

Pavement Markings

Marked Crosswalks

Painted pedestrian crossings that specify proper locations for pedestrians to cross the street. Design may vary. Two parallel lines are standard. Ladder style is considered high-visibility.

Possible general criteria to consider in analysis:

- Speed limit under 40 mph
- Fewer than 4 lanes of traffic (unless there is a median island)
- Fewer than 12,000 ADT
- Over 20 student crossings in a peak hour.
- Consider crosswalks at intervals of 250 feet.

Recommended Implementation Criteria

Crosswalks should be marked at all intersections on established routes to a school where there is substantial conflict between motorists, bicyclists, and student movements; where students are encouraged to cross between intersections; where students would not otherwise recognize the proper place to cross; or where motorists or bicyclists might not expect students to cross.

Controlled Intersections (signal or stop): Use if a sidewalk exists on both sides of the street.

Uncontrolled Intersections: Must be convenient, accessible and in the direct pedestrian route to school.

Multi-lane or high volume marked crosswalks need substantial treatments so that crash risk does not increase.

Consider midblock crosswalks only if: there is adequate sight distance, protected intersection crossings are more than 200 feet away, the combination of traffic and pedestrian volume justify the installation, gap analysis shows that the frequency and adequacy of gaps in traffic is insufficient. Do not use in locations with speeds greater than 40 mph or Volumes greater than 20,000 vpd.

MUTCD Guidance

Section 3B -18 New marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either:

- A. The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or
- B. The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.

Section 7A.03 Important to determine frequency and adequacy of gaps in the traffic stream. Use Traffic Control Devices Handbook Section 1A.11

Section 7C.02 Guidance: Crosswalks should be marked at all intersections on established routes to a school where there is substantial conflict between motorists, bicyclists, and student movements; where

Other Precedence/Details to Consider

Most installation guidance exempts school routes. ITE Recommended Practice on Design and Safety of Pedestrian Facilities Guidance for locations with

young pedestrians based on ped volume and ADT. Below are two examples from the table:

- Do not install with less than 15 peak hr ped crossings and under 7000 ADT
- 2 lane street, with 25 peak hour peds requires 6,000 ADT to meet requirements.

FHWA Study (and Ped SOS):

- Below 12,000ADT there is no significant difference in safety between marked and unmarked for 2 lane roads.
- For multi lane roads and speeds over 40mph, don't install a crosswalk.
- Roads with speeds less than 35mph, and under 12,000 ADT could be a candidate for a marked crosswalk.

San Luis Obispo Installation Guidelines:

- 40 or more peak hour peds, or 30 groupings of 2 or more during a 2 hr. period twice per day
- 85% speed below 40mph
- less than 3 travel lanes in each direction
- proper sight distance
- 2,700 ADT or more
- No controlled crosswalk within one block or 660ft

Sacramento Installation Guidelines:

- 20 peds per peak hour or 60 per 4 hours
- located near a school with the nearest marked crosswalk at least 300 feet away.
- 250 feet of visibility
- If it meets the criteria, a different level of crosswalk is recommended per level.

Transportation Association of Canada:

- counts each youth, or disabled as 2 adults, and each senior as 1.5 when considering ped volume they take crossing opportunity into account. ie. Analysis of vehicle gaps. And community size
- There is a warrant chart based on number of peds and crossing opportunity.

Brookline Guidelines:

- Speed limit 40mph or less

- 20 or more pedestrians during peak hour of vehicle traffic. Less can be considered for child population
- ADT exceeds 3000
- A sidewalk or adequate shoulder exists on both sides of the roadway
- no other crosswalks within 200ft
- adequate sight distance

AASHTO Green Book.

No marked crosswalks on ADT greater than 9000 with 3 or more lanes of traffic.



Crosswalk A is a traditional parallel line crosswalk.



Crosswalk B is high-visibility crosswalk with a ladder design.

Image from National Center for Safe Routes to School. "Safe Routes to School Guide"

Advanced Stop/Yield Lines

Advance stop or yield lines are used to indicate the optimal stopping point for vehicles. They encourage drivers to stop/yield further back from the crosswalk.

Recommended Implementation Criteria

Use to promote better visibility between pedestrians and motorists, and help to prevent multiple-threat collisions particularly at mid-block or uncontrolled crossings. Consider advanced stop or yield signs at marked crosswalks with more than one lane of traffic in one direction. Install yield lines and signs at all marked crosswalks along a school route.

MUTCD Guidance

Yield here for pedestrians signs and markings may be used in advance of a marked crosswalk that crosses an uncontrolled multi lane approach. Should be placed 20 to 50 feet in advance of the nearest crosswalk line.

Section 3B.16 – If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, and at midblock crosswalks.

Stop lines at midblock signalized locations should be placed at least 40 feet in advance of the nearest signal indication (see Section 4D.14).

If yield or stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines or stop lines should be placed 20 to 50 feet in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield or stop line and the crosswalk (see Figure 3B-17)

California MUTCD Section 7C.03 – The SCHOOL pavement marking may be used to guide, warn, or regulate traffic. CVC 21368. Should not be used at controlled intersections.

Other Precedence/ Details to Consider

Michael Cynecki Study:

-Typical stop lines are 4 feet in advance of the crosswalk, 20 feet for a mid-block location.

Angled or offset stop lines can be considered at signalized

intersections with a multi-lane approach to help improve sight distance in the right lane relative to pedestrians.

- Not used at most crosswalks

- Wider crosswalk or wider crosswalk lines can also be effective.

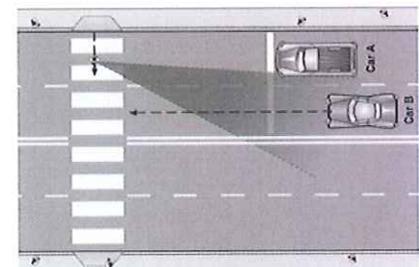
- They may occasionally be used at stop controlled intersections with unmarked crosswalks.

Brookline DPW Guidelines:

Install a stop line at all crosswalks at signalized intersections a min of 4 feet from the crosswalk line.



Heatherstone and Dale, at the SR 85 Ped Bridge



Solution: place advance stop/yield line so car 1 stops further back; car 1 no longer masks car 2, which can better see and be seen by the pedestrian.

Image from National Center for Safe Routes to School. "Safe Routes to School Guide"

Raised Crosswalk

A speed table the width of a typical crosswalk stretching across an entire intersection, slowing traffic and keeping the crossing at grade with the sidewalk.

Recommended Implementation Criteria

Behaves more like a traffic calming device. Use traffic calming protocol for implementation.

Other Precedence/ data to consider

National Center for Safe Routes to School, Safe Routes to School Guide:

- Speed tables may increase the rate that vehicles yield to pedestrians
- Decreases vehicle speed.



Image from National Center for Safe Routes to School. "Safe Routes to School Guide"

Signs, Lights, and Beacons

Rectangular Rapid Flashing Beacons

Rectangular rapid flashing beacons (RRFBs) are active warning devices used to alert motorists of crossing pedestrians at uncontrolled crossings. They remain dark until activated by pedestrians, at which point they emit a bright, rapidly flashing yellow light, which signals drivers to stop. Studies suggest that RRFBs can significantly increase yielding rates over standard pedestrian warning signs

- Consider for high volume and speed roadways
- Consider for ADT greater than 2000 ADT and 85% speed of 40mph or greater.

MUTCD Guidance

They are not currently included in the MUTCD, but jurisdictions can use them if they obtain approval from FHWA.

Recommended Implementation Criteria

- Consider RRFB for midblock crosswalks or uncontrolled marked crosswalks.
- Should be installed on both the right and left side of the crosswalk.
- Do not install within 300 feet of a controlled crossing

Other Precedence/Details to Consider

National Center for Safe Routes to School, Safe Routes to School Guidelines recommends their use at midblock or marked uncontrolled crosswalks.



Image from Pedestrian and Bicycle Information Center
Image Library, Photographer Michael Frederick

Flashing Beacons and Overhead Signs

Overhead signs are easier for drivers to see in cases where on-street parking, street trees, or other visual obstructions. Flashing beacons at a marked crosswalk may draw additional attention to the crosswalk. In a busy urban environment, flashing beacons may not provide much benefit, while on a rural road, they may increase driver awareness of the crosswalk. Unlike the Rectangular Rapid Flashing Beacons, these are not pedestrian activated.

MUTCD Guidance

Section 4L.03 contains information regarding Warning Beacons to provide active warning of a pedestrian's presence.

Support: Typical applications of Warning Beacons include the following:

- A. At obstructions in or immediately adjacent to the roadway;
- B. As supplemental emphasis to warning signs;
- C. As emphasis for midblock

crosswalks;

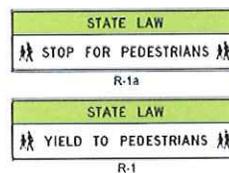
Recommended Implementation Criteria

- Consider placement at mid-block crossings but can be used at intersections with uncontrolled crossings.
- Do not install within 300 feet of a controlled crossing
- Consider overhead sign for all uncontrolled marked crosswalks along the school route with ADT over 6000.
- Add flashing beacon if there are 70-100 vehicles/peak school hour and 20 pedestrians per peak school hour.
- Consider beacons for ADT greater than 2000 ADT and 85% speed of 40mph or greater.

Other Precedence/Details to Consider

Los Angeles Guidelines:

- 300 feet of a controlled crossing
- Roadway to be crossed is 50 feet or more.
- Point system based on peds more than 136 per peak hour (youth ect count as 2), vehicle volume greater than 2001 ADT, speed 85% of 40mph or faster, more than 7 lanes of traffic, and collision info.



Images from Pedestrian and Bicycle Information Center Image Library, Photographer Dan Burden



In-Pavement Lights

Lights embedded in the crosswalk pavement that are activated when a pedestrian pushes a button or starts walking across the crosswalk.

Recommended Implementation Criteria

- Consider at uncontrolled marked crosswalks.
- ADT greater than 10,000
- Ped volumes greater than 100 per hour.
- 85% speed less than 35 mph
- 2 or more lanes of traffic in one direction.

MUTCD Guidance

Section 4N.02 contains information regarding In-Road Warning lights at crosswalks. They must be located at a marked crosswalk at an uncontrolled intersection. In-roadway lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to

In-Street Signs

These signs are usually installed at un-signalized pedestrian crossings to make the crosswalk more visible and increase driver yielding.

Recommended Implementation Criteria

- Consider at uncontrolled marked crosswalks.
- ADT greater than 10,000
- Ped volumes greater than 100 per hour.
- 85% speed less than 35 mph
- 2 or more lanes of traffic in one direction.

MUTCD Guidance

Section 4N.02 contains information regarding In-Road Warning lights at crosswalks. They must be located at a marked crosswalk at an uncontrolled intersection. In-roadway lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to provide additional warning to road users.

provide additional warning to road users.

Other Precedence/Data to Consider

San Luis Obispo Guidelines:

100 or more peds per hour, or
100 groupings of 2 peds for a

2hours period twice per day.

Ped volume after dark is 75 or more for any one hour or 25 or more for a period of any four hours during the night time.

10,000 ADT or more

85% of 35mph or less

2 or more lanes in one direction but 4 lanes or less in both directions.

Uncontrolled crossing

National Center for Safe Routes to School, Safe Routes to School Guidelines recommends them for use at some uncontrolled marked crosswalks with high collision rate, high volumes and high speeds.

Other Precedence/Data to Consider

San Luis Obispo Guidelines:

100 or more peds per hour, or
100 groupings of 2 peds for a
2hours period twice per day.

Ped volume after dark is 75 or more for any one hour or 25 or more for a period of any four hours during the night time.

10,000 ADT or more

85% of 35mph or less

2 or more lanes in one direction but 4 lanes or less in both directions.

Uncontrolled crossing

National Center for Safe Routes to School, Safe Routes to School Guidelines recommends them for use at some uncontrolled marked crosswalks with high collision rate, high volumes and high speeds.

Visibility and Crossing Distance

Curb Extensions

The extension of the curb out from the sidewalk and into the street, typically at an intersection. Curb extensions increase pedestrian visibility and decrease pedestrian exposure distance in the street, crossing time and vehicle turn speeds. Curb extensions can also provide additional space for curb ramps.

Recommended Implementation Criteria

Consider installation at intersections with: Wide streets, where visibility is limited, or on street parking is heavily utilized

Other Precedence/Data to Consider

This a traffic calming device. Use traffic calming criteria.

Refuge Islands

Raised medians in the middle of a street at an intersection, midpoint of the block, or continuously along street.

Recommended Implementation Criteria

Protect crossing pedestrians from oncoming traffic by serving as a barrier from motor vehicles, reduce crossing distance and allow pedestrians to focus on one direction of traffic at a time.

Best if used in streets with 4 lanes of traffic or more,

Waiting areas/Stand Back Line

Extra paving at busy crossings where large numbers of pedestrians can congregate before crossing the street without having to stand close to the busy street, or on landscaping, dirt or mud.

Recommended Implementation Criteria

Consider implementation if there are high volumes of pedestrians, waiting to cross streets with speeds of 35mph or greater.

Reduce Corner Radius

The reduction of a corner radius to produce a tighter turn results in decreases in turning speeds and improved motor vehicle and pedestrian site distances, and a shortened pedestrian crossing distance.

Recommended Implementation Criteria

Similar to criteria for a bulb out, but can be considered on roadways without the presence of on street parking. Consider installation at intersections with: Wide streets, where visibility is limited.

Crossing Guards

Adult crossing guards assist elementary age children while crossing the street. They help provide a gap in traffic where engineering studies show that adequate gaps do not occur naturally.

Stop controlled Intersections:

Where the vehicular traffic volumes on undivided highways of four or more lanes exceeds 500 per hour during any period when the school pedestrians are going to or from school.

Signal Controlled Intersections:

Where the number of vehicular turning movements through the school crosswalk exceeds 300 per hour while school pedestrians are going to or from school; or
Where justified through analysis of the operations of the intersection.

Recommended Implementation Criteria

Consider an adult crossing guards if the following conditions exist:

Uncontrolled Intersections:

no alternate controlled crossing within 600 feet; and

In urban areas where the vehicular traffic volume exceeds 350 during each of any two hours (not necessarily consecutive) in which 40 or more school pedestrians cross daily while going to or from school;

or In rural areas where the vehicular traffic volume exceeds 300 during each of any two hours (not necessarily consecutive) in which 30 or more school pedestrians cross daily while going to or from school.

Whenever the critical (85th percentile) approach speed exceeds 40 mph, the guidelines for rural areas should be applied.

MUTCD Guidance

The State of California provides criteria for the placement of adult school crossing guards in the MUTCD 2012, California Supplement. Section 7D.02 Adult Crossing Guards

Intersection Control

Stop Sign and Signal Installation

The installation of a 2-way or 4-way stop sign at an intersection legally requires vehicles to stop before proceeding through an intersection. This provides an opportunity for pedestrians to cross. Traffic signals provide a protected phase where it is safe for pedestrians to cross.

Stop sign and signs installation must meet MUTCD/CA MUTCD warrants.

There are warrants for installing traffic control signals based on the volume of pedestrians. This is intended for situations where the vehicle volume is high creating excessive delay for pedestrians crossing.

Recommended Implementation Criteria

MUTCD

6000vpd/2500 vpd

3 collisions in 1 year

5 collisions in 2 years

must be classified residential collector

MUTCD Guidance

Other Precedence/Data to Consider

Brookline DPW Guidelines:

All signalized intersections shall have marked crosswalks on the roadway approaches that have sidewalks on both sides, or if adequate shoulder exists.

Crosswalk design should be two parallel lines 8-10 feet wide

Install a stop line all signalized intersections.

Pedestrian Actuated Signal / Pedestrian Hybrid Beacons

Traffic signals that are only activated when a pedestrian is present. They provide a controlled crossing for pedestrians without delaying motorists unnecessarily. They remain dark until activated by a pedestrian. Activation results in a sequence of amber and red beacon lights, which signal to drivers when to stop for crossing pedestrians and when to go again after pedestrians have cleared the crosswalk.

Recommended Implementation Criteria

hour.

Inadequate gaps in vehicle traffic to allow for crossing.

Vehicle speed too high

excessive pedestrian delay

MUTCD Guidance

Chapter 4F contains information on Pedestrian Hybrid Beacons.

Support: A pedestrian hybrid beacon is a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Recommended Implementation Criteria

No fewer than 20 pedestrian crossings per peak

Treatments for Signalized Intersections

The following should be considered at all signalized intersections along school routes: marked crosswalks on all legs, countdown pedestrian heads, ADA pedestrian push buttons, minimize pedestrian wait time, and increase pedestrian clearance intervals.

Recommended Implementation Criteria

Consider implementing these treatments at all signalized intersections along the school route.

MUTCD Guidance

4E.06 Pedestrian Intervals and Signal Phases requires this interval to be calculated based on a minimum walking speed of 3.5 feet per second. The additional time provided by an extended pushbutton press to satisfy pedestrian clearance time needs may be added to either the walk interval or the pedestrian change interval.

Guidance: Where pedestrians who walk slower than 3.5 feet per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking

Right-turn-on-red restrictions/Leading pedestrian interval

Pedestrian and motor vehicle conflicts are a common occurrence when motorists get a green light and pedestrians get a green light or a "Walk" signal at the same time. While motorists are required to stop for pedestrians, conflicts are likely to occur. One solution is to install a "leading pedestrian interval" (LPI) which illuminates the pedestrian 'Walk' signal, while the motor vehicle signal remains red. The LPI gives pedestrians an opportunity to start walking and establish a presence in the crosswalk before motorists can begin their turn. The leading pedestrian interval is usually about three seconds or more. Prohibiting right-turn-on-red is also an option to reduce pedestrian/vehicle conflict.

speed of less than 3.5 feet per second should be considered in determining the pedestrian clearance time.

Other Precedence/Data to Consider

National Center for Safe Routes to School, Safe Routes to School Guidelines:

Some pedestrians, especially large groups of children, may need additional time to cross. Consideration should be given to increasing the pedestrian clearance interval if a pedestrian signal must accommodate pedestrians that need more time to cross. However, these considerations should be balanced against the potential for increased wait times between 'Walk' signals. The longer people must wait to cross the street, the more likely they will decide to cross against the signal. Pedestrian wait time can be reduced by shortening the overall signal cycle length or by providing an actuated demand-responsive pedestrian signal.

Recommended Implementation Criteria

LPI should be considered for all signalized intersections along the school route.

MUTCD Guidance

MUTCD 4E.06 Pedestrian Intervals and Signal Phases
Sections 4E.09 through 4E.13

References

National Center for Safe Routes to School, Safe Routes to School Guide
<http://guide.saferoutesinfo.org/engineering/index.cfm>

2009 MUTCD
http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm

2012 California MUTCD Edition
http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca_mutcd2012.htm

Crosswalks and Stop Lines
Michael J. Cynecki, PE

TCRP/NCHRP: Improving Pedestrian Safety at Unsignalized Crossings, Appendix F Pedestrian Crossing Installation Guidelines

Village of Brookline Department of Public Works, Crosswalk Policy and Design Guidelines

Sunnyvale Pedestrian Safety and Opportunities Study, 2007

Cover Image : Bicycle and Pedestrian Resource Center, Image Library, Photographer Dan Burden

SECTION 3 IMPROVEMENT IDENTIFICATION

There are sixteen schools with the City of Sunnyvale, most schools are within the Sunnyvale Unified School District, but some are within the Cupertino Unified School District or Santa Clara School District. Previous work by the Sunnyvale DPW, Division of Transportation and Traffic identified walking routes for all 16 schools.

For this study, all intersections on along these school routes were categorized by existing traffic control, signing and the

presence of marked crosswalks. A data base and geographic information systems (GIS) map was then created for these intersections with information about speed limit, roadway classification, collision data, and traffic volume for each intersection.

The implementation criteria identified in Section 2 was applied to the intersection data collected in the GIS data base to identify specific locations where improvements should be considered.

Traffic control devices typically have very specific rules standards for implementation. However, treatments for intersections along school routes allows for a significant amount of flexibility and use of engineering judgment. For this reason, many of the recommendations include a number of options using criteria that range from broad to conservative. For example, one query might identify all stop controlled intersections within a ½ mile of a school – this would be a broad option. A conservative option would include only stop controlled intersections within ½ mile of the school on collector streets, with more than 3 collisions in 5 years.

The information in this section details the type of intersection, the improvement to consider, the specific sql query that was used (so that it can be recreated in the future), the name of the GIS file, and the GIS map symbol (so that it can be identified on the accompanying maps)

Signalized Intersections

Improvements to Consider	Install High Visibility Crosswalks, Advanced Stop Bar, Leading Pedestrian Interval, Countdown Pedestrian signal, ADA Push Buttons, Minimize Ped Wait time, Increase Ped Clearance Intervals
Criteria	Option 1 Signalized Intersections within ½ mile of a school, on a school route, with 3 or more crashes in 1 year, or 5 or more crashes in 2 years.
Query	"Control" = 'signalized' AND ("Crash1yr" = 3 OR "Crash2yr" = 5) AND "School" <> 'not school' AND "In_half_mi" = 'yes'
Result file name	signals_for_Improvement.shp 38 intersections
Map Label and Symbol	 Improve Signal - Option1- Within 1/2 mile with high crash rate

#	Signalized Intersections – Option 1	School
1	N MATHILDA AV & INDIO WY	Bishop
2	N MATHILDA AV & W MAUDE AV	Bishop
3	N MATHILDA AV & SAN ALESO AV	Bishop
4	ALMANOR AV & N MATHILDA AV & W AHWANEE AV	Bishop
5	OLD SAN FRANCISCO RD & GAIL AV	Braly
6	S MARY AV & W KNICKERBOCKER DR	Cumberland
7	HOLLENBECK AV & S PASTORIA AV & W EL CAMINO REAL	Cumberland
8	S MATHILDA AV & W EL CAMINO REAL	Ellis
9	SVALE SARATOGA RD & SVALE AV & E EL CAMINO REAL	Ellis
10	E OLIVE AV & S SUNNYVALE AV	Ellis
11	CEZANNE DR & E EL CAMINO REAL	Ellis
12	E REMINGTON DR & S FAIR OAKS AV & E EL CAMINO REAL	Ellis
13	S FAIR OAKS AV & IRIS AV	Ellis
14	OLD SAN FRANCISCO RD & S FAIR OAKS AV	Ellis
15	S FAIR OAKS AV & E OLIVE AV	Ellis
16	S FAIR OAKS AV & E EVELYN AV	Ellis
17	RAMP LAW SB N101 & LAWRENCE EX	Fairwood
18	SANDIA AV & LAKEHAVEN DR & LAWRENCE EX	Fairwood
19	RAMP N101 & N FAIR OAKS AV	Lakewood
20	REED AV & S WOLFE RD & OLD SAN FRANCISCO RD	Ponderosa
21	POPLAR AV & E EL CAMINO REAL	Ponderosa
22	HENDERSON AV & E EL CAMINO REAL	Ponderosa
23	E ARQUES AV & N FAIR OAKS AV	San Miguel
24	MAUDE AV & N FAIR OAKS AV	San Miguel
25	E DUANE AV & N FAIR OAKS AV	San Miguel
26	SAN CONRADO TE & N FAIR OAKS AV & CALIENTE DR	San Miguel
27	E AHWANEE AV & N FAIR OAKS AV	San Miguel
28	ALBERTA AV & HARWICK WY & SUNNYVALE SARATOGA RD	Stocklmeir
29	W FREMONT AV & SUNNYVALE SARATOGA RD	Stocklmeir
30	E FREMONT AV & S WOLFE RD	Stocklmeir
31	S WOLFE RDE EL CAMINO REAL	Stocklmeir
32	W EL CAMINO REAL & GRAPE AV	Vargas
33	W EL CAMINO REAL & S MARY AV	Vargas
34	S MARY AV & W WASHINGTON AV	Vargas
35	S MARY AV & W EVELYN AV	Vargas
36	N MARY AV & CX	Vargas
37	ALBERTA AV & HOLLENBECK AV	West Valley
38	W FREMONT AV & HOLLENBECK AV	West Valley

Improvements to Consider **Install High Visibility Crosswalks, Advanced Stop Bar, Leading Pedestrian Interval, Countdown Pedestrian signal, ADA Push Buttons, Minimize Ped Wait time, Increase Ped Clearance Intervals**

Criteria **Option 2
Signalized intersections within ½ mile of a school, on a school route.**

Query **"Control" = 'signalized' AND "School" <> 'not school' AND "In_half_mi" = 'yes'**
signals_for_improvement_option2.shp

Result file name 78 intersections

Map Label and Symbol  **Improve Signal - Option2- Within 1/2 mile**

Signalized Intersections – Option 2	School	#	Signalized Intersections – Option 2	School
1 N MATHILDA AV & INDIO WY	Bishop	39	REED AV & S WOLFE RD & OLD SAN FRANCISCO RD	Ponderosa
2 N MATHILDA AV & W MAUDE AV	Bishop	40	POPLAR AV & E EL CAMINO REAL	Ponderosa
3 N MATHILDA AV & SAN ALESO AV	Bishop	41	SEQUOIA DR & REED AV	Ponderosa
4 ALMANOR AV & N MATHILDA AV & W AHWANEE AV	Bishop	42	HENDERSON AV & E EL CAMINO REAL	Ponderosa
5 E CALIFORNIA AV & N SUNNYVALE AV & N SUNNYVALE AV*	Bishop	43	EVELYN AV & REED AV	Ponderosa
6 CX & N SUNNYVALE AV	Bishop	44	ARQUES AV & N FAIR OAKS AV	San Miguel
7 WCX & N SUNNYVALE AV	Bishop	45	MAUDE AV & N FAIR OAKS AV	San Miguel
8 E ARQUES AV & N SUNNYVALE AV	Bishop	46	N WOLFE RD & N FAIR OAKS AV	San Miguel
9 N SUNNYVALE AV & E MAUDE AV	Bishop	47	E DUANE AV & N FAIR OAKS AV	San Miguel
10 OLD SAN FRANCISCO RD & GAIL AV	Braly	48	SAN CONRADO TE & N FAIR OAKS AV & CALIENTE DR	San Miguel
11 S BERNARDO AV & HEATHERSTONE WY	Cherry Chase	49	AHWANEE AV & N FAIR OAKS AV	San Miguel
12 S MARY AV & TICONDEROGA DR	Cherry Chase	50	E DUANE AV & DE GUIGNE DR	San Miguel
13 S MARY AV & W KNICKERBOCKER DR	Cumberland	51	ALBERTA AV & HARWICK WY & SUNNYVALE SARATOGA RD	Stockmeir
14 S MARY AV & W REMINGTON DR	Cumberland	52	CHEYENNE DR & CONNEMARA WY & SUNNYVALE SARATOGA RD	Stockmeir
15 HEATHERSTONE AV & S MARY AV	Cumberland	53	W FREMONT AV & SUNNYVALE SARATOGA RD	Stockmeir
16 DANFORTH DR & HOLLENBECK AV	Cumberland	54	E HOMESTEAD RD & BLUE JAY DR	Stockmeir
17 HOLLENBECK AV & S PASTORIA AV & W EL CAMINO REAL	Cumberland	55	BLUEJAY DR & HOMESTEAD RD	Stockmeir
18 S MATHILDA AV & SENECA TE	Ellis	56	HOMESTEAD RD & N BLANEY AV	Stockmeir
19 S MATHILDA AV & W EL CAMINO REAL	Ellis	57	N BLANEY AV & HOMESTEAD RD	Stockmeir
20 TENNIS CENTER WY & S MATHILDA AV	Ellis	58	MARION WY & S WOLFE RD	Stockmeir
21 SVALE SARATOGA RD & SVALE AV & E EL CAMINO REAL	Ellis	59	E FREMONT AV & S WOLFE RD	Stockmeir
22 E OLIVE AV & S SUNNYVALE AV	Ellis	60	S WOLFE RDE EL CAMINO REAL	Stockmeir
23 S SUNNYVALE AV & E IOWA AV	Ellis	61	S BERNARDO AV & W WASHINGTON AV	Vargas
24 E MC KINLEY AV & S SUNNYVALE AV	Ellis	62	W EL CAMINO REAL & GRAPE AV	Vargas
25 CEZANNE DR & E EL CAMINO REAL	Ellis	63	S BERNARDO AV & W EVELYN AV & E EVELYN AVE	Vargas
26 E REMINGTON DR & S FAIR OAKS AV & E EL CAMINO REAL	Ellis	64	W EL CAMINO REAL & S MARY AV	Vargas
27 S FAIR OAKS AV & IRIS AV	Ellis	65	S MARY AV & W IOWA AV	Vargas
28 OLD SAN FRANCISCO RD & S FAIR OAKS AV	Ellis	66	S MARY AV & W WASHINGTON AV	Vargas
29 S FAIR OAKS AV & E OLIVE AV	Ellis	67	S MARY AV & W EVELYN AV	Vargas
30 S FAIR OAKS AV & E EVELYN AV	Ellis	68	W CALIFORNIA AV & N MARY AV & BUENA VISTA AV	Vargas
31 RAMP LAW SB N101 & LAWRENCE EX	Fairwood	69	MARY AV & CX	Vargas
32 SANDIA AV & LAKEHAVEN DR & LAWRENCE EX	Fairwood	70	BARRANCA DR & HOMESTEAD RD	West Valley
33 TASMAN DR & BIRCHWOOD DR	Fairwood	71	BELLEVILLE WY & W HOMESTEAD RD	West Valley
34 BIRCHWOOD DR & LR	Fairwood	72	MAXINE AV & HOMESTEAD RD	West Valley
35 REAMWOOD AV & TASMAN DR	Fairwood	73	RAMP S85 HOMESTEAD & W HOMESTEAD RD	West Valley
36 REAMWOOD AV & LR	Fairwood	74	S BERNARDO AV & RAMP HOMESTEAD N85 & W HOMESTEAD *	West Valley
37 RAMP N101 & N FAIR OAKS AV	Lakewood	75	WRIGHT AV & W HOMESTEAD RD	West Valley
38 S WOLFE RD & IRIS AV	Ponderosa	76	ALBERTA AV & HOLLENBECK AV	West Valley
		77	HOLLENBECK AV & CASCADE DR	West Valley
		78	FREMONT AV & HOLLENBECK AV	West Valley

Stop Controlled – Without Marked X-Walks

Improvements to Consider	Install High Visibility Crosswalks
Criteria	Option 1 Stop controlled intersections, along a school route, with no crosswalks, within ½ mile of a school, with 3 crashes in 1 year or 5 crashes in 2 years, on an arterial or collector
Query	"Control" = 'stop' AND "School" <> 'not school' AND "In_half_mi" = 'yes' AND "Crosswalk" = '' AND ("Crash1yr" = 3 OR "Crash2yr" = 5) AND ("Collector" = 'yes' OR "Arterial" = 'yes')
Result file name	Install_Crosswalks_stopcontrol_Option1.shp
Map Label and Symbol	9 Intersections  Mark x-walk at Stop - Option1-crashes and street class

#	Stop Controlled with no X-Walks Option 1	School
1	ROOSEVELT AV & E MAUDE AV	Bishop
2	WORLEY AV & E MAUDE AV	Bishop
3	S MARY AV & BLAIR AV	Cumberland
4	E TAYLOR AV & N FAIR OAKS AV	San Miguel
5	E DUANE AV & SAN LUISITO WY	San Miguel
6	SANTA PAULA AV & E DUANE AV	San Miguel
7	E DUANE AV & SAN RAFAEL ST	San Miguel
8	W OLIVE AVS MARY AV	Vargas
9	CARSON DR & CARSON DR & S MARY AV	Vargas

Improvements to Consider	Install High Visibility Crosswalks
Criteria	Option 2 Stop controlled intersections, along a school route, with no crosswalks, within ½ mile of a school
Query	"Control" = 'stop' AND "School" <> 'not school' AND "In_half_mi" = 'yes' AND "Crosswalk" = ''
Result file name	stops_for_improvementbroad.shp
Map Label and Symbol	256 intersections  Mark x-walk at Stop - Option2 -within 1/2 mile