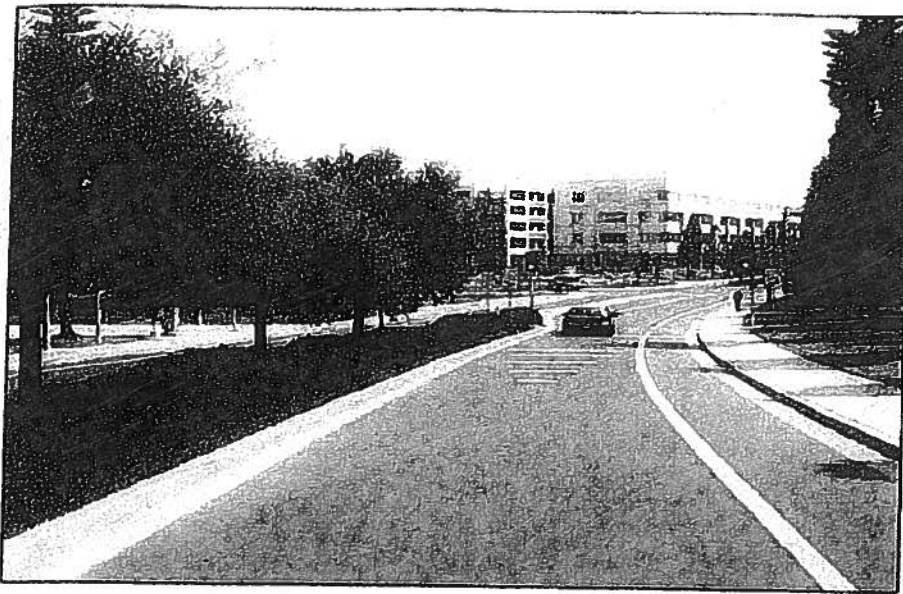


Figure 2. UCI example of psycho-perspective striping.

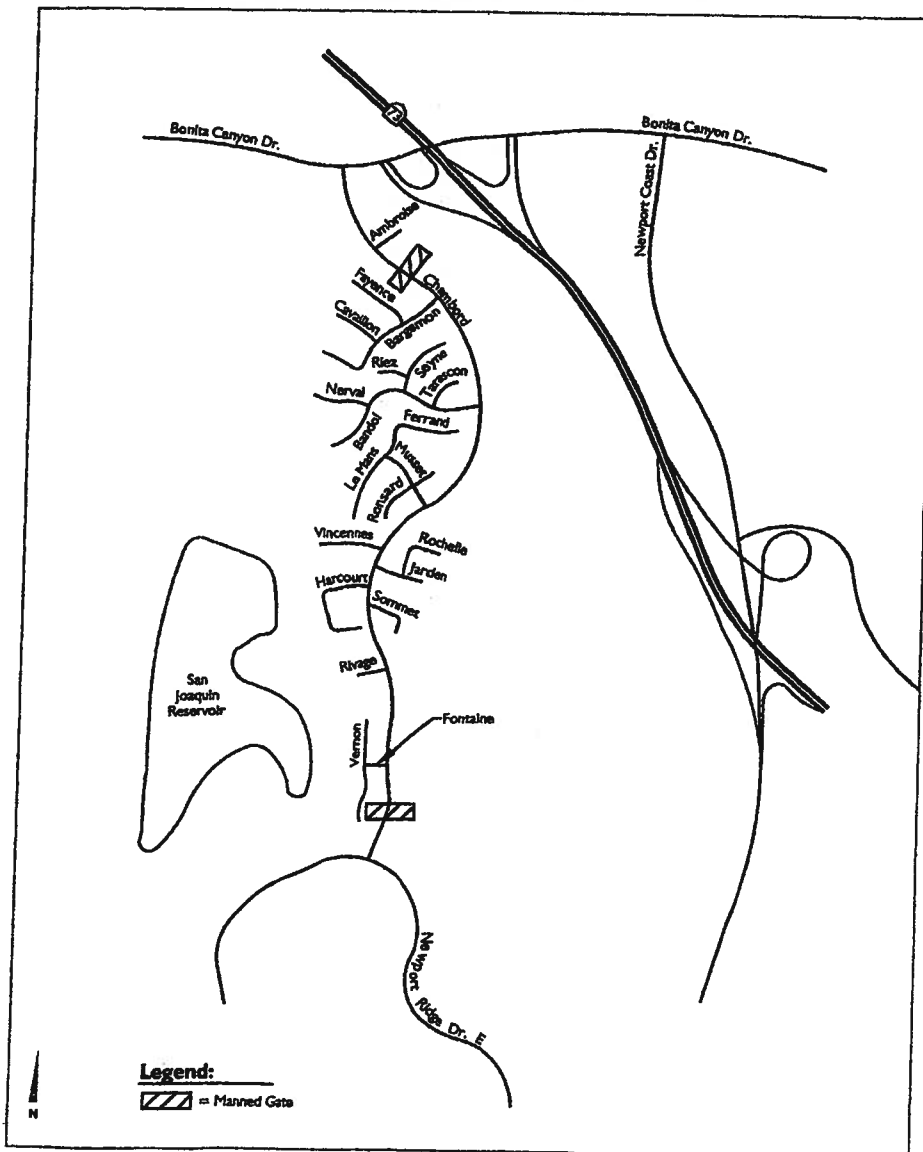


Figure 3. Newport Ridge North, Newport Beach.

(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

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-

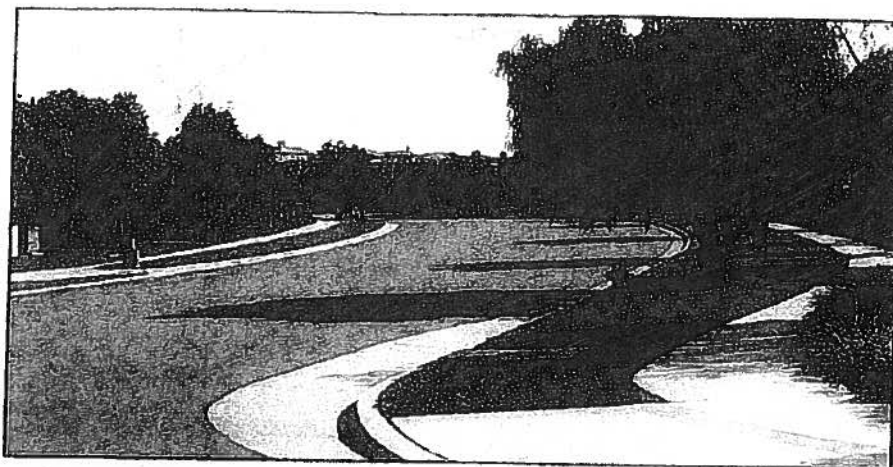


Figure 4. Chambord Road before restriping.

Table 1. Before-and-after speed surveys.

Location	Roadway	85th% Speed	
		Before Traffic Calming Striping (mph)	After Traffic Calming Striping (mph)
Case Study #1 Newport Ridge North (Newport Beach)	• Chambord N/O Rivay	46	37
	• Chambord S/O Musser	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

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

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.

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.

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-foot 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

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

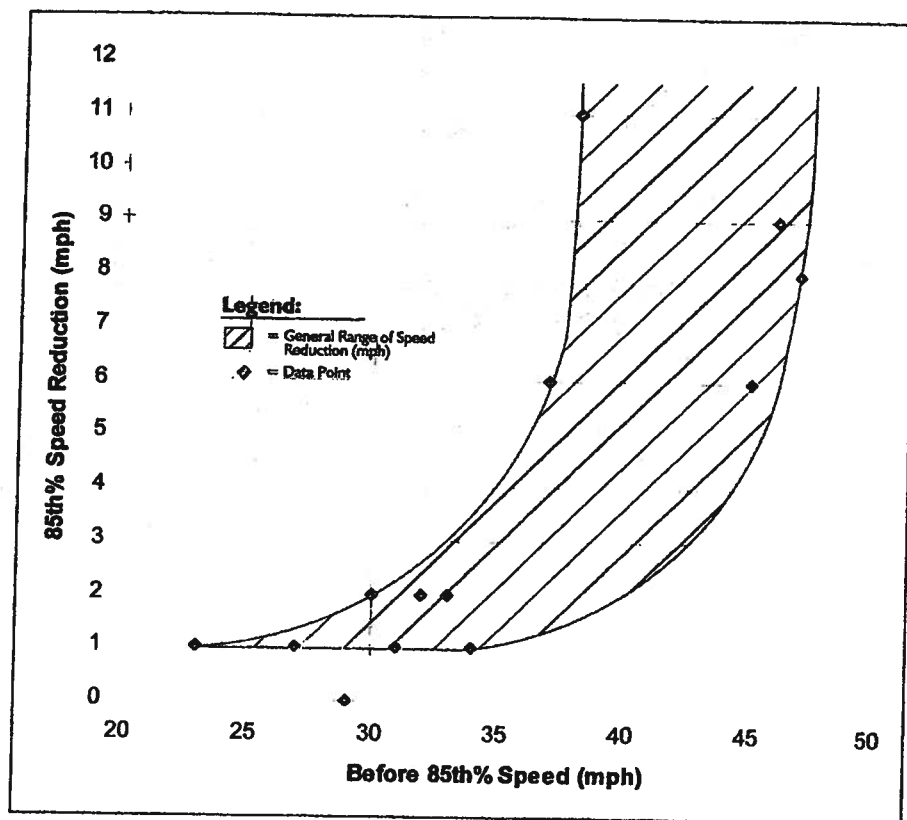


Figure 5. Speed reduction with traffic calming striping.

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 effect 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

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).

CITY OF LAGUNA HILLS

February 2012

RADAR TRAILER SCHEDULE

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 Bridlewood S/O Laurel Crest 25 MPH	2 Stageline W/O Hidden Trail 25 MPH	3	4
5	6	7 Mustang Mid-block 25 MPH	8 Santa Vittoria S/O San Remo 30 MPH	9 Laguna Hills W/O Indian Hill 45 MPH	10	11
12	13	14 Champlain Mid-Block N/O Grissom 25 MPH	15 Hidden Trail S/O Coach Springs 25 MPH	16 Lost Colt W/B W/O Stageline 25 MPH	17	18
19	20 Holiday	21 Glen Canyon N/O Bridlewood 25 MPH	22 Rapid Falls W/O Sundowner 25 MPH	23 Woodbluff E/O Green Hills 25 MPH	24	25
26	27	28 Nellie Gail N/O Hidden Trail 25 MPH	29 Lost Colt W/O Stageline 25 MPH			

CITY OF LAGUNA HILLS

March 2012

RADAR TRAILER SCHEDULE

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 San Remo S/O Taranto 30 MPH	2	3
4	5 Stageline W/O Hidden trail 25 MPH	6 Santa Vittoria N/O Ridge Route 30 MPH	7 Mustang Mid-block 25 MPH	8	9	10
11	12 Devonshire Mid-block 25 MPH	13 Champlain Mid-Block N/O Grissom 25MPH	14 Ericson Mid-block 25 MPH	15	16	17
18	19 Hidden Trail E/O Pinestrap 25 MPH	20 Woodbluff S/O Middleridge 25 MPH	21 Buckboard W/O Nellie Gail 25 MPH	22	23	24
25	26 Rapid Falls W/O Sundowner 25 MPH	27 San Remo N/O Pesaro 30 MPH	28 Glen Canyon W/B Mid-Block 25 MPH	29	30	31