



City of Santa Barbara
Public Works Department

Interoffice Memorandum

DATE: July 23, 2009
TO: Transportation and Circulation Committee
FROM: Browning Allen, Transportation Manager
SUBJECT: ST. FRANCIS TRAFFIC CALMING

RECOMMENDATION:

That the Transportation and Circulation Committee (TCC) hear a report on the one year post-construction evaluation of the traffic calming installations constructed as a part of the St. Francis Area Neighborhood Traffic Management Program and The Safe Routes To School Pedestrian Improvements Projects.

BACKGROUND:

The St Francis NTMP was undertaken in an area bound by Mission Street, Garden Street, Anapamu Street and Alameda Padre Serra. Area residents participated in the program through a series of public meetings and a design charrette. They were kept informed of the program through a dozen public newsletters, totaling 23,000 pieces. The installations that are the subject of this report were the product of an extensive project including residents in efforts to improve quality of life in the neighborhood by addressing traffic concerns utilizing education, encouragement, enforcement, and engineering strategies. Traffic calming devices were approved as part of the mobility plan.

Preliminary plans for the traffic calming elements of the Mobility Plan adopted by Council in December 2003, were undertaken during the Spring of 2004 and the initial temporary device was installed in September 2004. Several other traffic calming devices have been installed throughout the area, some in a temporary configuration and some in a semi-permanent configuration. Following an evaluation period for the temporary installations, design commenced on the project in April 2006, with a construction contract awarded in September 2007.

Construction was completed on the locations listed below in June 2008:

Project - Location	Access Ramps	Traffic Circles	Median Island	Bulbouts
NTMP:				
Islay\Garden	8		1	
Arrellaga\Garden	8			4
Sola\Olive	8	1		
SR2S:				
Alta Vista\Sola	1	1		
Alta Vista\Victoria	6	1		

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Alta Vista\Anapamu	5			2
Quarantina\Canon Perdido	8			4
Quarantina\De la Guerra	8			4
Totals	52	3	1	14

CONCLUSION:

A detailed report, attached, of the one year post-construction evaluation of the traffic calming installations constructed as a part of the St. Francis Area Neighborhood Traffic Management Program and the Safe Routes to School Pedestrian Improvements Projects shows the effect of the installations on 85th percentile speed, excessive speed, volume, and collisions in the project area.

To summarize the report, tangible speed reductions appear to have been achieved as a consequence of traffic calming measures. A comparison of traffic calmed with non-traffic calmed streets in this group shows a statistically significant drop in 85th percentile speeds on traffic calmed streets only. The traffic calmed streets experienced an 8% reduction in 85th percentile speeds and the non traffic calmed streets received a 3 % reduction. Tangible reductions in excessive speed were also demonstrated in both the traffic calmed streets and the control group where no traffic calming was built. However, the difference is more profound on the traffic calmed streets, where a 16% reduction in excessive speeds was demonstrated. The average reduction on streets without traffic calming was 7%. With respect to traffic volumes, it is unclear at this time if diversion has been experienced as a result of the project due to uncertainty about data quality as well as changes in land use, including the closure of the St. Francis Hospital during the planning and development of the St. Francis Area Mobility Plan. Additional information on collisions, maintenance and emergency response is provided.

DvH/

Attachments

St. Francis Area Mobility Plan Traffic Calming One Year Post Construction Evaluation July 2009

Executive Summary

The Neighborhood Traffic Management Program (NTMP) was adopted by Council in 2001 as a strategy to respond to community complaints about how traffic influences quality of life and safety where people live and work. The first pilot project, the St Francis NTMP, was undertaken in an area bounded by Mission Street, Garden Street, Anapamu Street and Alameda Padre Serra. The installations that are the subject of this report were the product of an extensive pilot project including residents in efforts to improve quality of life in the neighborhood by addressing traffic concerns utilizing education, encouragement, enforcement, and engineering strategies.

Preliminary plans for the traffic calming elements of the Mobility Plan adopted by Council in December 2003, were undertaken during the Spring of 2004 and the first temporary device was installed in September 2004. Several other interim traffic calming devices were installed throughout the area, some in a temporary configuration and some in a semi-permanent configuration. Following an evaluation period for the temporary installations, design commenced on the project in April 2006, with a construction contract awarded in September 2007. By June 2008, construction was completed at all locations within the project area.

Tangible speed reductions appear to have been achieved as a consequence of traffic calming measures. A comparison of traffic calmed with non-traffic calmed streets in this group shows a statistically significant drop in 85th percentile speeds on traffic calmed streets only. The traffic calmed streets experienced an 8% reduction in 85th percentile speeds and the non traffic calmed streets received a 3 % reduction. Tangible reductions in excessive speed were also demonstrated in both the traffic calmed streets and the control group where no traffic calming was built. However, the difference is more profound on the traffic calmed streets, where a 16% reduction in excessive speeds was demonstrated. The average reduction on streets without traffic calming was 7%. With respect to traffic volumes, it is unclear at this time if diversion has been experienced as a result of the project because of uncertainty about data quality as well as changes in land use, including the closure of the St. Francis Hospital during the planning and development of the St. Francis Area Mobility Plan. Additional information on collisions, maintenance and emergency response is provided.

Project History

The Neighborhood Traffic Management Program (NTMP) was adopted by Council in 2001 as a strategy to respond to community complaints about how traffic influences quality of life and safety where people live and work.

The staff documentation for the NTMP details the process recommended for developing Neighborhood Area Mobility Plans. The community based process includes public education, community participation, enforcement, and possible design and construction of traffic calming projects. The St. Francis Area Neighborhood was selected as the first pilot project to utilize the program at the time of its adoption. Several locations identified

in the St. Francis Area Mobility Plan development were later incorporated into a Safe Routes to School Project grant application. The project backgrounds for both projects are described separately as a means of providing a project history.

Project Background

St. Francis Area Mobility Plan

For the purpose of this project, the neighborhood was defined by the approximate boundaries of Mission, Garden and Anapamu Streets, and Alameda Padre Serra. Beginning in April 2002, residents were invited to a series of ten public meetings over the course of twelve months. These meetings were advertised through lawn signs, personal outreach to residents who had made requests or shown interest in the past and direct mailings to residents in the area. Over the 19 months of the pilot project, over 2,000 neighborhood residents were mailed 12 newsletters about the project.

Staff from the Public Works, Community Development, Fire, and Police Departments played an active role in all phases of the pilot project development by attending meetings and being responsive to resident questions.

Before considering any traffic calming in the neighborhood, a "Before Traffic Calming" phase was introduced. Through this phase, staff gathered 620 calls for service through a neighborhood survey and dedicated telephone line, and gained a solid understanding of the residents' concerns. Typical complaints received and processed included zoning enforcement, parks and street maintenance complaints, and requests for signage or additional speed and parking enforcement.

One hundred and thirty residents attended at least one meeting out of the seven "Before Traffic Calming" meetings. Staff and consultants introduced the possibilities and limitations of neighborhood planning. Minor improvements including vegetation abatement, inspection of street maintenance requests, sign installation, and street improvements and repairs were initiated. Neighbors took an active role in data gathering, community outreach, and use of the Community Involved Traffic Enforcement (CITE) radar gun. With the assistance of Rauch Communications Consultants, staff developed outreach tools appropriate for use in future neighborhoods. These include bumper stickers, lawn signs, and newsletter templates that are still in use today. By November 2002, many participants began to express their frustration with the process and requested the project move into the "Traffic Calming" phase.

During the weekend of March 14 to 16, 2003, with the assistance of staff from the Police, Community Development, and Fire Departments, the Public Works Department hosted a traffic calming charrette, facilitated by Dan Burden, Executive Director of Walkable Communities, an internationally renowned expert in pedestrian oriented planning and traffic calming design.

This three-day workshop offered education on traffic calming, and resulted in a resident-developed traffic calming plan to address the remaining traffic issues in the pilot project area. Based on the work done during the previous year, residents attending the meetings represented the concerns and issues of the area. The neighborhood used traditional analytical methods, such as speed surveys and complaints from residents, to recommend locations for traffic calming treatments, keeping in mind the importance of

creating an area-wide solution to speeding, that would not cause one street's solution to become another street's problem.

Using information about existing conditions, emergency response, and available traffic calming measures, the charrette participants worked in design groups to suggest potential solutions to problem areas. Based on the suggestions from the charrette, the traffic calming team developed a system-wide set of solutions to the noise and speeding concerns. After a walking audit, the consultant prepared a conceptual traffic calming scheme for the neighborhood and sample treatment designs to illustrate some of the proposed features.

This conceptual traffic calming scheme was informally ratified by twenty five representatives of the project area on March 16, 2003. Together with continuing "Before Traffic Calming" strategies, the proposal represented a desire to improve pedestrian access, minimize parking loss, slow speeds on residential streets, reduce collision rates, and protect private property. At this meeting, residents also prioritized the proposed improvements based on an understanding that it may not be possible to construct all of the improvements at one time with the available funds.

This plan was subsequently formulated into a survey, outlining the area's Mobility Plan, for consideration and approval by all property owners. An extensive effort was undertaken by several residents to distribute the survey and to share their knowledge. With the assistance of their efforts, the plan was approved with 85% support from the survey respondents (425 of 1161 property owners in the area responded) in September 2003. In November 2003, the Transportation and Circulation Committee heard public comment and made recommendations that Council adopt the Mobility Plan including continued enforcement, and education, as well as the resident developed traffic-calming plan. Staff recommended a phased implementation of the traffic calming plan, beginning at locations prioritized by the participants in the process, where the level of support was highest. It was proposed that temporary measures be put in place initially. If the temporary measures increased walkability by reducing speeds and did not divert traffic onto adjacent streets, the City would consider making them permanent and discuss opportunities to fully implement the plan. The plan was adopted by Council in December 2003.

In February of 2006, following a period of demonstrating the effects of temporary and semi-permanent traffic calming installations on several streets, the Transportation and Circulation Committee (TCC) recommended to City Council that the following items be designed and constructed in a final configuration as part of the St Francis Neighborhood Traffic Management Program:

1. Olive Street/Sola Street – mini traffic circle
2. Alta Vista Street/Anapamu Street – curb extensions
3. Alta Vista Street/Victoria Street – mini traffic circle
4. Alta Vista Street/Sola Street – mini traffic circle
5. Garden Street/Islay Street – median island and curb extensions
6. Garden Street/Arrellaga Street – curb extensions

The selection of these intersections was based not only on the residents' prioritization of corridors at the traffic calming charrette, but also based upon the high levels of neighborhood support demonstrated in canvassing efforts around these locations. Trials

at the above intersections gave residents the opportunity to observe whether or not their concerns were being addressed. The trial installation period is no longer recommended as a component of the Traffic Management Program due to the poor aesthetics and subsequent loss of neighborhood support for the installations.

Importantly the project goals identified by participants included improved pedestrian access, minimized parking loss, slow speeds on residential streets, reduce collision rates, and protect private property.

Safe Routes to School Project

In the Spring 2002, the School District's Pedestrian Safety Advisory Committee submitted reports on Santa Barbara Junior High School (SBJH) and Santa Barbara Senior High School (SBHS). The list of requests for the junior high school included: reopening Quarantina Street; police enforcement on Cota; a new MTD Mesa Route; participation in School Pools; a crossing guard; and enhanced crosswalks on Cota Street.

The list of requests for the high school included consideration of a stop sign on Canon Perdido at Quarantina Street (which was not warranted), extension of the red curb on Canon Perdido adjacent to the crosswalks; an examination of the entire area between SBHS and SBJH, with a request that no speed limit here be higher than 25 mph; Ladder-striping of all crosswalks; and consideration of safety measures on Olive Street.

In a final report the Committee highlighted the above recommendations and wrote "In the long term, the entire area between SBHS and SBJHS needs to be examined, especially the Quarantina corridor".

In May 2003 Council authorized staff to submit an application to the Federal Safe Routes to School Construction Program to design and construct up to five mini traffic circles, two sets of curb extensions, and overhead flashing beacons to improve pedestrian access and slow vehicle traffic on the routes to Roosevelt Elementary School, SBJH, and SBHS. The proposed project was identified through the NTMP in the St. Francis neighborhood and through review of the requests described above, with the intent of creating a corridor from the schools to the St. Francis neighborhood, through the Alta Vista/Quarantina Street corridor.

Due to the community involvement with the development of the St. Francis Area Mobility Plan, the City was successful in its application for a California SR2S grant. The City was awarded \$450,000 of SR2S funds for design and construction of the project, with a \$50,000 local match required. The proposed scope of work includes construction of the curb extensions and traffic circles on Alta Vista Road that are in the St. Francis Area Mobility Plan. In total, the SR2S project constructed the following safety items in these high pedestrian volume locations on the approaches to Santa Barbara Junior and Senior High Schools:

- ◆ De La Guerra Street /Quarantina Street - curb extensions
- ◆ Canon Perdido Street/Quarantina Street - curb extensions
- ◆ Anapamu Street/Alta Vista Road/High School entrance - curb extensions
- ◆ Alta Vista Road/Victoria Street - traffic circles
- ◆ Alta Vista Road/Sola Street - traffic circles

The project limits for the SR2S project are the intersections listed above in the vicinity of the SBJH and SBHS as well as the intersections of Cota Street at Nopal and Quarantina Streets where above ground flashing crosswalks were installed in 2009.

Project Description

The project currently under evaluation is the construction of those elements that were considered highest priority in the St. Francis Area Traffic Management Project, plus the Quarantina Corridor connecting the Junior and Senior High School. The project was completed in June, 2008. These projects together consist primarily of 14 curb curb extensions, 52 access ramps, 3 traffic circles, and 1 median island, as well as landscaping at 8 intersections. The projects were funded by local Measure D and the Utility Users Tax funds as well as federal state-exchange Safe Routes to School grant funds.

The breakdown of these improvements by project and location is shown in the table below.

Project - Location	Access Ramps	Traffic Circles	Median Island	Curb Extensions
NTMP:				
Islay\Garden	8		1	
Arrellaga\Garden	8			4
Sola\Olive	8	1		
SR2S:				
Alta Vista\Sola	1	1		
Alta Vista\Victoria	6	1		
Alta Vista\Anapamu	5			2
Quarantina\Canon Perdido	8			4
Quarantina\De la Guerra	8			4
Totals	52	3	1	14

These projects were prepared based on the input of St. Francis Pilot project participants, public input received on the temporary and semi-permanent installation of traffic calming devices through the St. Francis Area Neighborhood Traffic Management Program and the Safe Routes to School Pedestrian Improvement Project, advice from the Council Ad Hoc Committee on transportation issues, recommendations from the Transportation and Circulation Committee, Architectural Board of Review approval, and approval by Council.

Evaluation Method

Speed and Volume

A literature review conducted for the purpose of choosing the evaluation methodology for this report showed that the most common approach that municipalities use to measure and evaluate traffic calming is to assess volume, speed and collision data before and after the installation. These methods of analysis allow for the evaluation of several of the neighborhood's project goals including slowing speeds and reducing collisions.

Future studies may be useful to evaluate the remaining goals including pedestrian access, minimization of parking loss, and protection of private property.

Prior to the development of traffic calming in the neighborhood, Transportation Operations Staff collected speed and volume data through the use of pneumatic hoses. Unfortunately, the raw data from that exercise were destroyed shortly afterward, and only the summary information is available, limiting the opportunity to conduct meaningful statistical analyses.

These data were not collected as part of the Safe Routes to School Project planning and therefore only collision information will be evaluated for the intersections of Anapamu at Alta Vista and the intersections of Quarantina at Canon Perdido and de la Guerra.

Collision

Statewide Integrated Traffic Records System (SWITRS) data were collected from the California Highway Patrol to understand the five year collision history around the various installations. Because of the different periods and duration in which the semi-permanent installations were in place, the brief duration of time since the installations have been constructed, and the low number of crashes, a true understanding of the collision patterns after the construction is less instructive for evaluation than it is for operational corrections.

Using SWITRS data, the change in average number of collisions reported in 2003-2005 is compared with those reported in 2006-2008. These periods are proxies for “before” and “after” but they do not exactly mirror the before and after period around the construction of the traffic calming features. This is because semi-permanent and permanent installations were in place at various locations for different durations prior to the construction in 2008.

Results

A detailed review of the changes in the area follows, including: a brief photographic review and analyses of speed, volume and collisions.

Visual Description

The following section provides visual descriptions of the work done within the St. Francis Mobility Plan area. The data described were collected in the Winter of 2003 and 2009, following the completion of the construction of the project by long enough that it is assumed any change in travel patterns would be, by this time, well established. Data are reported only for those locations where data were collected in 2003, and where physical changes were made to the street. There are many locations within the Mobility Plan area where no construction occurred.

Alta Vista

Alta Vista was well represented at the neighborhood charrette. Residents were concerned about event parking and speeding of traffic generated by Santa Barbara High School. Mini-traffic circles were installed on Alta Vista at Sola and Victoria, and curb extensions were installed at Alta Vista and Anapamu.

Before (1200 Block)

Posted Speed:	25mph
85% speed	29 mph
Percent Exceeding 35 mph:	3



After (1200 Block)

Posted Speed:	25mph
85% speed	27.8 mph
Percent Exceeding 35 mph:	.7

Alta Vista at Victoria – Before and After



Alta Vista at Sola – Before and After



Anapamu

The speeding of High School students and others is an ongoing concern along major lengths of Anapamu. The street has a dense tree canopy along much of its length. An overly wide road, and wide intersections contribute to the problem. More orderly access to the school was requested by residents. Curb extensions were constructed on Anapamu at Alta Vista.

Posted Speed: 25 mph
85% speed Not available



Anapamu at Alta Vista - Before and After



Garden Street

Garden is characterized by excessive width. Along its length, it experiences both the highest volume and the steadiest high-end speeds. A high number of stop controls (one signal and three stop signs) generates noise, frustration, and a speed spiking problem. Pedestrians continue to describe difficulty getting across the street at many locations. Curb extensions were constructed on all corners of Garden at Arrellaga, and a median and curb extensions were constructed at Garden and Islay.

Before (1800 block)

Posted Speed:	25-30 mph
85% speed	36 mph
Percent Exceeding 35 mph:	43



After (1800 block)

Posted Speed:	25-30 mph
85% speed	31.9
Percent Exceeding 35 mph:	3.8

Garden at Arrellaga – Before and After



Garden at Islay – Before and After



Olive Street

This street is characterized by long blocks and an overly wide street. Numerous speeding complaints have been recorded, especially in the upper portions of the neighborhood. A mini-traffic circle was installed at Olive and Sola.

Before (1600 block)

<u>Posted Speed:</u>	<u>25mph</u>
<u>85% speed</u>	<u>34mph</u>
<u>Percent Exceeding 35 mph:</u>	<u>21</u>

After (1600 Block)

<u>Posted Speed:</u>	<u>25 mph</u>
<u>85% speed</u>	<u>30.3</u>
<u>Percent Exceeding 35 mph:</u>	<u>1.6</u>



Olive at Sola – Before and After



Curb Extensions on Quarantina Corridor

The corridor connecting Santa Barbara Junior and Senior High Schools has high pedestrian volumes and low motor vehicle volumes. It was a natural area to improve the non-vehicular access between the facilities. The work done on Quarantina at Canon Perdido formalized a semi-permanent installation that was effective in improving pedestrian access across the intersection.

Quarantina at De La Guerra – Before and After



Quarantina at Canon Perdido – Before and After



85th Percentile Speed

In order to understand any changes in the context of the overall neighborhood, several street segments within different parts of the St. Francis Neighborhood Area without traffic calming or curb extension installations were selected as a control group. This group was compared with segments on approach to intersections receiving mini-traffic circles or median islands, as before data were not collected on the segments scheduled for curb extensions. Although curb extensions are not considered meaningful speed reduction measures, a future analysis of change comparing segments on approach to curb extensions only will be useful.

Tangible speed reductions appear to have been achieved as a consequence of traffic calming measures. The following table shows the change in 85th percentile speed during a 24 hour period after the implementation of the St. Francis and Safe Routes project. A comparison of traffic calmed with non-traffic calmed streets in this group shows a statistically significant reduction in 85th percentile speeds on traffic calmed streets only. The traffic calmed streets experienced an 8% reduction in 85th percentile speeds and the non traffic calmed streets received a 3 % reduction.

Table 1: Vehicle Speeds Before and After Traffic Calming

	Speed Before (mph)	Speed After (mph)	Percent Change
<i>Streets with Traffic Calming</i>			
Alta Vista (1200)	29.00	27.80	-4.14%
Garden St(1800)	36.00	31.90	-11.39%
Olive St. (1600)	34.00	30.30	-10.88%
Sola St (300)	31.00	29.10	-6.13%
		average	-8.13%
<i>Streets without Traffic Calming</i>			
Oramas (midblock)	31.00	29.50	-4.84%
Grand (midblock)	30.00	28.90	-3.67%
Laguna St (1700)	34.00	31.70	-6.76%
Loma St (1600)	27.00	28.60	5.93%
Micheltorena St (500)	32.00	30.40	-5.00%
Victoria St (500)	31.00	30.40	-1.94%
		average	-2.71%

Excessive Speed

Excessive speed is a repeating concern citywide, and was also expressed by St. Francis area residents as a frustration due to its inconsistency with residential speed limit expectations of 25 miles per hour. Because of the increased severity of collisions that occur at 35 miles per hour, and the ease of demonstrating a safety risk due to drivers speeding in excess of 10 miles per hour over the speed limit, the percent of drivers traveling in excess of 35 miles per hour was also evaluated.

Tangible reductions in excessive speed were demonstrated in both the traffic calmed streets and the control group where no traffic calming was built. However, the difference is more profound on the traffic calmed streets, where a 16% reduction in excessive speeds was demonstrated. The average reduction on streets without traffic calming was 7%.

Staff believes that the change in reported speeds in excess of 35 miles per hour on Laguna and Micheltorena are in some part due to the closure of the St. Francis Hospital. Because the before data are no longer available in raw form it is not possible to test this hypothesis at this time. If these streets are excluded from the analysis, a 4% reduction is observed.

Table 2: Excessive Speeds Before and After Traffic Calming

	Percent above 35 mph Before	Percent above 35 mph After	Change
Streets with Traffic Calming			
Alta Vista (1200)	3.00%	0.70%	2.30%
Garden St(1800)	43.00%	3.80%	39.20%
Olive St. (1600)	21.00%	1.60%	19.40%
Sola St (300)	5.00%	2.20%	2.80%
		Average Reduction	15.93%
Streets without Traffic Calming			
Oramas (midblock)	5.00%	1.40%	3.60%
Grand (midblock)	4.00%	1.50%	2.50%
Laguna St (1700)	28.00%	4.60%	23.40%
Loma St (1600)	4.00%	1.20%	2.80%
Micheltorena St (500)	11.00%	3.10%	7.90%
Victoria St (500)	6.00%	6.50%	-0.50%
		Average Reduction	6.62%

The analysis of speed in the area leads us to conclude that there has been a decrease in excessive speeding throughout the study area, with more change observed on streets with traffic calming than without. This conclusion is not inconsistent with other area wide traffic calming schemes.

Volume

One provision of the traffic calming project development was that diversion of traffic volumes would not be an acceptable consequence of the project. It is unclear at this time if diversion has been experienced as a result of the project due to uncertainty about data quality as well as changes in land use, including the closure of the St. Francis Hospital during the planning and development of the St. Francis Area Mobility Plan.

The following table shows the change in average daily traffic volume during a 24 hour period in the St. Francis area after the construction. Data were collected in winter

months of 2003 and 2009. With the exception of one outlier data point, it appears that traffic volumes throughout the area have decreased, and with the data available, it is not possible to ascertain whether the volume changes correlate with traffic calming installations.

Table 3: Traffic Volumes Before and After Traffic Calming

	Volume Before (vpd)	Volume After (vpd)	Percent Change
Streets with Traffic Calming			
Alta Vista (1200)	1900	1217	-35.95%
Garden St(1800)	6000	4814	-19.77%
Olive St. (1600)	2250	2640	17.33%
Sola St (300)	1200	1235	2.92%
		average	-8.87%
Streets without Traffic Calming			
Oramas (midblock)	638	662	3.76%
Grand (midblock)	1700	1322	-22.24%
Laguna St (1700)	1700	1596	-6.12%
Loma St (1600)	387	304	-21.45%
Micheltorena St (500)	3240	2537	-21.70%
Victoria St (500)	770	1763	128.96%
		average	10.20%

The reported volume change on Victoria is obviously a concern and will be remeasured for data accuracy after the school year recommences. It is expected that the before data are not correct, based on traffic volumes collected on other segments of the street nearby. If the Victoria Street volumes are omitted from the analysis, the average volume reduction on the non-traffic calmed streets is 13.55%.

Collisions

Traffic collisions have also been a concern of community members. A 2007 analysis comparing all of the intersections in the NTMP project during the semi-permanent phase of the traffic calming installations showed a slight reduction in reported collisions in the traffic calmed intersections and an increase in the control group where traffic calming was planned, but not in place.

For the current analysis, reported collision data from the period 2003-2008 were utilized to compare collision changes at treatment and control intersections in both the St. Francis and Safe Routes area. The three year average of reported collisions in 2003-2005 is compared with the three year average of collisions in 2006-2008. The choice of years was based on the knowledge that during the period 2006-2007, semi-permanent installations were in place already at the locations of future traffic circles, in configurations similar to the permanent features that were eventually installed. The control group included intersections in the St. Francis area that were identified for similar possible future traffic calming treatments (n=12). The treatment condition included any intersection receiving a mini-circle, median, or curb extensions (n=8).

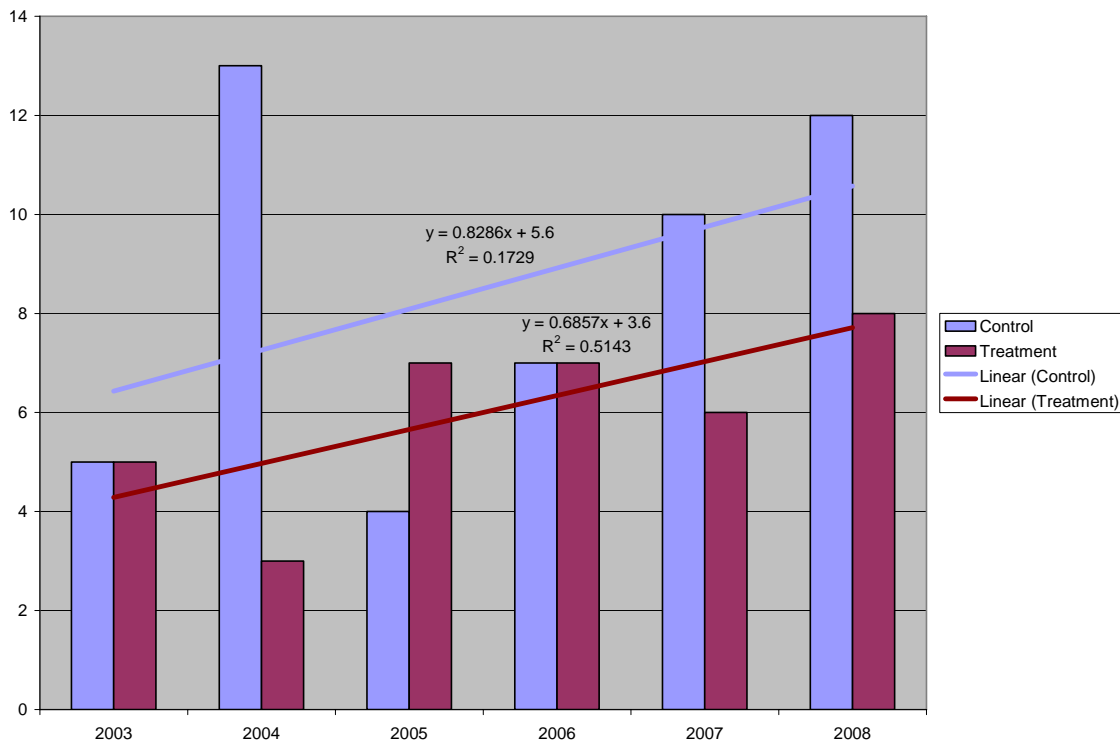
There are many ways to summarize the data. Staff conclusion is that the number of reported collisions increased throughout the study area between 2003 and 2009. The average number of collisions per intersection per year remains low in both the treatment and control group. There is less variation over time on the streets with traffic calming than without. The per year increase showed a higher rate of increase on non-traffic calmed streets and the simple “before-after” comparison showed a higher rate of increase on control streets.

Because of the small number of data points involved, a future study will be useful in understanding not only total collisions, but also those specifically at curb extensions. Semi-permanent features were not consistently installed at these intersections, and less than one year of data exists for the after condition.

Table 4: Change In Average Number Of Collisions Per Intersection Per Year

Treatment or Control	2003-2005	2006-2008	Percent Change
Control	0.61	0.81	31.82%
Treatment	0.63	0.88	40.00%

**Figure 1:
Total Number of Reported Collisions Within 75' of Intersections in Study**



An increase in minor collisions at specific locations has been addressed by planned installation of object markers to increase the visibility of the fixed objects in the roadway. In many curb extension locations, the reported or unreported collisions of motor vehicles with vertical curbs has caused minor damage and scuffing of the curb.

Emergency Response

A summary of Fire Department concerns, including an assessment of the impact of the traffic calming installations on operations has been requested and to the extent possible staff will make adjustments to existing conditions, to address concerns. Furthermore, Fire Department input will be useful if traffic calming planning efforts are pursued in the future.

Maintenance

The traffic calming features have a three-fold impact on Streets Maintenance that is budgeted through Streets Maintenance funds: landscaping maintenance of the traffic calming installations, curb painting, and pavement striping.

Impact on Bicyclists

The impact of the traffic calming measures on bicyclists has also been reviewed at length. As the project overlaps with only one short segment of a peak hour bike lane, bicyclists riding in these areas are utilizing the mixed flow lanes because on-street parking is permitted. The safe and legal position for a bicyclist riding in mixed flow lanes is three feet from a parked car. The curb extensions are approximately the width of a parked car, and therefore do not require bicyclists to appreciable change lane position unless they are riding adjacent to the curb. The prevention of crashes depends upon a cyclists' visibility by motorists. This visibility is enhanced by the traffic calming features, and the speed reduction impact will have the effect of reducing the severity of any collisions that do occur. There was one bicycle involved collision in 2005 on Garden at Arrellaga. There have been no reported collisions involving bicycles on streets with traffic calming since their installation.

Future Research

Because of the large number of hours it takes to collect enough data to truly understand pedestrian and bicycle user patterns, this study relied on automated technology that is most available for information about vehicles. The methodology chosen is consistent with that conducted in the vast majority of municipalities, but staff caution that this review, though informative, does not paint the whole picture in relationship to goals expressed by the community at the onset.

Traffic calming devices in this neighborhood were installed in response to residents' concerns about walking and bicycling comfortably on their streets, so future evaluations focusing on the street livability will be useful for understanding more clearly what impact traffic calming and curb extension elements have on perceived outputs such as neighborhood livability, slowing at intersections, and yield compliance of vehicle drivers to pedestrians.

A 12 hour pedestrian count, and a neighborhood survey were conducted in 2004 in the St. Francis area only. These data collection efforts were made possible through the participation of Cal Poly, San Luis Obispo. Staff resources did not permit the mobilization of a pedestrian count or follow-up survey for this report, but follow-up with

qualitative analyses of the impact of the planning and construction efforts might help to more fully understand the impact of the features on the pedestrian realm.

Staff recommends that further resources be dedicated to understanding both the social and operational impacts of this and other traffic calming projects. A separate citywide study, specifically comparing curb extensions to mini-traffic circles and median islands would be useful to more fully understand yield compliance, vehicle braking, and user perception.

Conclusion

The Neighborhood Traffic Management Program was designed to consider area-wide traffic impacts as opposed to considering single streets in isolation. On appearance one possible result of the program design is that 85th percentile speed and excessive speed have decreased throughout the pilot project area. Other possible explanations for this change include increased fuel prices, changing land uses and other unknown factors.

Notwithstanding a key land use change in the area, the closure of the St. Francis Hospital, there are key differences between monitored intersections that can, at this time, be explained only by the traffic calming devices themselves. There was a statistically significant reduction in 85th percentile speed on traffic calmed streets that was not demonstrated on streets without traffic calming. Also, a reduction of excessive speed (over 35 miles per hour) has been observed throughout the neighborhood. However, this reduction is more profound on traffic calmed streets. With reductions in speed, it is assumed that noise levels decrease and yield compliance at crosswalks increases. Patterns of traffic volume changes are unclear, with the appearance that volumes have gone down throughout the area. Similarly, reported collisions have gone up in the neighborhood, with data limiting the ability to understand the cause of the increase relative to the traffic calming efforts.