

Introduction to Traffic Engineering & Operations

Jaime Rodriguez, Traffic Engineer
Public Works Department
March 13, 2025



Speaker Info – Jaime O. Rodriguez

Education: B.S. Civil Engineer
M.S. Transportation Management

Past Experience: Palo Alto Chief Transportation Official
Milpitas City Traffic Engineer
San Jose Transportation - Capital Project Specialist
Walnut Creek Traffic Operations Technician

Current: Founder Traffic Patterns
Co-Founder: Smart City Signals
SchoolRoutes.org

Current City Partners: Salinas
Watsonville
Concord
Foster City
Los Altos
Los Altos Hills
Millbrae
Palo Alto
Pleasant Hill
Redwood City
Saratoga
Woodside

TRAFFIC PATTERNS



Today's Topics

Traffic Engineering

- Design
- Signage & Striping
- Planning
- Master Plans
 - Traffic Impact Studies

Traffic Operations

- Customer Investigations
- Curb Mngmt
 - Intersection Controls
 - Neighborhood Traffic Mngmt
 - Speed Surveys

Engineering Standards & Best Practices

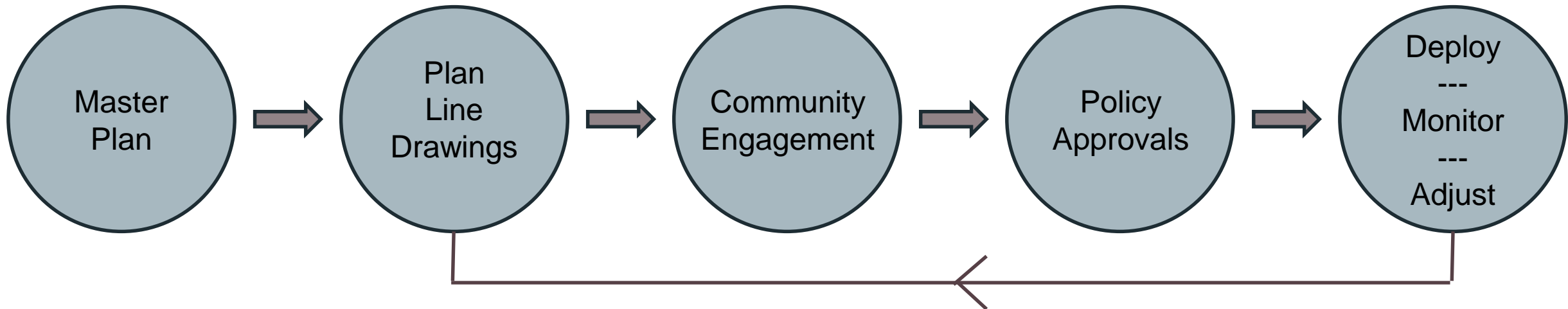
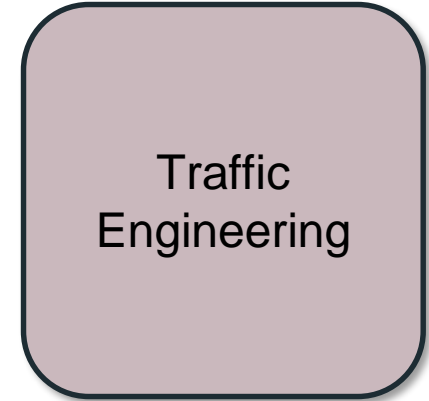
- MUTCD
- CA Vehicle Code
- Institute of Transportation Engineers (ITE)
- NACTO

Roadway Infrastructure & Management

- NOT TODAY
- Traffic Signals
- ITS | Communications
- Pavement Mngmnt

Signage & Striping Plans

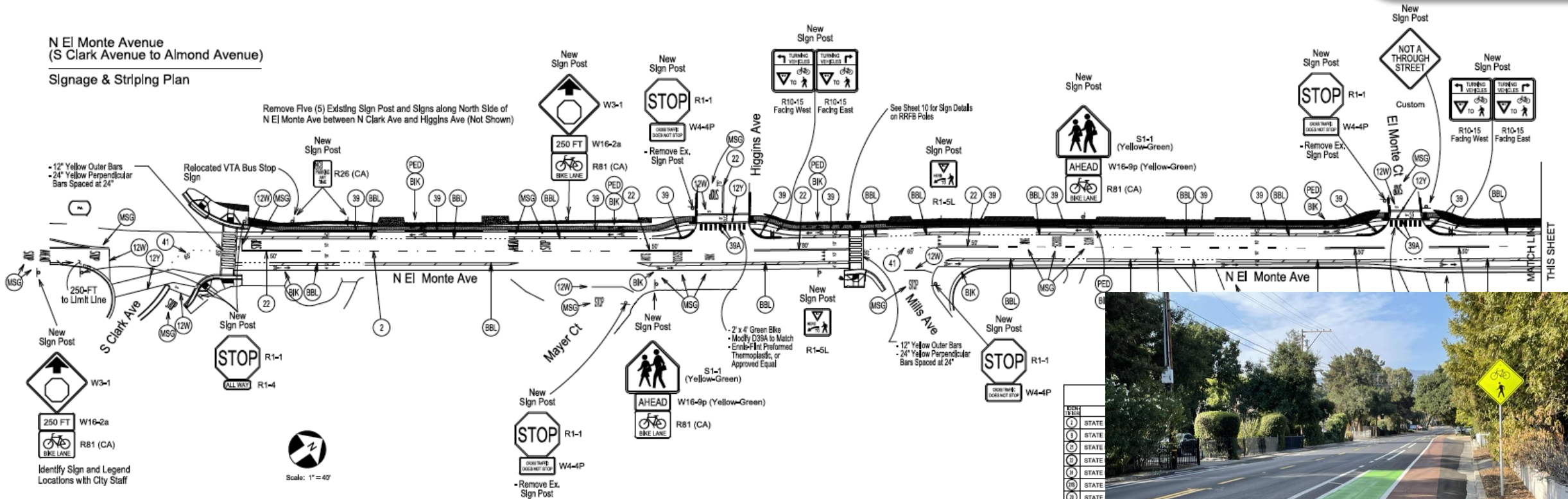
- Typically Implemented with CIP Projects
Annual Street Resurfacing
- Implement Master Plan Documents
Bicycle & Pedestrian | Complete Streets | Active Transportation Plans
Safe Routes to School Programs
Safe Routes to Parks
- Successful Projects Start with Community Engagement



N El Monte Avenue (S Clark Avenue to Almond Avenue)

Signage & Striping Plan

Remove Five (5) Existing Sign Post and Signs along North Side of N El Monte Ave between N Clark Ave and Higgins Ave (Not Shown)



12" Yellow Outer Bars
24" Yellow Perpendicular Bars Spaced at 24"

Relocated VTA Bus Stop Sign

250-FT to Limit Line

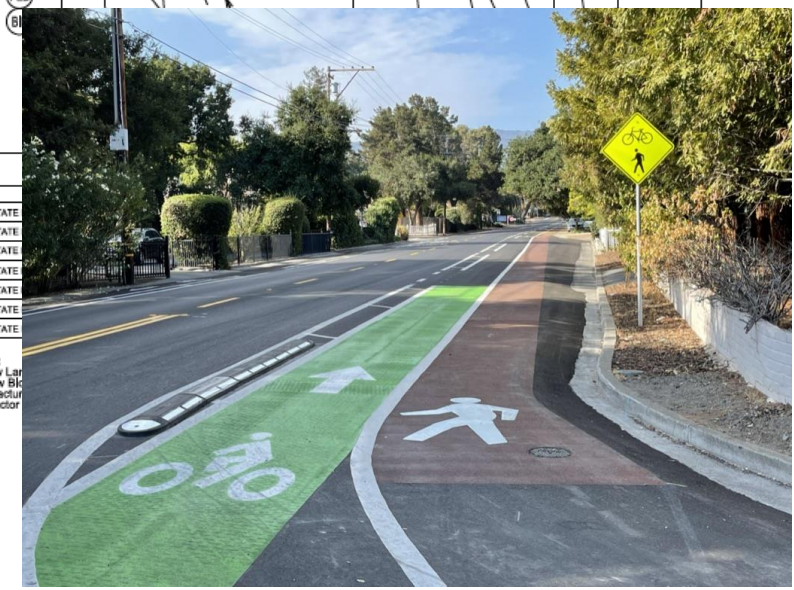
Identify Sign and Legend Locations with City Staff



Scale: 1" = 40'

Legend	Symbol	Description
(1)	STATE	STATE
(2)	STATE	STATE
(3)	STATE	STATE
(4)	STATE	STATE
(5)	STATE	STATE
(6)	STATE	STATE
(7)	STATE	STATE

NOTES:
 - All new Lar
 - All New Bk
 - Manufactur
 - Contractor



THIS SHEET

Master Plan Documents

Bicycle & Pedestrian Transportation Plan

- Proposed Bike & Ped Network Maps

Class I – Pathways

Class II – Bike Lanes

Class IIB – Buffer Bike Lanes

Class III – Bike Routes

Class III – Neighborhood Bike Routes

Class IV – Protected Bikeways

- High Collision Areas

Safe Routes to School

- Walk n Roll Routes

- School Improvement Maps

General Plan

- Policy
- Programs
- Projects

Traffic
Engineering

Dr. Martin Luther King Jr. Elementary School

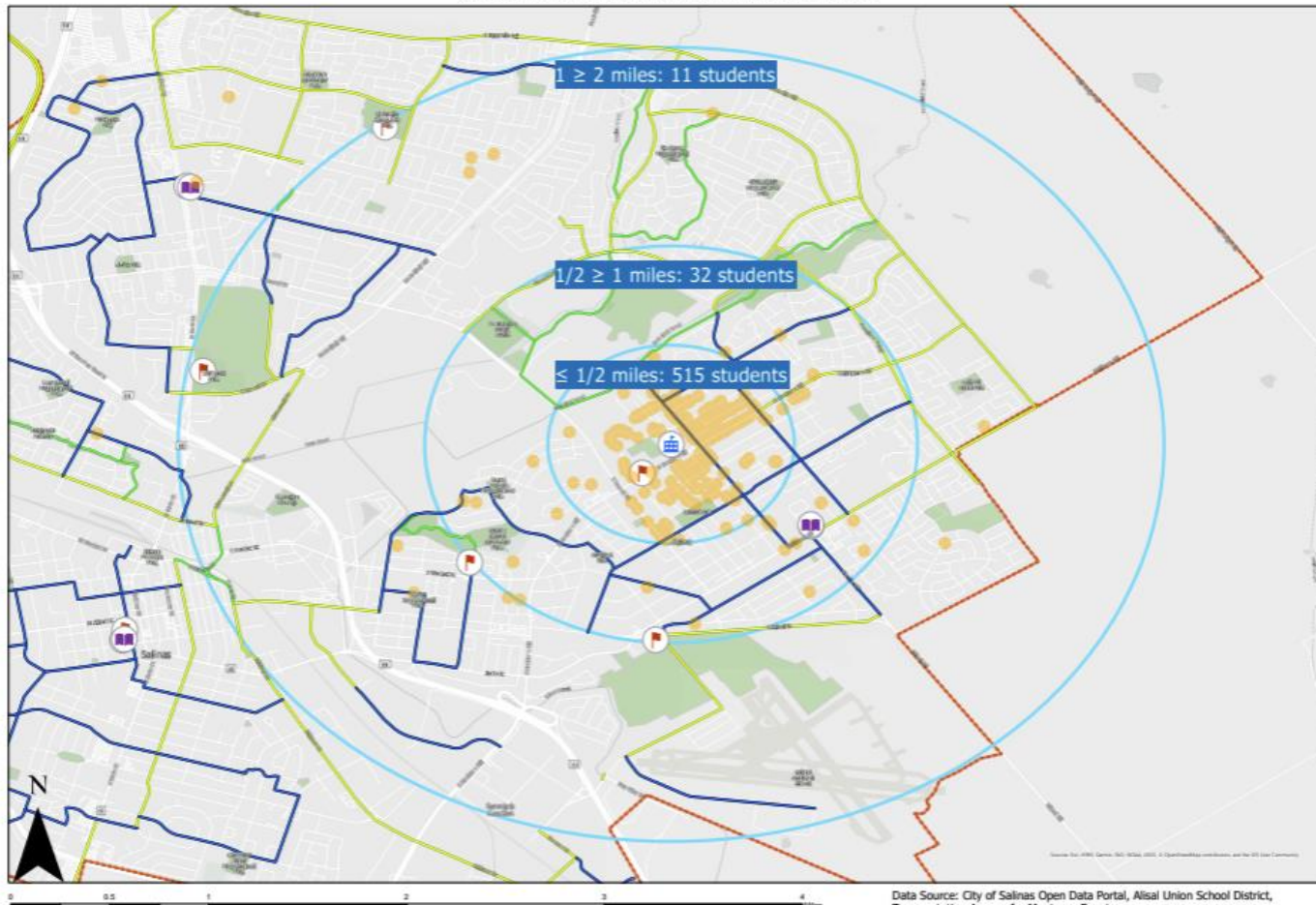
Salinas Safe Route to School Plan

Traffic Engineering

Legend

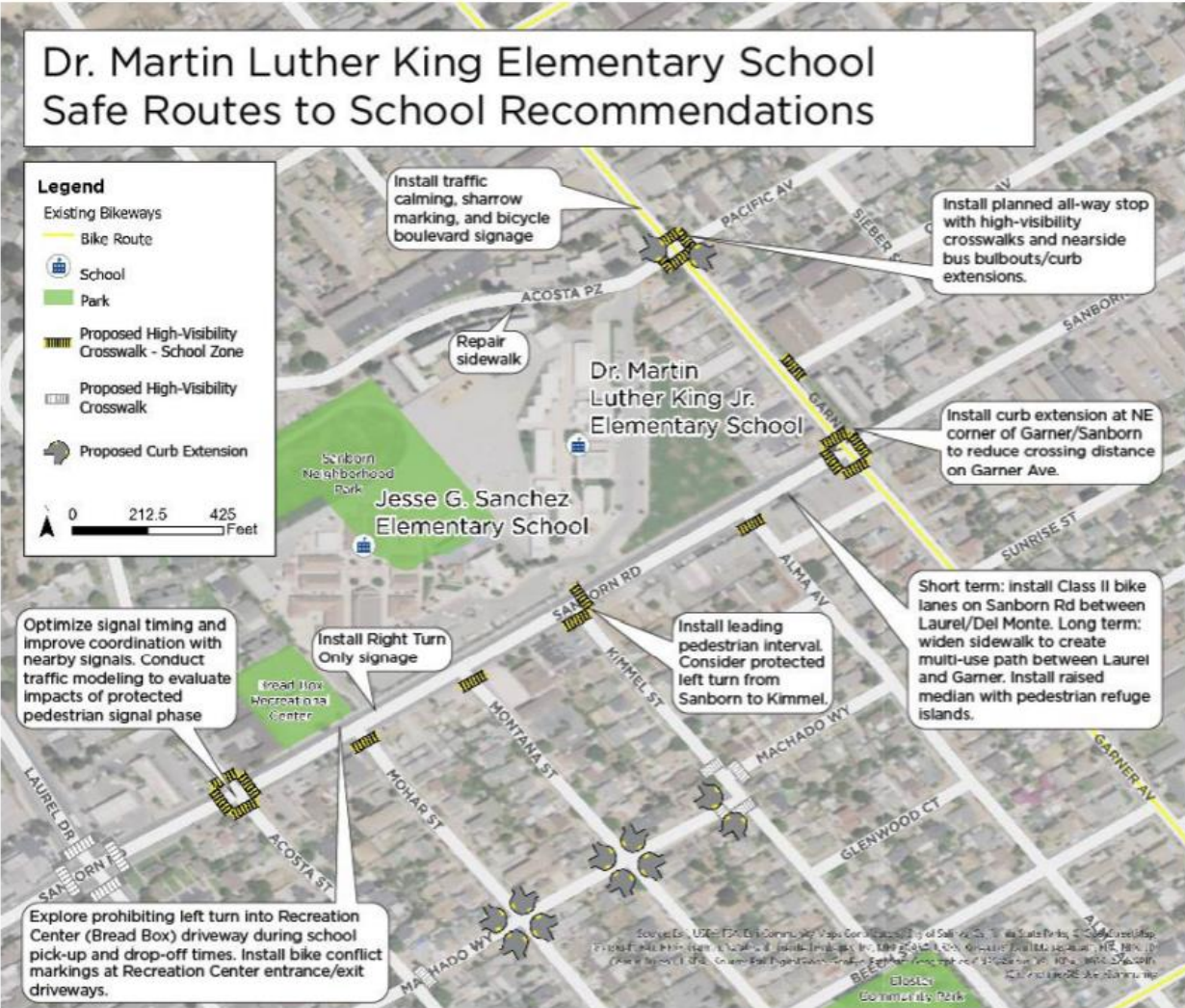
- Students
- Dr. Martin Luther King Jr.
- Public Libraries
- Community Centers
- Parks
- Salinas Boundary
- Existing Bike Infrastructure
 - Bike Path
 - Bike Lane
 - Bike Route

1 mile | 1/4 mile
6 minutes | 5 minutes



Data Source: City of Salinas Open Data Portal, Alisal Union School District, Transportation Agency for Monterey County

Traffic Engineering



SAFETY IMPROVEMENTS




- Bicycle boulevards** are streets with low traffic volumes and speeds that are designed to prioritize bicycle travel. They can include traffic calming measures like speed bumps or chicanes.
 
- Protected Pedestrian Signal Phases** are traffic signals where people walking do not cross at the same time as drivers are making left turns.
 
- Traffic Calming** uses measures including speed humps, traffic circles, and chicanes to slow vehicle traffic on residential streets and improve safety and conditions for walkers and cyclists.
 
- Rectangular Rapid Flashing Beacons** are used at uncontrolled intersections or mid-block crosswalks to alert drivers to people who are waiting to cross the street.
 

ILLUSTRATION CREDIT: NACTO.ORG

Blossom Hill Elementary School

WALK & ROLL TO SCHOOL SUGGESTED ROUTES

- | | |
|-------------------------------------|------------------|
| Walk 'n Roll Suggested School Route | Traffic Signal |
| Walking Only Suggested School Route | All-Way Stop |
| Bike Parking | Marked Crosswalk |
| Parking | Crossing Guard |
| Parking Prohibited | Fire Station |

Suggested On-Campus Traffic Circulation

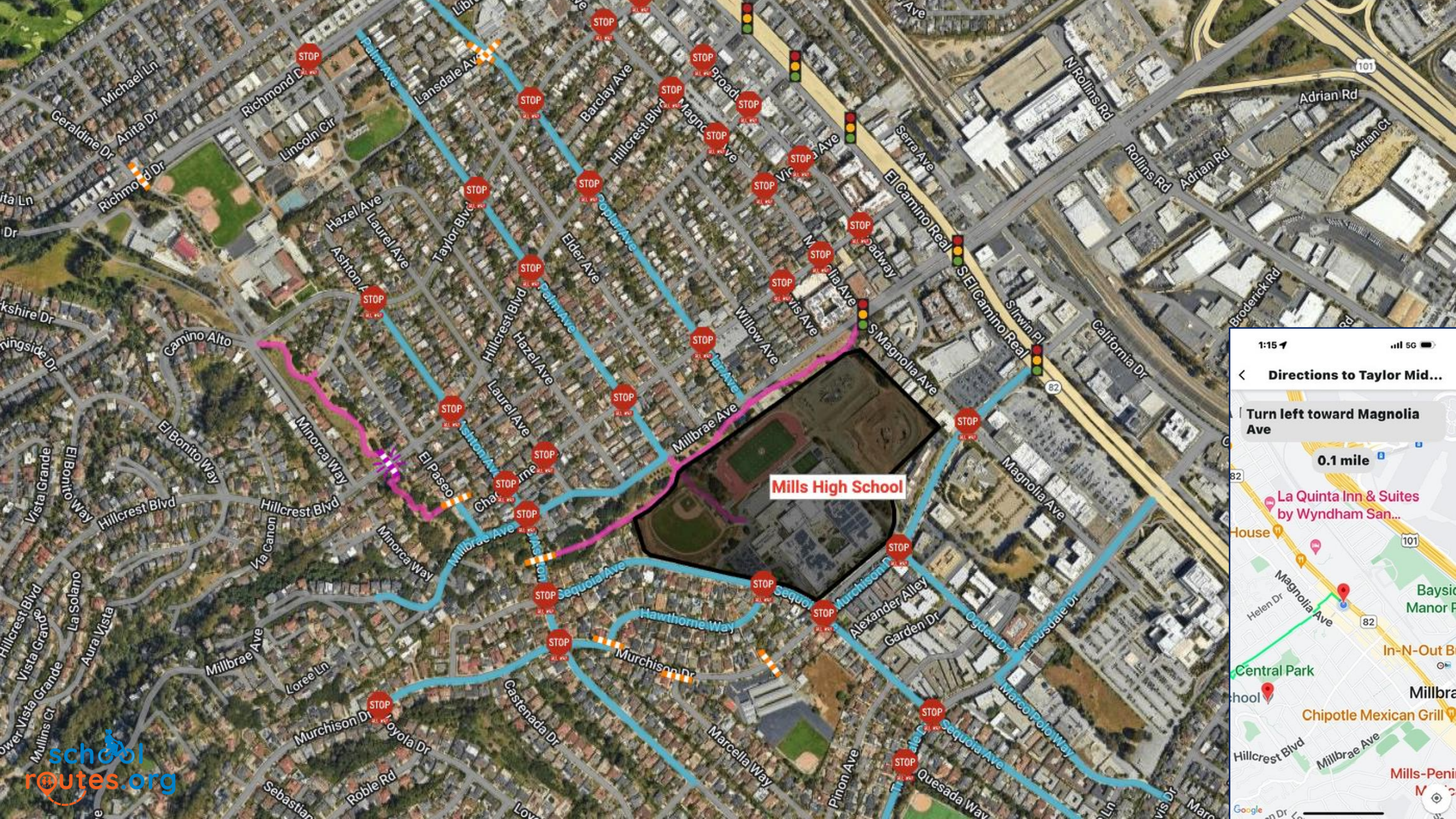


Designated Student Drop Off/Pick Up areas help to consolidate and organize the school circulation patterns. This can increase safety for students, as it minimizes the number of students walking through drive lanes and the parking lot. Parents are responsible for choosing the most appropriate option based on their knowledge of the conditions on the different routes and the experience level of their child.

For more Safe Routes to School information, please visit:
www.LosGatosCa.gov/SafeRoutes or
 email SafeRoutes@LosGatos.gov



Traffic Engineering



Mills High School

1:15 5G

< Directions to Taylor Mid...

Turn left toward Magnolia Ave

0.1 mile

La Quinta Inn & Suites by Wyndham San...

House

Magnolia Ave

Central Park

Chipotle Mexican Grill

Mills-Peni

Google

Curb Management

- Red Curb (Sight Distance | Access Control)
- Commercial Loading
- Passenger Loading (Schools)

Intersection Access Control (Warrants)

- Crosswalks
- Side Street STOP
- All Way STOP
- Traffic Signals

Traffic
Operations

Curb Management

- Red Curb (Sight Distance | Access Control)
- Commercial Loading
- Passenger Loading (Schools)

Intersection Access Control (Warrants)

- Crosswalks
- Side Street STOP
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Traffic
Operations

Red Curb – Sight Distance



Sight Distance Standards

Design Speed ⁽¹⁾ (mph)	Stopping ⁽²⁾ (ft)
10	50
15	100
20	125
25	150
30	200
35	250
40	300
45	360

Traffic
Operations

Your City Logo

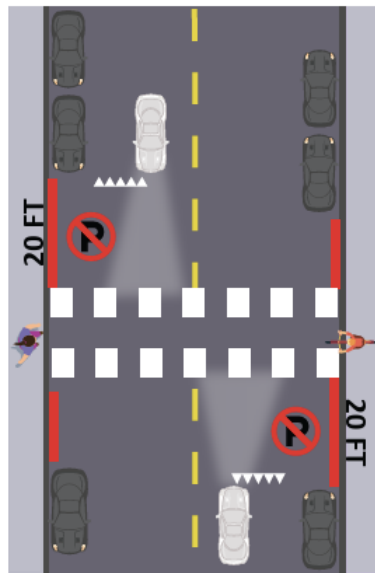
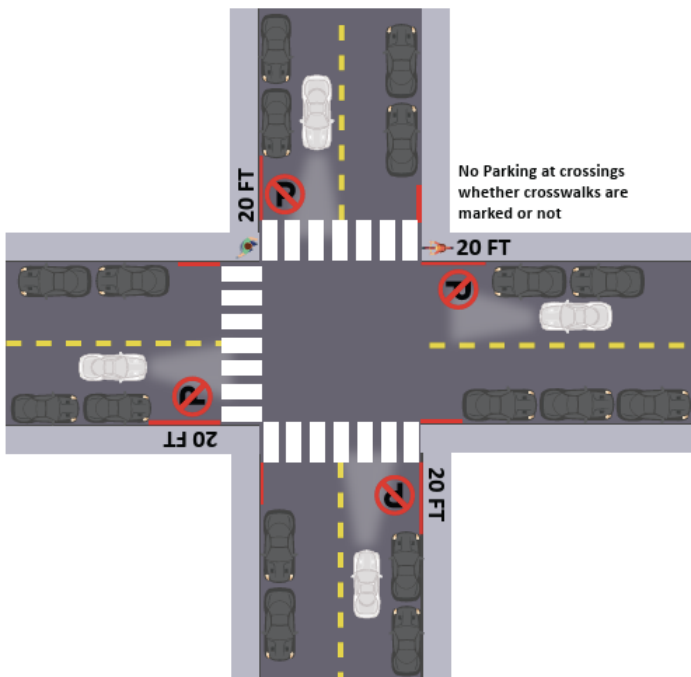
INTERSECTION DAYLIGHTING



CA State Law: Vision Clearance Guidelines at Intersection

Improve Visibility at Crosswalks

California State Law – AB413 eliminates 20 FT of parking in front of crosswalks and at intersections for the intent of "Daylighting" the crossings to help improve visibility between pedestrians & bicyclists and motorists. The law restricts parking regardless of whether red curb or parking sign restrictions are in place, motorists should avoid parking directly in front of crosswalks to comply with the new state law.



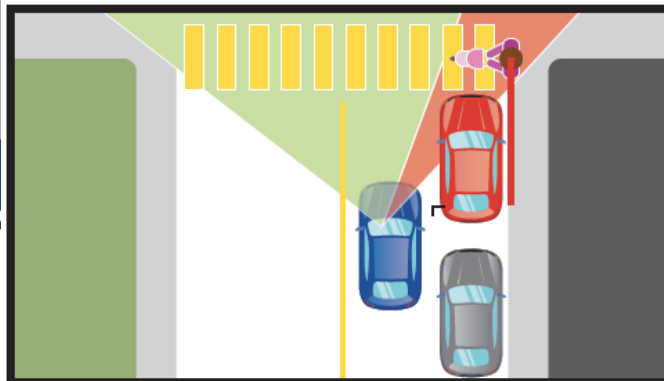
Parking Compliance:

No stopping or parking within 20 FT of a marked crosswalk or intersections is allowed starting January 1, 2025. Motorists are responsible for complying with the law whether parking is restricted using red curb or parking sign restrictions.

State Law Implementation:

AB413 allows for immediate parking enforcement starting January 1, 2025. Motorists are encouraged to self-comply with the law to avoid citations.

WARNING NOTICE



Parking within 20 feet of a crosswalk or intersection is prohibited regardless of whether red curb or parking sign restrictions are in place.

Under California State Law AB413 (the "Daylighting Bill"), parking near crosswalks and intersections is banned to improve visibility for pedestrians, cyclists, and drivers.

This is a Warning Notice only. The City will begin issuing citations soon.

For more information on this new law, please visit watsonville.gov



WATSONVILLE POLICE

QR

WARNING NOTICE

Parking within 20 FT of a crosswalk or intersection is not permitted.

California State Law, AB413 known as the Daylighting bill, restricts parking within 20 FT of crosswalks and intersections to improve visibility between pedestrians & bicyclists and motorists. Parking is not permitted whether crosswalks are marked or not.

This is a Warning Notice only. Parking citation enforcement will begin shortly.



AVISO DE ADVERTENCIA

Estacionarse a menos de 20 pies de un paso de peatones o intersección no está permitido.

La ley estatal de California, AB413, conocida como la ley de "Daylighting" (Iluminación Diurna), restringe el estacionamiento a menos de 20 pies de pasos de peatones e intersecciones para mejorar la visibilidad entre peatones, ciclistas y conductores. El estacionamiento no está permitido, ya sea que los pasos de peatones estén marcados o no.

Este es solo un aviso de advertencia. El cumplimiento de las citaciones de estacionamiento omenzará pronto.

CA State Law AB43 – Daylighting

Prohibits Parking within 20-FT of Marked or Unmarked Crosswalks

All Way STOP Studies

- Isolated Intersection Analysis (This Slide)
- Master Plan Recommendation

Traffic
Operations

Data Collection Process: 12-Hour
Vehicle Turning Movement Count

Bicycle & Pedestrian Volumes

Quantitative: 8 Hour Continuous Street
300 vehicles/hour on Major St vs 200 Vehicles-Bike-Peds

Qualitative: Crash History
Land Use (High Ped-Bike Generators)
Roadway Geometry (Curves, Hills, etc.)
Sight Distance

TRAFFIC PATTERNS



Multi-Way STOP Analysis

City: **Los Altos, CA**
 Intersection: **Cuesta Dr & Gabilan St**
 Study Date: **9/21/23**

Multi-Way STOP Installation Criteria based on California MUTCD 2014 Edition - Rev 1

Page 1 of 2

A. Interim Measure prior to Traffic Signal Installation

Where traffic control signals are justified, the multi-way 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.

Has a traffic signal warrant study been conducted for this intersection that recommends installation of a traffic control signal? Yes No

Temporary Multi-Way STOP Installation criteria satisfied? Yes No

B. 12-Month Crash History

Five or more reported crashes in a 12-month period that are susceptible to correction by a Multi-Way STOP installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.

Total Number of crashes in 12-month period susceptible to correction by a Multi-Way STOP: 4/12/2019 w/Bike: 1 Crash(es)

Multi-Way STOP Installation criteria satisfied? Yes No

C. Minimum Volumes

- C1 The vehicle 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 the day; and
- C2 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 higher hours; but
- C3 If the 85-th percentual approach speed of the major-street traffic exceeds 40 MPH, the minimum vehicular volume warrants are 70 percent of the values provided in Items C1 and C2.

Hour	Eastbound Cuesta Dr				Westbound Cuesta Dr				Northbound Gabilan St				Southbound Gabilan St			
	Autos	Peds	Bikes	Total	Autos	Peds	Bikes	Total	Autos	Peds	Bikes	Total	Autos	Peds	Bikes	Total
7:00 AM	52	4	4	60	111	1	4	116	7	3	0	0	19	4	2	25
8:00 AM	137	2	4	143	226	0	4	230	15	2	2	0	31	4	5	40
9:00 AM	95	1	0	96	176	4	1	181	11	0	0	0	20	3	2	25
10:00 AM	92	2	0	94	173	5	3	181	6	1	2	0	22	6	2	30
11:00 AM	110	0	0	110	180	4	3	187	10	3	1	0	16	4	3	23
12:00 PM	115	4	2	121	168	4	2	174	15	1	2	0	15	5	0	20
1:00 PM	137	2	1	140	171	2	4	177	12	0	6	0	16	8	4	28
2:00 PM	148	1	3	152	162	3	1	166	16	2	0	0	17	7	3	27
3:00 PM	136	2	6	144	204	0	1	205	15	2	4	0	32	0	5	37
4:00 PM	165	1	3	169	194	2	2	198	11	1	1	0	23	1	0	24
5:00 PM	168	1	3	172	215	0	3	218	10	2	4	0	28	1	2	31
6:00 PM	139	1	2	142	153	4	0	157	10	9	0	0	21	5	0	26

Major Street EB 85-th % Speed: 31.5 MPH 2016 Speed Survey Recommended Speed Limit: 25 MPH
 Major Street WB 85-th % Speed: 31.5 MPH 2016 Speed Survey Recommended Speed Limit: 25 MPH

- C1 8 Hour minimum volume on Major Street satisfied? Yes No
 - C2 8 Hour minimum volume on Minor Street satisfied? Yes No
 - C3 85-th percentual approach speed on Major Street exceeds 40-MPH? Yes No
- 70 Percent Values in C1 and C2 Satisfied? Yes No Major Street

TRAFFIC PATTERNS



Multi-Way STOP Analysis

City: **Los Altos, CA**
 Intersection: **Cuesta Dr & Gabilan St**
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Multi-Way STOP Installation Criteria based on California MUTCD 2014 Edition - Rev 1

Page 2 of 2

D. 80% Minimum Values

Where no single criterion is satisfied, but where Criterion B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

B-80% Crash History satisfied to 80% of the minimum values: Yes No

C1-80% Major Street (State Street) satisfied to 80% of the minimum values: Yes No

C2-80% Minor Street (2nd Street) satisfied to 80% of the minimum values: Yes No

E. Other Engineering Study Factor for Multi-Way STOP Installation

Other criteria that may be considered in an engineering study for a Multi-Way STOP Installation 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 negotiate the intersection unless conflicting cross traffic is also required to stop
- D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where Multi-Way STOP control would improve traffic operational characteristics of the intersection.

A. Are majority of Crashes in Section B - 12 Month Crash History left-turn crashes or do field conditions require mitigations against left turn conflicts? Yes No

B. Identify the potential pedestrian generators near or adjacent to the study intersection:

- Covington Elementary School
- Egan Middle School
- Los Altos High School

Can installation of a Multi-Way STOP better control vehicle/pedestrian conflicts at the study intersection? Yes No

C. Are there sight distance or other geometric considerations that can be improved through installation of a Multi-Way STOP at the study intersection? Attach any additional study documentation. Yes No

D. - Are the two streets of the study intersection predominantly residential land use? Yes No
 - Are one or both of the streets classified as a Collector street? Yes No
 - Would installation of a Multi-Way STOP improve traffic operational characteristics of the intersection or the Collector street? Yes No

MULTI-WAY STOP installation recommended at Cuesta Dr & Gabilan St
 Yes No

CERTIFICATION:

This Multi-Way STOP Analysis was determined in accordance with the recommendations set forth by the California - Manual on Uniform Traffic Control Devices (MUTCD) - 2014 Edition - Rev 2 and was conducted by a Registered Traffic Engineer within the State of California and Approved by the City of Los Altos.

Engineer's Stamp



Multi-Way STOP Analysis - Prepared by
 Jaime O. Rodriguez, T.E. - Traffic Patterns

Neighborhood Traffic Management (Traffic Calming)



1. Traffic Operations Standards

- Ensure Consistency with Best Practice Standards
- Quick Build Improvements
Signage & Striping

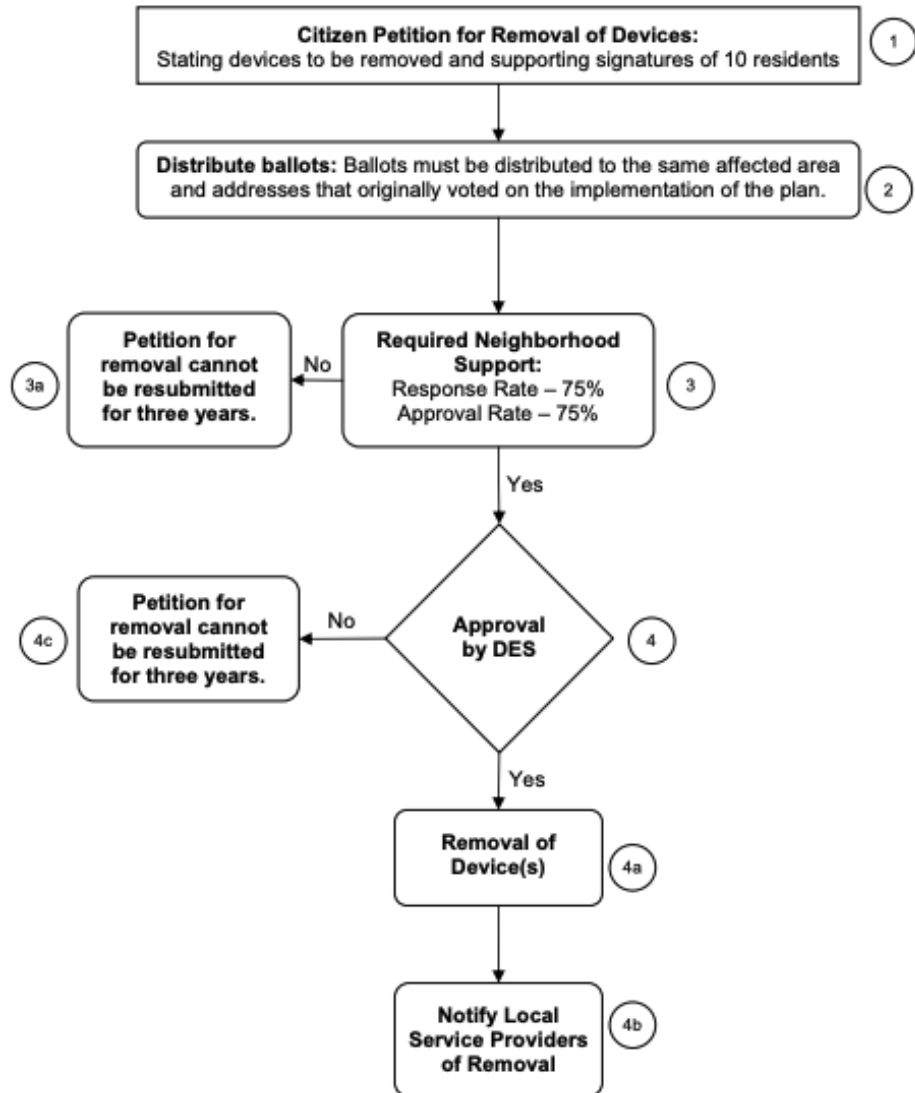
2. Minor Traffic Calming Improvements

- Data Collection
- Community Engagement
- CIP Projects
Vehicle Speed Feedback Signs
Enhanced Crosswalks
Temporary | Demonstration Treatments

3. Minor Traffic Calming Improvements

- Data Collection
- Neighborhood Champion Petitions
- Community Engagement
- Silent Surveys
- Community Engagement
- Policy & Funding Approvals

Figure 2 NTMP Process For Removal



TRANSPORTATION



& PLANNING



FEHR & PEERS
TRANSPORTATION CONSULTANTS

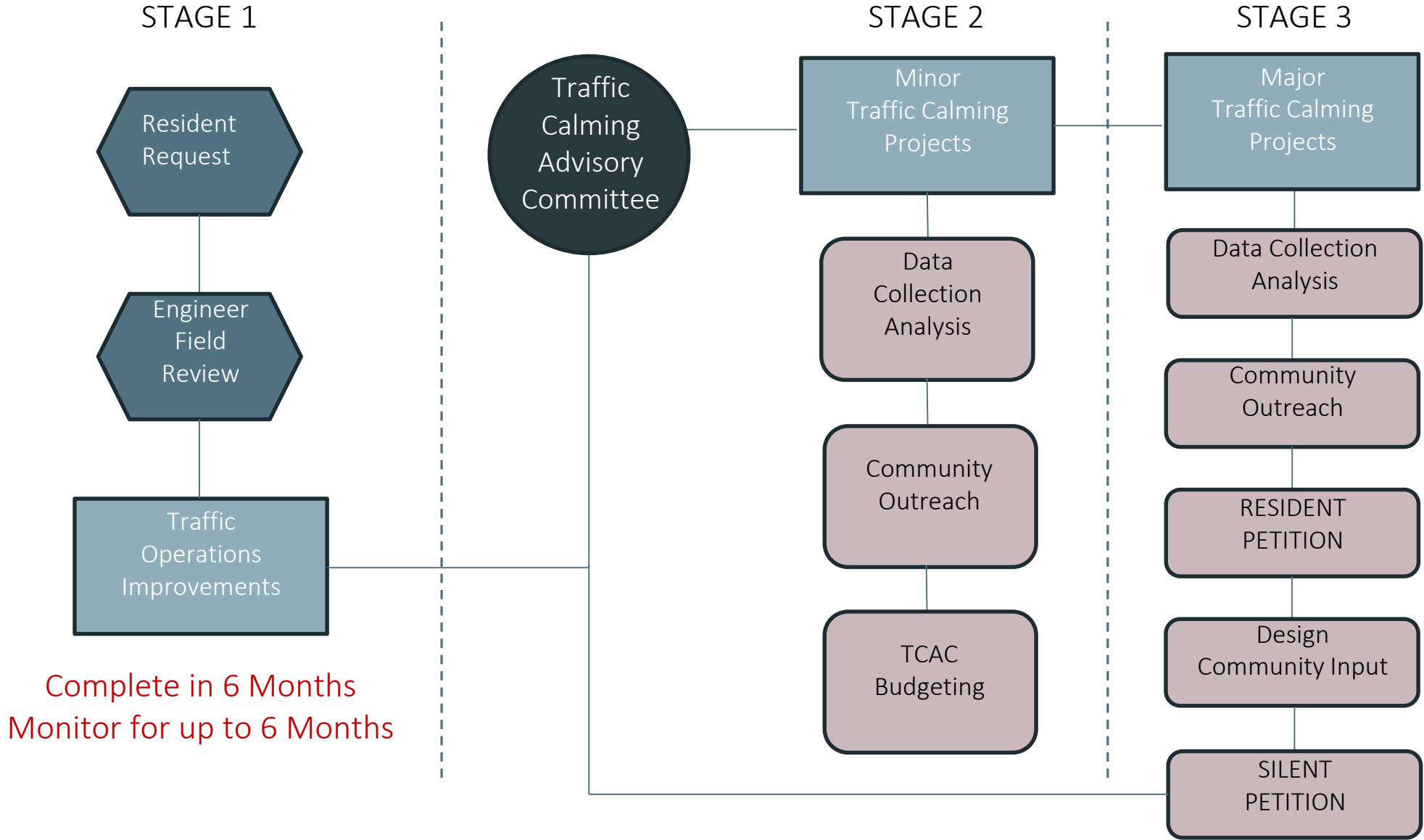
160 W. Santa Clara St., Ste. 675
San Jose, CA 95113

SJ07-905

November 2008

Traffic Calming Program Structure

Traffic Calming – Developing Trends



TRAFFIC PATTERNS



Speed Hump | Speed Table Configurations

Traffic Calming – Developing Trends



Speed Hump
Across Entire Roadway
18" Slots



+30 Seconds Travel Time per Hump



Speed Table
Half Street



+5 Seconds Travel Time per Hump

Manual on Uniform Traffic Control Devices (FED & CA)

Signs

Markings

Traffic Control

School Zones

Traffic Signals

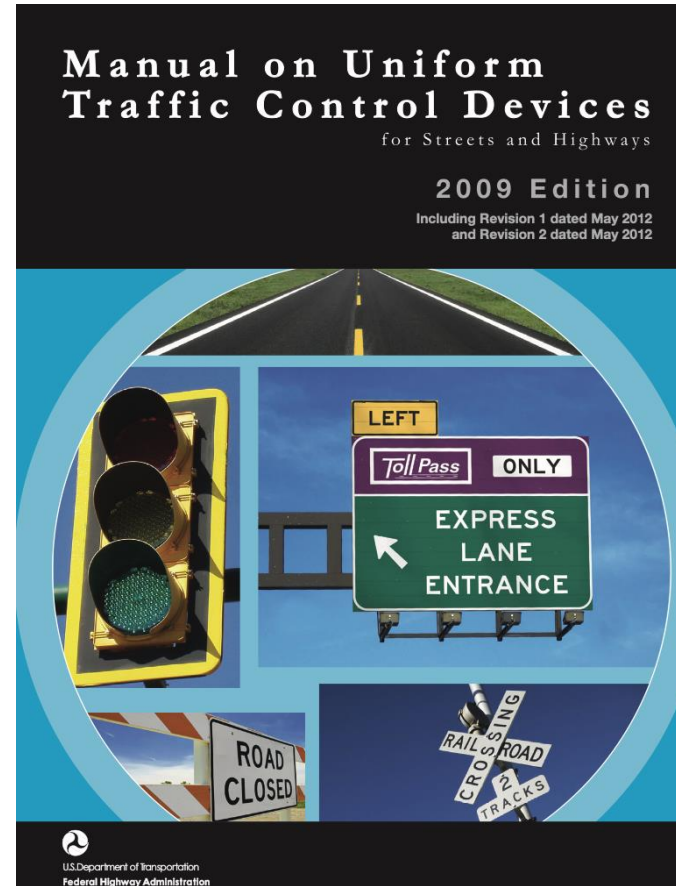
Rail Roads

CA Vehicle Code

Enforcement

Practices & Standards

Engineering
Standards
&
Best
Practices



Institute of Transportation Engineers (ITE)

Trip Generation

Land Use

Parking Generation

Land Use

Best Practice Applications

Design Practices

On-Going Education

Conferences

Online Courses

Certifications

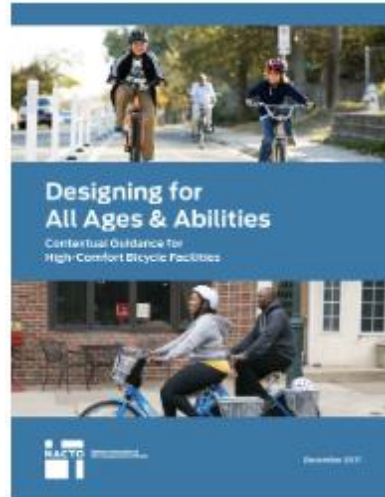
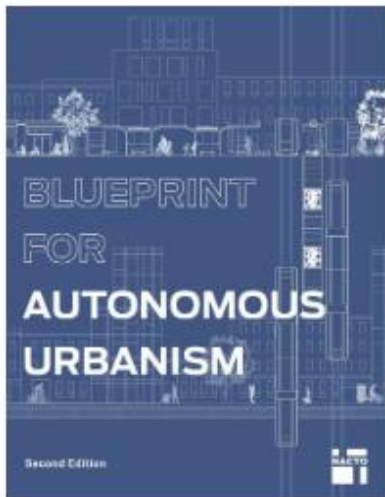
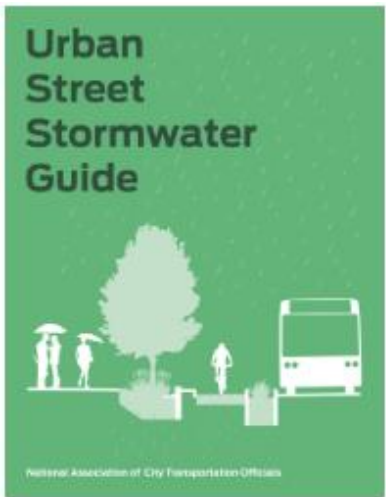
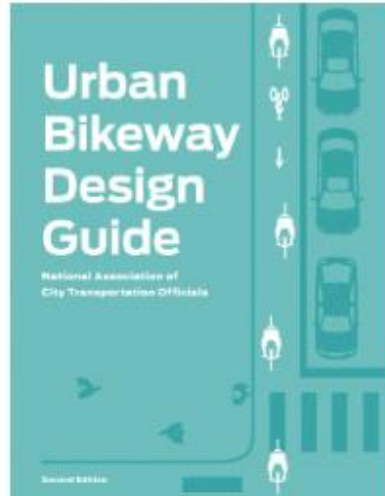
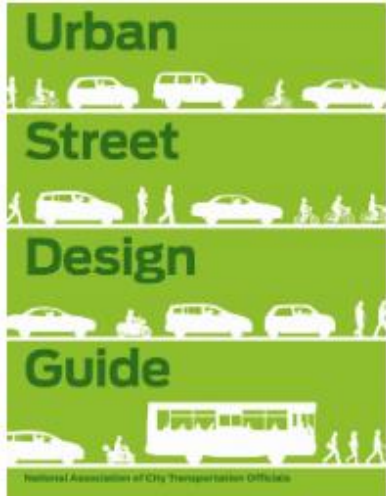
License



Engineering
Standards
&
Best
Practices

National Assoc. of City Transportation Officials (NACTO) Best Practices Standards before Federal and State Adoption

Engineering
Standards
&
Best
Practices

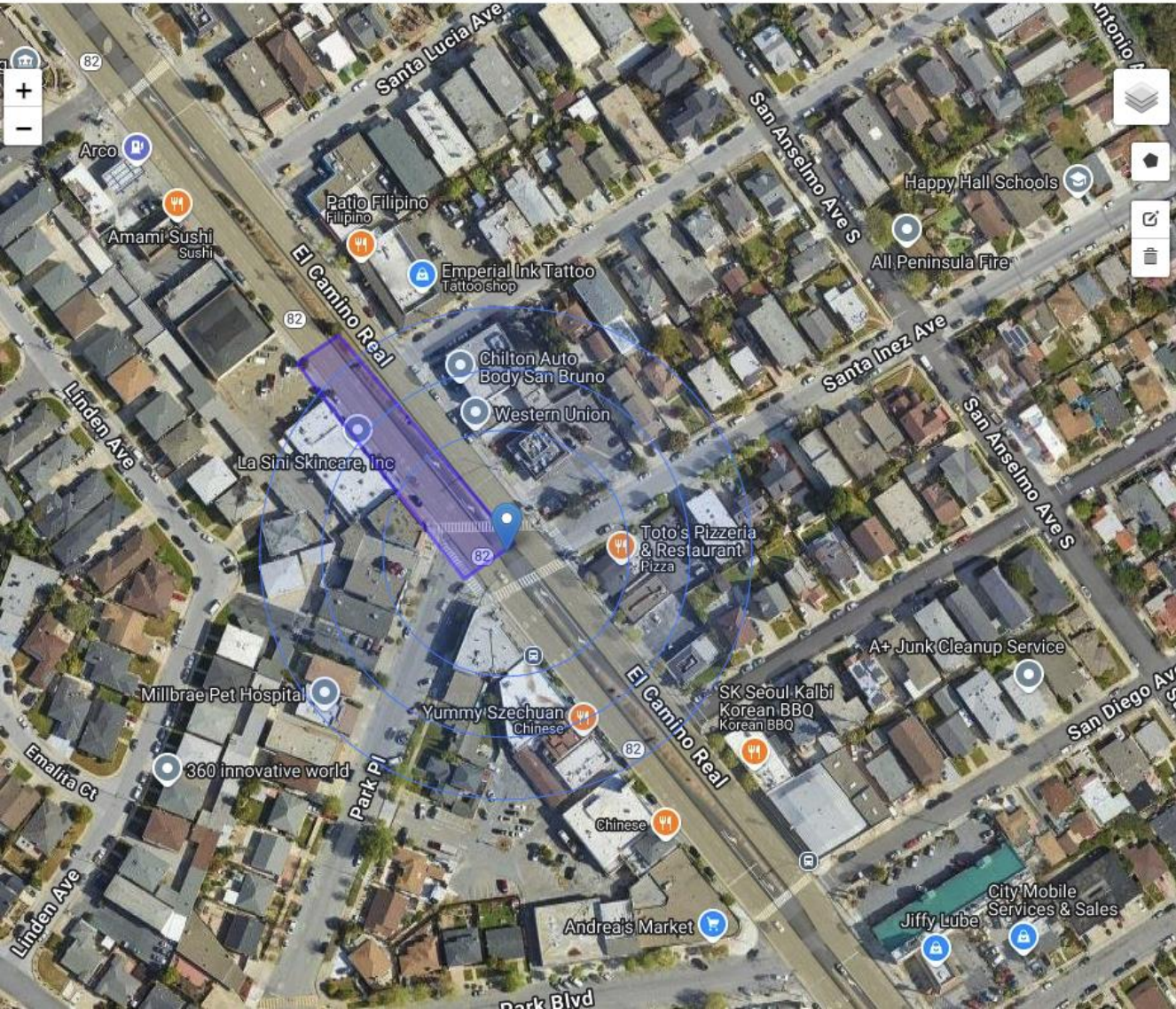


Technology Solutions for Traffic Management @ Schools

Traffic Calming – Developing Trends



Virtual Detection – Vector Setup



Approach Vectors
24-11 SBT 2 64

Device*
1 - El Camino Real & Santa Inez Ave-Park PI

Latitude*
37.613871

Longitude*
-122.40498

meters feet

Circle 1*
150

Circle 2*
225

Circle 3*
300

Circle 4*
0

Path
[[[37.61450777910001,-122.40586466396809],
[37.61378710709995,-122.4051541881636],
[37.613906050977114,-122.40494229365142],

Type*
Bicycle

Is PHB

Channel*
OUT_16: Phase 2 Bike

Direction*
Southbound Thru

Phase Ø*
2

Voice

Note

Virtual Detection
Bike Mode (app)
Pedestrian Mode (app)

Emergency Vehicle
(Tablet App or GPS)

Transit
(Tablet App or GPS)

Train Advanced
Detection
(Tablet App or GPS)

Developing
Trends

Technology
Advancement

Questions & Comments

