

SUNNYVALE ROADWAY SAFETY PLAN TECHNICAL APPENDIX



Prepared for:

City of Sunnyvale

Approved by City Council
September 29, 2020



Sunnyvale

TECHNICAL APPENDIX

- A. Prioritized Collision Data
- B. Collision Analysis Methodology
- C. Safety Countermeasure Toolbox
- D. Outreach Summary
- E. Project Locations Collision Data
- F. HSIP Benefit/Cost Worksheets
- G. Project Collision Stick Diagrams

A. PRIORITIZED COLLISION DATA

Table A1: Signalized Intersections Prioritized by Total Number of Collisions (July 1, 2013 – June 30, 2018)

Legend: Probability of Crash Type Exceeding Threshold Proportion¹: 90-100% ■ 80-90% ■

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Signalized Intersections																	
Mathilda Ave & Maude Ave	70	0.32	-	-	15	10	29	1	3	2	2	19	25	1	15	5	-
Central Expwy & Mary Ave	69	0.25	1	-	18	6	31	3	5	1	2	12	29	2	22	8	1
El Camino Real & Wolfe Rd	66	0.24	-	1	14	11	21	3	5	-	4	22	21	2	22	3	-
El Camino Real & S Mathilda Ave	61	0.07	-	-	14	16	20	3	3	-	-	14	16	2	15	6	1
Fremont Ave & Sunnyvale Saratoga Rd	54	0.16	-	-	7	8	21	1	4	3	5	7	15	2	11	5	-
Bernardo Ave & El Camino Real	51	0.08	-	-	9	8	23	-	1	3	1	13	22	-	9	3	-
El Camino Real & Sunnyvale Ave	50	0.17	-	-	6	11	13	3	4	2	7	14	9	1	15	4	-
El Camino Real & Fair Oaks Ave	50	0.13	-	1	10	5	22	1	4	3	3	9	16	2	15	2	-
Remington Dr & Sunnyvale Saratoga Rd	49	0.11	-	-	6	5	21	1	7	2	3	5	20	-	5	5	-
Lawrence Expy & Tasman Dr	48	0.06	-	-	15	7	11	2	9	-	-	15	11	1	15	3	1
El Camino Real & Mary Ave	48	0.05	-	-	6	8	18	2	5	2	5	14	15	2	14	2	-
Mathilda Ave & 237 EB Ramp	47	-0.10	-	-	17	12	5	-	3	-	-	4	9	1	8	3	-
Mathilda Ave & Ross Dr	46	0.14	-	2	13	7	12	3	3	3	1	8	11	-	12	4	-
Lawrence Expy & Kifer Rd	43	0.05	-	-	10	8	20	-	-	1	-	8	18	2	5	3	1
El Camino Real & Hollenbeck Ave	42	0.04	-	2	9	6	12	-	3	3	4	6	8	1	7	2	1
Old San Francisco Rd & Reed Ave	42	0.23	-	-	8	6	16	2	4	-	1	8	16	2	5	3	1
El Camino Real & Henderson Ave	39	0.11	1	-	8	3	17	-	2	3	3	11	11	1	13	3	1
Cezanne Dr & El Camino Real	39	0.20	1	2	5	5	11	1	3	8	2	5	10	1	8	2	-
Mathilda Ave & Almanor Ave/Ahwanee Ave	36	-0.17	-	-	7	9	10	-	3	-	-	9	11	1	10	2	-
Lakehaven Dr & Sandia Ave	35	-0.03	-	1	8	8	12	-	2	-	1	11	13	1	16	1	-

¹ Probability of Crash Type Exceeding Threshold Proportion is based on the probability that the long-term proportion of a specific crash type exceeds a threshold proportion for the site's reference population. See **Appendix B: Collision Analysis Methodology** for additional information.

² Critical Crash Rate (CCR) is a statistical threshold for screening sites to determine if the number of crashes are above the statistical range of crashes that could be expected to occur and indicative of a potential safety concern or issue. See **Appendix B: Collision Analysis Methodology** for additional information.

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Fremont Ave & Wolfe Rd	34	0.23	1	1	5	13	9	-	-	1	-	9	10	1	8	2	-
Lawrence Expwy & Persian Dr	34	-0.03	-	-	2	9	17	1	1	-	-	10	14	2	10	2	1
Duane Ave & Oakmead Pkwy	33	-0.05	-	-	6	4	19	2	-	-	1	10	14	-	10	1	-
Arques Ave & Wolfe Rd	32	0.00	-	2	10	8	6	2	3	-	1	2	4	1	5	2	-
Moffett Park Dr & Mathilda Ave	31	0.02	-	-	11	4	12	1	-	-	2	3	10	2	6	1	1
Mathilda Ave & WB SR 237 On/Off-ramps	30	-0.19	-	-	9	6	5	2	2	-	-	4	8	2	5	2	-
Evelyn Ave & Mary Ave	29	0.40	-	-	4	4	9	2	7	-	2	9	8	1	4	2	-
Fair Oaks Ave & Arques Ave	29	0.05	-	-	6	5	10	3	1	-	-	6	12	-	3	2	-
Duane Ave & Fair Oaks Ave	28	0.04	-	-	2	5	15	1	1	1	2	6	16	-	5	2	-
Fair Oaks Ave & Old San Francisco Rd	28	0.05	-	-	4	6	13	1	1	-	-	4	13	1	6	1	-
Homestead Rd & Wolfe Rd	28	-0.04	-	1								5	7	1	4	1	-
El Camino Real & Poplar Ave	27	-0.02	-	-	5	4	10	-	1	2	2	6	6	-	6	1	-
Lawrence Expwy & Arques Ave	27	-0.14	-	-	4	8	10	-	2	-	-	7	8	1	4	1	-
California Ave & Mathilda Ave	25	-0.06	-	-	1	3	12	-	5	-	2	2	12	-	4	2	-
El Camino Real & Maria Ln	25	-0.04	1	-	3	2	7	-	4	2	4	6	7	1	9	3	1
Fair Oaks Ave & Maude Ave	25	-0.02	1	-	8	4	8	-	3	-	-	7	8	-	8	3	-
Heron Ave & Homestead Rd	24	0.18	-	-	6	1	13	-	-	1	1	1	11	-	5	2	-
Fair Oaks Ave & Olive Ave	23	0.07	-	1	3	7	8	-	1	2	-	7	2	-	6	3	-
Mathilda Ave & San Aleso Ave	23	-0.11	-	-	3	7	9	-	2	-	-	5	8	-	5	2	-
Bernardo Ave & Fremont Ave	22	0.01	-	-	7	3	7	-	2	-	-	1	9	1	4	1	1
Fair Oaks Ave & Tasman Dr	22	0.08	-	-	4	6	4	2	5	1	-	7	5	1	6	-	-
Mathilda Ave & Indio Way	22	-0.09	-	-	1	3	11	1	4	-	-	5	11	-	4	2	-
Kifer Rd & Wolfe Rd	22	-0.12	-	1	6	-	9	-	1	-	4	3	8	-	2	-	-
Maria Ln & Wolfe Rd	22	0.11	-	-	6	5	6	1	1	-	1	6	6	2	8	1	2
Mathilda Ave & Washington Ave	20	-0.12	-	-	-	2	8	1	4	-	1	4	10	-	3	1	-
El Camino Real & Grape Ave	20	-0.16	-	-	4	2	12	-	2	-	-	2	9	-	2	2	-
Fremont Ave & Mary Ave	20	-0.03	1	-	3	3	8	-	1	-	3	4	6	-	7	-	-
Caliente Dr & Fair Oaks Ave	20	-0.02	-	1	6	2	7	2	-	1	1	3	8	-	8	4	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Ahwanee Av & Fair Oaks Ave	19	-0.09	-	-	5	6	6	-	-	1	1	5	2	-	1	2	-
Commercial St & De Guigne Dr	19	0.00	-	-	3	4	5	1	3	2	-	6	5	-	3	2	-
Alberta Av & Harwick Dr	19	-0.14	-	-	3	1	8	-	2	1	2	6	9	-	5	1	-
Kifer Rd & San Zeno Way	19	0.14	-	1	5	3	2	2	1	-	1	2	2	-	1	1	-
Hollenbeck Ave & Homestead Rd	18	-0.04	-	-	1	2	9	-	3	1	1	5	9	-	3	3	-
Mathilda Ave & Iowa Ave	18	-0.15	-	-	3	4	8	-	-	-	2	3	8	-	2	1	-
Mathilda Ave & Talisman Dr	18	-0.10	-	-	1	8	5	-	4	-	-	4	5	-	4	3	-
Fair Oaks Ave & Wolfe Rd	17	-0.15	1	-	3	-	2	3	5	1	-	5	5	2	5	2	-
Iris Ave & South Wolfe Road	17	-0.08	-	-	2	3	7	-	1	-	-	3	6	1	4	3	1
Bobwhite Ave & Fremont Ave	17	0.02	1	1	4	-	8	-	-	3	2	3	6	-	1	-	-
Mathilda Ave & McKinley Ave	17	-0.13	-	-	2	2	9	-	1	-	-	3	8	-	2	4	-
Evelyn Ave & Wolfe Rd	17	-0.13	-	1	4	2	5	-	3	-	3	2	5	-	4	2	-
Olive Ave & Sunnyvale Ave	16	0.02	-	-	7	2	4	-	1	1	-	-	4	-	4	2	-
Vienna Dr & Tasman Dr	16	0.09	-	-	2	1	4	1	6	2	-	5	6	1	5	-	1
Evelyn Ave & Fair Oaks Ave	16	-0.13	-	-	2	1	4	-	2	3	2	5	4	-	4	2	-
El Camino Real & Murphy Ave	16	-0.18	-	-	5	-	3	2	1	-	2	1	3	-	2	2	-
Caribbean Dr & Moffett Park Dr	16	0.04	-	1	1	4	4	1	4	-	-	5	6	-	5	2	-
Fair Oaks Ave & Iris Ave	15	-0.08	-	-	3	2	3	-	1	5	-	5	4	1	5	1	1
Mathilda Ave & Olive Ave	15	-0.18	-	-	4	2	5	1	1	2	-	1	4	1	3	3	1
Fremont Ave & Hollenbeck Ave	15	-0.12	-	-	-	1	8	-	2	1	1	2	9	-	2	2	-
Fremont Ave & Wright Ave	15	-0.09	-	-	1	2	3	-	5	1	1	3	2	-	1	2	-
Central Expwy Ebon/R & Wolfe Rd	13	-0.24	-	-	1	2	10	-	-	-	-	4	9	-	1	-	-
Knickerbocker Dr & Mary Ave	13	-0.07	-	-	1	-	7	-	1	-	3	1	5	2	3	2	1
Central Expwy Wboff/R & Wolfe Rd	13	-0.03	-	-	5	2	5	-	-	-	-	-	4	-	-	2	-
Fair Oaks Ave & Weddell Dr	13	-0.06	-	-	1	1	6	-	3	2	-	6	6	-	2	1	-
Evelyn Ave & Mathilda Ave	13	-0.07	-	-	-	-	7	-	2	-	1	2	8	-	2	1	-
California Ave & Mary Ave	13	0.07	-	-	5	-	5	-	-	-	2	-	5	1	1	-	-
California Ave & Sunnyvale Ave	12	0.08	-	-	3	1	2	1	-	3	1	3	2	-	6	3	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Sunnyvale Saratoga Rd & Connemara Way/Cheyenne Dr	12	-0.21	-	-	2	-	5	-	1	2	-	4	7	-	1	1	-
Fremont Ave & Rt 85 Nboff/R	12	-0.25	-	-	2	1	3	-	5	-	1	2	3	1	7	1	-
Hollenbeck Ave & Remington Dr	12	-0.06	-	-	4	3	-	-	2	-	-	-	1	1	-	-	-
Mc Kinley Ave & Sunnyvale Ave	11	-0.03	-	-	1	1	6	1	-	1	1	2	4	-	2	-	-
Reed Ave & Timberpine Ave	11	-0.08	-	-	3	1	6	-	-	-	-	2	5	-	2	1	-
Evelyn Ave & Sunnyvale Ave	11	-0.11	-	-	-	2	3	-	1	1	4	3	3	-	3	1	-
Pastoria Ave & Washington Ave	11	-0.04	-	-	5	1	1	1	1	1	-	5	-	-	5	-	-
California Ave & Fair Oaks Ave	11	-0.20	-	-	2	2	1	-	3	-	1	3	1	-	2	-	-
Danforth Dr & Hollenbeck Ave	10	0.05	-	1	1	2	2	1	-	2	-	3	2	-	1	1	-
Mary Ave & Maude Ave	10	-0.19	-	-	1	-	3	-	3	-	2	3	2	-	1	-	-
Manet Dr & Remington Dr	10	-0.15	1	-	1	-	2	-	1	2	2	2	2	1	2	-	1
Marion Way & Wolfe Rd	10	-0.20	-	-	-	2	3	-	1	3	1	3	3	-	3	-	-
Fremont Ave & Rt 85 Sboff/R	10	-0.27	-	-	7	2	-	-	-	-	-	1	-	-	2	-	-
Mary Ave & Washington Ave	9	-0.21	-	-	4	-	1	1	1	1	1	1	2	1	1	-	1
Inverness Way & Wolfe Rd	9	-0.24	-	-	2	4	3	-	-	-	-	4	3	-	2	1	-
Stewart Dr & Wolfe Rd	9	-0.23	-	-	2	2	2	-	1	-	-	1	3	-	2	-	-
Arques Ave & Sunnyvale Ave	9	0.00	-	-	1	1	1	-	2	-	3	3	1	1	3	-	-
Reed Ave/Monroe St & Lawrence Expwy	9	-0.05	1	-	3	2	3	-	-	-	-	3	4	-	5	-	-
Hendy Ave & Sunnyvale Ave	9	-0.08	-	-	2	3	-	1	2	-	-	1	3	-	1	1	-
Iowa Ave & Sunnyvale Ave	8	-0.20	-	-	1	1	5	-	-	1	-	-	6	-	1	1	-
Java Dr & Lockheed Martin Way	8	-0.20	-	-	4	1	-	-	2	-	-	1	-	-	1	-	-
Alberta Av & Hollenbeck Ave	8	-0.18	-	-	-	-	3	-	-	4	1	1	3	1	-	-	-
Mathilda Ave & Danforth Dr	8	-0.26	-	-	1	1	2	-	2	2	-	3	3	-	1	3	-
Central Expwy & Oakmead Pkwy	8	-0.05	-	-	3	1	3	-	1	-	-	1	3	-	2	-	-
Sunnyvale Ave & Washington Ave	7	-0.22	-	-	2	2	1	-	2	-	-	4	1	-	3	1	-
Evelyn Ave & Reed Ave	7	-0.19	-	-	3	1	1	-	1	1	-	1	1	-	1	1	-
Charles St & Evelyn Ave	7	-0.24	-	-	-	-	4	-	2	-	1	2	4	-	1	-	-
Crossman Ave & Fair Oaks Ave	7	-0.29	-	-	2	-	1	-	3	-	-	-	1	-	1	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Taaffe St & Washington Ave	4	-0.24	-	-	-	-	2	-	-	1	1	1	2	-	-	-	-
Mathilda Ave & Innovation Way	4	-0.31	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-
Fair Oaks Ave & Fair Oaks Way	4	-0.31	-	-	-	-	2	-	2	-	-	2	2	-	2	-	-
Maude Ave & Pastoria Ave	4	-0.32	-	-	-	-	3	-	-	-	1	-	2	-	-	-	-
Belleville Way & Homestead Rd	4	-0.21	-	-	1	1	1	1	-	-	-	-	1	-	-	-	-
Heatherstone Ave & Mary Ave	4	-0.30	-	-	2	2	-	-	-	-	-	1	-	-	1	-	-
De Guigne Drive & Duane Ave	4	-0.31	-	-	1	-	1	1	1	-	-	2	1	-	3	1	-
Mathilda Ave & 5th Ave	4	-0.31	-	-	-	-	1	-	2	-	-	2	1	-	1	-	-
Lakeside Dr & Arques Ave	3	-0.34	-	-	1	-	1	-	1	-	-	1	1	-	1	-	-
Borregas Ave & Maude Ave	3	-0.34	-	-	-	-	2	-	-	1	-	1	1	-	1	-	-
Iowa Ave & Taaffe St	3	-0.34	-	-	-	1	-	-	1	-	1	1	1	-	-	-	-
Adobe Wells Mhp & Reamwood Ave	3	-0.34	-	-	-	-	1	-	1	-	1	1	-	-	-	-	-
Evelyn Ave & Frances St	3	-0.33	-	-	-	-	2	-	-	1	-	1	1	-	-	-	-
Hollenbeck Ave & Torrington Dr	3	-0.34	-	-	1	1	1	-	-	-	-	-	1	-	-	-	-
Mango Ave & Remington Dr	3	-0.29	-	-	-	-	2	-	-	1	-	-	1	-	-	-	-
Bordeaux Dr & Java Dr	3	-0.34	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Homestead Rd & Kennewick Dr	3	-0.34	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-

Table A2: Unsignalized Intersections Prioritized by Total Number of Collisions (July 1, 2013 – June 30, 2018)

Legend: Probability of Crash Type Exceeding Threshold Proportion¹: 90-100% ■ 80-90% ■

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Unsignalized Intersections																	
Mary Ave & Olive Ave	26	0.84	-	1	16	1	-	1	2	1	2	1	-	-	6	4	-
El Camino Real & Sycamore Ter	25	0.19	-	-	1	4	19	-	1	-	-	4	17	1	4	5	-
Lawrence Expy & 101 SB On Ramp	24	0.00	-	-	9	2	9	-	2	-	1	5	8	-	6	-	-
El Camino Real & Helen Ave	23	0.13	-	4	4	1	8	-	2	4	2	7	9	-	7	-	-
Bayview Ave & Maude Ave	21	0.68	-	-	3	3	8	-	-	-	2	2	8	1	2	1	1
Central Expwy & Potrero Ave	20	0.06	-	-	-	1	15	-	3	-	1	1	17	1	2	-	1
Lawrence Expy & Lakewood Dr	19	0.07	-	-	3	4	8	1	1	-	1	5	8	-	8	3	-
Mathilda Ave & Del Rey Ave	18	0.05	-	-	7	1	4	1	2	1	-	-	6	1	7	1	-
Ayala Dr & Bernardo Ave	17	0.65	-	2	-	6	2	2	2	1	2	2	3	1	5	2	-
Blazingwood Dr & Sandia Ave	16	0.67	-	-	8	5	1	1	-	-	1	1	1	-	2	-	-
Fair Oaks Ave & Taylor Ave	15	0.13	-	1	5	5	4	-	-	-	1	2	2	-	4	-	-
Arcadia Ter & Fair Oaks Ave	14	0.11	-	-	3	3	4	-	1	1	2	3	3	-	4	3	-
El Camino Real & Remington Dr	14	0.08	-	-	4	4	1	-	-	2	3	5	2	-	6	1	-
Fair Oaks Ave & US 101 SB Off-Ramp	14	0.03	-	-	3	1	4	-	2	-	-	1	5	1	3	2	1
Evelyn Ave & Murphy Ave	14	0.62	-	-	-	-	2	-	5	1	3	2	4	-	5	1	-
Duane Ave & San Luisito Way	13	0.47	-	-	1	2	5	2	-	-	-	5	4	-	2	1	-
Central Expwy & Central Expwy Wbon/R	12	-0.06	-	-	-	-	9	-	1	-	-	1	9	-	-	-	-
Columbia Ave & Fair Oaks Ave	12	0.08	-	1	1	5	4	-	-	-	1	5	3	-	2	1	-
Grand Fir Ave & Old San Francisco Rd	12	0.25	-	-	3	3	2	2	-	-	2	2	3	-	-	-	-
Central Expwy & Santa Elena Way	12	-0.01	-	-	-	1	10	-	-	-	1	-	10	-	-	-	-

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Caribbean Dr & WB SR 273 On-ramp	11	0.02	-	-	1	4	4	1	1	-	-	1	3	1	-	1	1
Bernardo Ave & Knickerbocker Dr	11	0.18	-	-	9	-	1	-	-	-	1	-	1	-	-	2	-
Bernardo Ave & Iowa Ave	11	0.27	-	1	2	4	4	-	-	-	-	6	-	-	5	2	-
Homestead Rd & Ontario Dr	10	0.06	-	-	4	-	1	1	1	-	1	2	2	-	2	-	-
Eleanor Way & Fremont Ave	10	0.06	-	-	-	2	4	-	-	2	1	2	2	1	4	-	1
Mathilda Ave & NB US 101 On-ramp	10	-0.07	-	-	-	4	3	1	2	-	-	2	5	-	-	1	-
Mathilda Ave & NB US 101 Off-ramp	10	-0.07	-	-	2	1	6	-	-	-	-	3	6	-	4	2	-
Lawrence Expwy & NB US 101 Off-ramp	10	-0.07	-	-	2	2	5	-	-	-	-	4	4	-	2	1	-
Central Expwy & Mary Ave Off-ramp	10	-0.07	-	-	-	-	8	-	2	-	-	5	6	-	2	1	-
Bernardo Ave & Mc Kinley Ave	9	0.24	-	-	5	1	2	1	-	-	-	1	3	-	3	1	-
El Camino Real & Knickerbocker Dr	9	0.56	-	-	1	1	4	-	1	-	-	3	4	-	4	-	-
Murphy Ave & Washington Ave	9	0.44	-	-	2	1	2	-	1	1	-	4	-	-	5	-	-
Hollenbeck Ave & The Dalles	9	0.11	-	-	1	3	2	-	1	-	-	2	1	-	1	-	-
Michelangelo Dr & Remington Dr	9	0.07	1	-	4	-	1	-	1	2	1	1	1	-	5	-	-
Fair Oaks Way & Persian Dr	9	0.33	-	-	3	-	1	1	2	-	2	2	1	-	3	1	-
Azure St & Remington Dr	9	0.10	-	-	3	2	-	-	1	-	1	1	1	-	-	-	-
Duane Ave & San Rafael St	9	0.17	-	-	4	2	-	1	1	-	1	4	1	-	2	-	-
Arbor Ave & Fair Oaks Ave	9	0.01	-	-	1	-	3	1	3	-	1	3	4	-	5	3	-
Carroll St & Washington Ave	8	0.36	-	-	4	3	1	-	-	-	-	2	1	-	2	-	-
Fair Oaks Ave & Mc Kinley Ave	8	0.02	-	-	2	3	2	-	-	-	-	3	1	-	2	1	-
Carroll St & Evelyn Ave	8	0.17	-	-	4	1	1	-	-	1	1	-	1	-	2	-	-
California Ave & San Anselmo Way	8	0.58	-	-	5	-	-	2	1	-	-	-	-	-	-	-	-
Eden Ave & Fair Oaks Ave	8	-0.01	-	-	2	1	2	1	2	-	-	3	2	2	3	2	-
Persian Dr @ EB SR 273 Off-Ramp (to Fair Oaks Ave)	8	0.03	-	-	4	1	-	1	1	-	-	1	-	-	1	-	-
Crescent Ave & Sunnyvale Saratoga Rd	8	-0.05	-	-	-	-	7	-	-	1	-	1	7	-	-	2	-
Mathilda Ave & Dunsmuir Ter	8	-0.04	-	-	-	-	4	-	4	-	-	2	5	-	2	1	-
Evelyn Ave & Waverly St	8	0.25	-	-	1	-	1	1	2	-	3	4	1	-	3	-	-
Henderson Ave & Valerian Way	8	0.27	-	-	1	1	2	-	2	-	-	2	1	-	2	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Acalanes Dr & Bernardo Ave	7	0.17	-	-	2	2	1	-	-	1	-	1	-	-	-	-	-
Lakehaven Dr & Meadowlake Dr	7	0.17	-	-	-	-	1	1	2	1	-	2	-	-	-	-	-
Borregas Ave & Weddell Dr	7	0.10	-	-	-	1	1	-	2	1	1	2	2	-	3	-	-
Cypress Ave & Fair Oaks Ave	7	-0.03	-	-	2	3	-	2	-	-	-	1	-	1	3	1	-
Grand Coulee Ave & Hollenbeck Ave	7	0.08	-	1	1	1	1	-	1	-	1	1	2	-	2	1	-
De Guigne Dr & Santa Real Ave	7	0.05	-	-	5	-	-	-	-	-	2	-	-	-	-	-	-
Remington Dr & Tilton Dr	7	0.13	-	-	3	1	1	-	-	-	2	1	1	-	-	-	-
Remington Dr & Spinosa Dr	7	0.11	-	-	2	-	3	-	-	1	1	-	3	-	1	-	-
Sunset Ave & Washington Ave	7	0.17	-	-	4	-	1	-	-	-	2	1	-	2	1	-	-
Duane Ave & San Juan Dr	7	0.15	-	-	1	2	-	1	-	-	-	1	1	-	-	-	-
Indio Way & Soquel Way	7	0.90	-	-	-	-	3	-	4	-	-	2	5	1	1	2	1
Ahwanee Av & San Aleso Ave	7	0.20	-	-	1	-	1	2	1	-	1	1	-	1	1	2	1
Central Expwy & San Bernardino Way Off-ramp	7	-0.06	1	-	1	-	3	1	2	-	-	3	4	1	2	1	-
Elizabeth Way & Wolfe Rd	7	0.00	-	-	1	-	3	1	-	1	-	2	2	-	2	-	-
Dartshire Way & Wolfe Rd	7	0.00	-	2	2	-	3	-	-	1	1	2	2	-	2	-	-
Fairwood Ave & Wildwood Ave	7	0.90	-	-	1	2	2	-	1	-	-	3	3	1	2	1	1
Fremont Ave & Warner Ave	7	0.01	-	-	5	-	1	-	-	-	-	-	1	-	-	-	-
Central Expwy & Middlefield Rd On-Ramp	7	-0.06	-	-	-	4	1	-	2	-	-	3	2	-	3	2	-
Carson Dr & Mary Ave	6	0.00	-	-	1	2	1	-	-	-	-	3	1	1	2	-	1
Acalanes Dr & Washington Ave	6	0.49	-	-	1	1	1	1	-	-	-	2	-	-	3	-	-
Carroll St & Mc Kinley Ave	6	0.49	-	-	2	-	1	1	-	-	1	-	-	-	-	-	-
Lakehaven Dr & Silverlake Dr	6	0.11	-	-	2	2	-	-	-	-	-	2	-	-	1	1	-
Mathilda Ave (NB) & Evelyn Ave	6	-0.07	-	-	1	3	-	-	2	-	-	1	1	-	1	-	-
Harvard Ave & Hollenbeck Ave	6	0.11	-	-	2	-	2	-	-	-	-	-	2	-	-	-	-
Arques Ave & Globalfoundries Dwy	6	-0.01	-	1	3	1	-	-	-	-	2	1	1	-	-	-	-
Caliente Dr & Johanna Ave	6	0.72	-	-	-	4	-	-	1	-	-	3	1	-	3	1	-
Mission College Blvd & Sandia Ave	6	0.28	-	-	2	1	1	-	2	-	-	1	2	-	3	-	-
Mary Ave & Valencia Ave	6	0.02	-	-	3	-	2	-	1	-	-	2	1	-	1	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Fair Oaks Ave & Rt 101 Nboff/R	6	-0.06	-	-	2	1	3	-	-	-	-	4	1	-	3	2	-
Bernardo Ave & Olive Ave	6	0.12	-	-	1	1	1	-	1	-	1	1	2	-	-	1	-
Olive Ave & Pastoria Ave	6	0.06	-	-	2	-	1	1	-	1	1	-	1	-	1	-	-
Gary Ave & Primrose Ave	6	-0.03	-	-	3	-	1	-	-	-	-	-	1	-	-	-	-
Blair Ave & Mary Ave	6	0.04	-	-	3	-	1	-	1	-	1	1	1	-	-	-	-
El Camino Real & Taaffe St	6	-0.07	-	1	-	-	-	-	2	1	1	2	1	-	2	-	-
Eleanor Way & Wolfe Rd	6	-0.03	-	-	2	1	-	1	-	-	-	2	3	-	1	-	-
Angel Ave & Beemer Ave	6	0.72	-	-	-	-	6	-	-	-	-	1	6	1	3	1	-
Lily Ave & Timberpine Ave	6	0.07	-	-	-	2	1	1	2	-	-	5	1	-	5	-	-
Rt 273 Auxiliary Rd & Rt 273 Ebon/R	6	0.00	-	-	-	1	4	-	-	-	-	-	3	-	1	-	-
Glendale Ave & Morse Ave	5	0.08	-	-	1	1	1	-	1	-	-	1	1	-	1	-	-
Bernal Ave & Caliente Dr	5	0.54	-	-	2	1	-	-	-	-	1	2	-	-	1	-	-
Maude Ave & Murphy Ave	5	0.02	-	-	3	1	-	-	-	1	-	1	-	-	2	-	-
Henderson Ave & Rockrose Ave	5	0.08	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-
Taylor Ave & Wolfe Rd	5	-0.07	-	-	1	1	-	-	1	-	2	3	-	-	1	1	-
Persian Dr & Plaza Dr	5	0.08	-	-	2	-	2	-	-	-	1	4	-	-	3	-	-
Hollenbeck Ave & CVS/Orchard Dwy	5	-0.06	-	-	-	2	-	-	2	-	1	-	-	-	1	-	-
Central Ave & Old San Francisco Rd	5	-0.02	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-
Hollenbeck Ave & Sheraton Dr	5	0.02	-	-	1	1	-	-	2	-	-	1	-	-	2	-	-
Fall River Ter & Sunnyvale Saratoga Rd	5	0.03	-	-	3	1	-	-	-	-	-	-	-	-	1	1	-
El Camino Real & Summerwinds Nursery Dwy	5	-0.09	-	-	-	1	4	-	-	-	-	-	3	-	1	-	-
California Ave & Frances St	5	0.18	-	-	1	1	-	-	1	1	-	1	1	-	-	-	-
Bernardo Ave & Cortez Drive	5	0.06	-	-	2	2	-	-	-	-	-	2	-	-	3	1	-
Blair Ave & Grape Ave	5	0.36	-	-	1	2	-	-	1	-	-	2	-	1	-	1	1
Reed Ave & Bougainvillea Ter	5	-0.05	-	-	2	3	-	-	-	-	-	2	-	-	1	-	-
Maude Ave & Worley Ave	5	0.02	-	-	-	2	1	1	-	-	-	2	-	1	-	-	-
America Ave & Arques Ave	5	0.00	-	-	2	-	1	-	1	-	-	3	-	-	-	-	-
Noriega Ave & Washington Ave	5	0.08	-	-	-	3	1	1	-	-	-	2	-	2	2	1	-

[illegible]

[illegible]

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Fremont Ave & Lillian Ave	4	-0.06	-	-	1	-	2	-	-	-	1	1	2	-	2	1	-
Helen Ave & Tamarack Ln	4	0.02	-	-	-	2	1	-	-	-	-	4	-	-	1	-	-
Gainsborough Dr & Manet Dr	4	0.02	-	-	-	-	-	2	-	-	1	3	-	-	1	-	-
Fremont Ave & Picasso Dr	4	-0.07	-	-	-	-	2	-	1	-	-	1	2	-	1	-	-
Morse Ave & Roosevelt Ave	4	0.35	-	-	-	2	2	-	-	-	-	1	3	-	-	1	-
Balsam Ave & Fair Oaks Ave	4	-0.08	-	-	2	-	1	-	1	-	-	-	2	-	1	1	-
San Zeno Way & Sonora Ct	4	0.35	-	-	-	1	1	-	1	-	-	-	2	-	-	-	-
Evelyn Ave & Mathilda Pl	4	0.01	-	-	-	-	-	-	1	-	3	1	2	-	1	1	-
Ayala Dr & Leota Ave	4	0.35	-	-	1	2	-	-	-	-	-	3	-	-	2	-	-
Evelyn Ave & Lincoln Ave	4	-0.04	-	-	-	3	-	-	-	1	-	1	1	-	1	-	-
El Camino Real & Avenue-El Camino Oaks Dwy	4	-0.10	-	-	1	2	1	-	-	-	-	-	1	-	-	-	-
Cumulus Ave & Sunnyvale Saratoga Rd	4	-0.09	-	-	-	-	1	-	2	-	1	1	1	-	1	-	-
Rt 101 Sboff/R & Lawrence Expwy	4	-0.10	-	-	2	2	-	-	-	-	-	1	-	-	1	-	-
Rt 273 Eboff/R & Lawrence Expwy	4	-0.10	-	1	-	2	1	-	-	-	-	1	1	-	1	-	-
Crescent Ave & Manet Dr	3	-0.08	-	-	-	1	2	-	-	-	-	2	-	-	1	1	-
Acalanes Dr & Cortez Drive	3	0.17	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Borregas Ave & Garner Dr	3	0.17	-	-	-	3	-	-	-	-	-	1	-	-	1	-	-
Fremont Ave & La Bella Ave	3	-0.09	-	-	1	-	1	-	-	-	-	-	1	-	-	-	-
Ithaca Ave & Knickerbocker Dr	3	-0.05	-	-	1	-	-	1	1	-	-	1	-	-	-	-	-
Deodar Way & Evelyn Ave	3	-0.08	-	-	-	-	1	-	2	-	-	1	1	-	1	1	-
Charles St & Washington Ave	3	-0.02	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-
Iowa Ave & Sunset Ave	3	-0.06	-	-	-	-	1	-	-	-	2	1	-	-	2	-	-
California Ave & Murphy Ave	3	0.03	-	-	1	2	-	-	-	-	-	1	-	-	1	-	-
Borregas Ave & Moffett Park Dr	3	-0.09	-	-	-	-	-	2	-	-	1	1	-	-	1	-	-
Bayview Ave & California Ave	3	0.03	-	-	-	2	-	-	-	-	-	1	-	1	1	-	1
Eden Ave & Fair Oaks Ave	3	-0.10	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
Fremont Ave & Selo Dr	3	-0.09	-	-	1	-	1	-	1	-	-	1	1	-	-	1	-
Brookfield Ave & Knickerbocker Dr	3	-0.06	-	-	1	1	1	-	-	-	-	1	1	-	1	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Bittern Dr & Harwick Dr	3	-0.05	-	-	-	-	-	-	1	-	1	-	1	-	1	-	-
Caribbean Dr & WB SR 273 Off-ramp	3	-0.11	-	-	-	1	2	-	-	-	-	-	2	-	-	-	-
Bellomo Ave & Wolfe Rd	3	-0.10	-	-	1	1	-	1	-	-	-	1	-	-	2	-	-
Cobalt Way & Central Expwy On/Off-ramps	3	0.17	-	-	-	1	2	-	-	-	-	2	1	-	-	-	-
Aries Way & Washington Ave	3	0.00	-	-	-	-	1	-	2	-	-	1	-	-	1	-	-
California Ave & Sobrante Way	3	0.00	-	-	-	1	1	-	1	-	-	1	-	1	1	-	-
Socorro Ave & Wildwood Ave	3	0.17	-	-	1	-	-	-	-	-	-	-	1	-	1	1	-
Lillick Dr & Thunderbird Ave	3	0.08	-	-	2	-	-	-	1	-	-	1	-	-	1	-	-
Ferndale Ave & Morse Ave	3	-0.05	-	-	-	1	1	-	-	-	1	-	-	-	-	-	-
Hammerwood Ave & Old Mountain View Alviso Rd	3	-0.07	-	1	2	1	-	-	-	-	-	1	-	-	1	-	-
Borregas Ave & Persian Dr	3	-0.05	-	1	-	-	2	-	-	-	1	3	-	-	2	-	-
Florence St & Washington Ave	3	-0.02	-	-	1	-	1	-	-	-	-	1	-	-	-	-	-
Coolidge Ave & Pastoria Ave	3	-0.05	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
Mathilda Ave & Booker Ave	3	-0.10	-	-	-	1	1	-	-	-	-	-	2	-	-	1	-
Floyd Ave & Fremont Ave	3	-0.09	-	-	1	-	1	-	1	-	-	-	1	-	-	-	-
Bayview Ave & Evelyn Ave	3	-0.08	-	-	-	-	1	1	-	-	1	1	2	-	1	-	-
Hendy Ave & Kifer Rd	3	-0.11	-	-	1	-	-	-	2	-	-	1	1	-	2	-	-
Mary Ave & Sutter Ave	3	-0.09	-	-	1	1	-	-	-	-	-	-	-	-	-	1	-
Reed Ave & Willow Ave	3	-0.08	-	-	-	-	1	-	-	-	1	1	-	-	1	1	-
Kern Ave & Lawrence Expwy On/Off-ramps	3	0.17	-	-	-	-	1	1	1	-	-	2	1	-	-	-	-
Dunholme Way & Floyd Ave	3	0.17	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
Arques Ave & Silicon Image Dwy	3	-0.09	-	1	2	-	-	-	1	-	-	1	-	-	1	-	-
Alvarado Ave & San Juan Dr	3	0.17	-	-	-	2	-	1	-	-	-	1	-	-	1	-	-
Cobalt Way & Central Expwy On-ramp	3	-0.11	-	-	-	-	3	-	-	-	-	-	3	-	-	-	-
Miramar Way & Tamarack Ln	3	-0.05	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Columbine Ave & Timberpine Ave	3	-0.05	-	-	-	-	1	-	-	-	1	-	1	-	-	-	-
Bellomo Ave & Maria Ln	3	0.17	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-
Buena Vista Ave & Private Mobile Home Rd	3	0.17	-	-	-	-	1	-	2	-	-	1	2	-	2	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Arques Ave & Murphy Ave	3	0.17	-	-	-	-	2	-	1	-	-	1	3	-	-	-	-
Carroll St & Iowa Ave	3	0.08	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Leota Ave & Olive Ave	3	0.22	-	-	1	1	-	-	-	-	-	1	-	-	2	1	-
Amador Ave & San Ramon Ave	3	-0.06	-	-	1	-	1	-	-	-	-	1	-	-	1	-	-
Larkspur Ave & Ponderosa Ave	3	0.17	-	-	-	1	-	-	-	-	2	-	-	1	-	-	-
Miraloma Way & Lawrence Expwy On/Off-ramps	3	0.17	-	-	1	-	-	1	1	-	-	-	1	-	-	1	-
Alberta Av & Norland Dr	3	-0.05	-	-	1	-	-	-	1	1	-	-	1	-	-	-	-
Alberta Av & Richelieu Pl	3	-0.05	-	-	1	1	-	-	-	1	-	-	-	-	-	-	-
Central Avenue & Evelyn Ave	3	-0.08	-	-	1	-	2	-	-	-	-	-	-	-	2	1	-
Fair Oaks Ave & Rt 101 Sbon/R	3	-0.11	-	-	-	-	3	-	-	-	-	1	3	1	-	1	-
Leota Ave & Mc Kinley Ave	3	0.08	-	-	2	-	-	-	-	-	1	-	-	-	-	1	-
El Camino Real & Frances St	3	-0.11	-	-	-	-	2	-	1	-	-	1	2	-	2	-	-
Inverness Way & Meadowlark Ln	3	-0.06	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Sequoia Dr & Shasta Fir Way	3	-0.05	-	-	-	1	1	-	-	-	-	1	1	-	1	-	-
California Ave & Commercial St	3	0.08	-	-	-	-	1	-	-	-	-	1	1	-	-	1	-
Frances St & Olson Wy	3	0.17	-	-	1	-	1	-	-	1	-	-	1	-	1	1	-
Miraloma Way & San Vincente Way	3	-0.09	-	-	-	1	2	-	-	-	-	-	1	-	1	-	-
Bradford Dr & Ross Dr	3	0.17	-	-	1	-	1	-	-	-	-	2	-	-	-	-	-
Wolfe Rd & Sunrise Ter	3	-0.11	-	-	1	-	1	-	-	-	1	-	1	-	-	1	-
Tasman Dr & L St	3	-0.08	-	-	-	1	-	1	1	-	-	3	-	-	2	-	-
Alberta Av & Tenaka Pl	3	-0.05	-	-	-	2	1	-	-	-	-	1	-	-	-	1	-
Bayview Ave & Duane Ave	3	-0.06	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-
Lakebird Dr & Silverlake Dr	3	0.17	-	-	2	-	-	1	-	-	-	1	-	-	1	-	-
Carroll St & Old San Francisco Rd	3	-0.09	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
Anchor Bay Ter & Sunnyvale Ave	3	-0.05	-	-	-	-	-	-	2	-	-	1	1	1	1	-	1
Kiel Ct & Weddell Dr	3	-0.07	-	1	-	-	-	1	2	-	-	2	-	1	2	-	1
Arques Ave & Lastreto Ave	3	0.17	-	1	-	1	1	-	1	-	-	1	1	-	2	-	-
Begonia Way & Grand Fir Ave	3	0.17	-	-	-	1	-	1	-	-	-	1	-	-	1	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Calle Dorita & Calle Lupe	3	0.17	-	-	-	-	1	-	2	-	-	2	1	1	1	-	1
Morse Ave & Taylor Ave	3	0.08	-	-	-	1	-	-	-	-	2	1	-	-	-	-	-
Hollenbeck Ave & Knickerbocker Dr	3	-0.07	-	-	-	1	1	-	-	-	1	-	1	-	3	-	-
Blazingwood Dr & Prescott Ave	3	0.17	-	-	-	1	1	-	-	-	-	2	-	-	-	-	-
Cascade Dr & Selo Dr	3	-0.05	-	-	-	2	-	-	1	-	-	1	-	-	-	-	-
Heron Ave & Inverness Way	3	0.04	-	-	-	1	-	-	1	-	1	-	-	-	1	-	-
Knickerbocker Dr & Persimmon Ave	3	-0.06	-	1	-	-	-	-	-	1	1	-	-	-	-	1	-
Avenida Ricardo & Calle Isabella	3	0.17	-	-	-	-	-	-	3	-	-	1	1	1	-	1	-
Roosevelt Ave & Taylor Ave	3	0.08	-	-	-	-	-	1	-	-	-	1	-	-	1	-	-
Maude Ave & San Angelo Ave	3	-0.07	-	-	1	-	-	-	-	1	-	1	1	-	1	-	-
California Ave & Pajaro Ave	3	0.00	-	-	-	2	-	-	-	-	-	1	-	-	1	-	-
Borregas Ave & Carl Rd	3	0.17	-	-	-	-	-	-	3	-	-	1	1	-	1	-	-
Arbor Ave & Worley Ave	3	0.08	-	-	1	1	1	-	-	-	-	2	-	-	1	-	-
Bellflower Ave & Grand Fir Ave	3	0.08	-	-	-	1	1	-	-	-	-	2	-	-	-	-	-
Lakebird Dr & Palamos Ave	3	-0.11	1	-	-	-	1	-	2	-	-	1	3	-	2	1	-
Homestead Rd & Samedra St	3	-0.04	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-
The Dalles & Wright Ave	3	-0.06	-	-	1	-	-	-	-	-	1	1	1	-	-	1	-
Santa Elena Way & Arques Ave	3	-0.09	-	-	1	-	1	-	1	-	-	1	1	-	2	1	-
Candlewood Ave & Candlewood Ct	3	-0.06	-	-	-	1	1	-	1	-	-	1	2	-	3	1	-
Duane Ct & Santa Ynez St	3	0.00	-	-	-	1	1	-	1	-	-	-	1	-	-	-	-
California Ave & Oak Ct	3	0.03	-	-	-	-	-	-	2	-	-	2	-	-	1	-	-
Sunnyvale Ave & Taylor Ave	3	-0.05	-	-	-	2	1	-	-	-	-	2	-	-	2	-	-
Apollo Way & Cobalt Way	3	0.17	-	-	1	-	1	-	1	-	-	1	1	-	-	-	-
3Rd St & 4Th St	3	0.17	-	-	-	2	1	-	-	-	-	2	1	-	-	-	-
Mary Ave & EB Central Expwy Off-ramp	3	-0.10	-	-	-	-	1	-	1	-	-	-	2	-	1	1	-
Coronach Ave & Helena Dr	3	0.17	-	-	1	-	-	-	-	1	-	-	-	-	-	1	-
Helena Dr & Mary Ave	3	-0.07	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-
Soquel Way & Centra Expwy On/Off-ramps	3	-0.11	-	-	-	-	2	-	1	-	-	1	2	-	-	-	-

Intersection	Crashes	Local CCR Differential ²	<i>Fatal Crashes</i>	<i>Severe Crashes</i>	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Foxtail Dr & Golden Oak Ct	3	0.17	-	-	-	2	-	-	1	-	-	1	-	-	-	-	-
Maude Ave & Roosevelt Ave	3	-0.07	-	-	1	-	-	-	1	-	1	-	-	-	-	-	-
Duane Ave & El Capitan Ter	3	-0.09	-	-	2	-	-	-	1	-	-	1	1	-	-	-	-
Reed Ave & Reed Ter	3	-0.08	-	-	1	-	1	-	1	-	-	2	-	-	1	-	-
Bremerton Dr & Mary Ave	3	-0.06	-	-	1	-	-	1	-	-	-	1	-	-	1	-	-
Miraloma Way & Central Expwy On/Off-ramps	3	-0.10	-	-	-	-	1	-	2	-	-	1	1	-	2	-	-
Mary Ave & Middlefield Rd	3	-0.09	-	-	-	-	2	-	1	-	-	1	3	-	-	-	-

Table A3: Corridor Segment Types Prioritized by Total Number of Collisions (July 1, 2013 – June 30, 2018)

Legend: Probability of Crash Type Exceeding Threshold Proportion¹: 90-100% ■ 80-90% ■

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
County Expressway																			
Central Expy	Wolfe Rd East Ramps	Wolfe Rd West Ramps	51	0.54	-	-	-	3	48	-	-	-	-	2	45	1	1	3	1
Central Expy	Arques Ave East Ramps	Arques Ave West Ramps	13	0.52	-	-	-	1	8	-	4	-	-	1	11	-	-	5	-
Central Expy	Commercial St	San Vincente Way	12	0.50	-	1	-	3	6	1	5	-	1	3	6	-	3	-	-
Central Expy	Mary Ave Intersection	Mary Ave East Ramps	8	0.61	-	-	-	-	8	-	-	-	-	-	7	-	-	1	-
Central Expy	Commercial St	Wolfe Rd	7	0.80	-	-	-	1	6	-	-	-	-	-	6	-	-	1	-
Lawrence Expy	Reed Ave	San Zeno Way	5	0.55	-	-	-	-	3	-	2	-	-	1	3	1	2	-	1
Central Expy	San Bernardino Way	Soquel Way	5	0.67	-	-	-	-	1	-	1	-	-	1	2	-	1	-	-
Lawrence Expy	SB Lawrence Expy to SB US 101 Ramp	NB US 101 to Lawrence Expy Ramp	4	0.68	-	-	1	1	1	-	1	-	1	2	2	-	2	-	-
Central Expy	Middlefield Rd	City Limit	4	0.57	1	-	-	-	2	-	2	-	-	1	3	-	3	1	-
Lawrence Expy	Kifer Rd	San Zeno Way	3	0.59	-	-	-	-	2	-	1	-	-	-	2	-	-	-	-
Lawrence Expy	Oakmead Pkwy	US 101 SB Off-Ramp	3	0.60	-	-	1	-	1	-	1	-	-	2	1	-	1	2	-
Central Expy	Middlefield Rd Off-Ramp	Middlefield Rd On-Ramp	3	0.62	-	-	-	-	1	-	2	-	-	1	1	-	1	-	-
Lawrence Expy	Persian Dr	SR 237 EB Ramps	3	0.63	-	-	-	1	1	-	-	-	-	1	1	-	2	1	-
Class I Arterial																			
El Camino Real	Maria Ln	Fair Oaks Ave	21	0.41	-	1	3	6	9	-	4	1	-	3	7	-	6	2	-
El Camino Real	Pastoria Ave	Mary Ave	20	0.42	-	-	6	4	6	-	4	2	5	2	5	-	4	2	-
Sunnyvale-Saratoga Rd	Fremont Ave	Crescent Ave	18	0.47	-	-	5	2	3	-	8	-	1	5	2	1	5	1	1
El Camino Real	Mathilda Ave	Pastoria Ave	14	0.48	-	-	1	3	7	-	1	1	2	3	6	1	3	-	1
El Camino Real	Fair Oaks Ave	Cezanne Dr	14	0.49	-	-	-	3	8	1	-	1	2	2	7	-	3	1	-
El Camino Real	Cezanne Dr	Sunnyvale Ave	14	0.51	1	-	2	1	5	1	3	1	1	5	5	-	7	2	-

¹ Probability of Crash Type Exceeding Threshold Proportion is based on the probability that the long-term proportion of a specific crash type exceeds a threshold proportion for the site's reference population. See **Appendix B: Collision Analysis Methodology** for additional information.

² Critical Crash Rate (CCR) is a statistical threshold for screening sites to determine if the number of crashes are above the statistical range of crashes that could be expected to occur and indicative of a potential safety concern or issue. See **Appendix B: Collision Analysis Methodology** for additional information.

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Mathilda Ave	Maude Ave	Indio Way	12	0.50	-	-	-	2	10	-	-	-	-	1	10	1	1	-	1
El Camino Real	Henderson Ave	Poplar Ave	11	0.55	1	-	1	4	5	-	2	1	-	4	5	-	1	1	-
El Camino Real	Bernardo Ave	Grape Ave	10	0.48	1	-	-	3	5	-	1	1	1	1	6	1	2	1	-
El Camino Real	Wolfe Rd	Maria Ln	9	0.48	-	-	-	3	3	-	4	-	1	-	3	-	3	1	-
Mathilda Ave	Ahwanee Ave	US 101 SB Ramps	9	0.47	-	-	-	6	2	-	-	-	3	1	1	-	2	-	-
Sunnyvale-Saratoga Rd	Fremont Ave	Cheyenne Dr	8	0.46	-	-	1	1	6	-	-	-	-	-	4	1	1	1	-
Sunnyvale-Saratoga Rd	Remington Dr	Crescent Ave	8	0.53	-	-	1	1	5	-	-	1	1	1	5	-	1	2	-
Mathilda Ave	Dunsmuir Terrace	California Ave	8	0.53	-	-	-	2	2	-	2	-	-	2	4	-	2	-	-
Sunnyvale-Saratoga Rd	Harwick Way	Homestead Rd	7	0.46	-	-	-	1	3	2	3	1	2	2	5	1	2	1	-
Mathilda Ave	Ahwanee Ave	San Aleso Ave	7	0.55	-	-	-	2	4	-	1	-	-	1	3	-	5	1	-
El Camino Real	Mary Ave	Grape Ave	6	0.46	-	-	-	2	1	-	3	-	-	2	3	-	2	2	-
Wolfe Rd	Kifer Rd	Evelyn Ave	5	0.50	-	-	-	-	4	-	1	-	-	1	4	-	-	-	-
Mathilda Ave	Maude Ave	Del Rey Ave	4	0.53	-	-	-	2	-	-	1	-	-	2	-	-	1	-	-
Mathilda Ave	Innovation Way	Java Dr	4	0.53	-	-	-	1	1	-	3	-	-	3	1	-	-	-	-
Sunnyvale-Saratoga Rd	Alberta Ave	Cheyenne Dr	3	0.50	-	-	-	2	1	-	-	-	1	-	1	-	-	1	-
Mathilda Ave	El Camino Real	Danforth Dr	3	0.57	-	-	-	-	-	1	2	1	-	1	-	1	1	-	1
El Camino Real	Knickerbocker Dr	City Limit	3	0.51	-	-	1	-	1	-	1	-	-	-	1	-	1	-	-
Class II Arterial																			
Wolfe Rd	Iris Ave	Reed Ave	13	0.57	-	-	-	6	4	-	8	-	-	6	2	1	5	-	1
Evelyn Ave	Mary Ave	City Limit	12	0.75	-	-	2	-	5	1	5	1	2	3	4	1	4	1	1
Fremont Ave	Sunnyvale-Saratoga Rd	Bobwhite Ave/Manet Dr	11	0.65	-	1	3	2	1	-	1	1	3	1	1	1	2	1	1
Sunnyvale-Saratoga Rd	El Camino Real	Fall River Ter	8	0.92	-	-	6	1	1	1	-	-	-	1	-	-	1	1	-
Wolfe Rd	El Camino Real	Maria Ln	7	0.63	-	-	2	1	1	1	1	-	-	-	2	-	-	-	-
Mary Ave	The Dalles Ave	Cascade Dr	6	0.81	-	-	2	1	1	-	2	-	-	2	1	1	1	-	1
Wolfe Rd	Gary Ave/Primrose Ave	Iris Ave	6	0.60	-	-	1	3	2	-	2	-	1	1	1	-	3	1	-
Evelyn Ave	Wolfe Rd	Fair Oaks Ave	6	0.70	-	-	1	-	3	1	4	-	-	1	1	-	3	-	-

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Fair Oaks Ave	California Ave	Arques Ave	6	0.66	-	-	-	1	4	-	1	-	-	-	4	-	-	1	-
Wolfe Rd	Homestead Rd	Inverness Way	5	0.55	-	-	2	-	1	-	3	1	-	2	1	-	1	1	-
Wolfe Rd	Inverness Way	Marion Way	4	0.54	-	-	1	-	2	-	2	-	-	2	2	-	2	-	-
Mary Ave	Fremont Ave	Bremerton Dr	4	0.89	-	-	1	1	1	-	1	-	-	-	2	-	1	2	-
Fair Oaks Ave	Reed Ave	Olive Ave	4	0.68	-	-	-	4	-	-	4	-	-	1	1	1	4	-	-
Mary Ave	Homestead Rd	Helena Dr	3	0.79	-	-	-	-	1	-	2	-	2	-	-	-	1	-	-
Wolfe Rd	Fremont Ave	Eleanor Way	3	0.74	-	-	-	-	1	-	1	-	1	2	1	-	2	-	-
Wolfe Rd	Eleanor Way	Elizabeth Way	3	0.71	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-
Wolfe Rd	Ponderosa Ave	Periwinkle Ter	3	0.70	-	-	1	-	-	-	2	-	-	-	-	-	1	1	-
Sunnyvale Ave	Old San Francisco Rd	Olive Ave	3	0.79	-	-	1	-	2	-	-	-	-	-	-	-	1	1	-
Fair Oaks Ave	Garland Ter	Reed Ave	3	0.71	-	-	-	1	2	-	-	-	-	-	2	1	-	2	-
Commercial/Industrial Collector																			
Maude Ave	Pastoria Ave	Mathilda Ave	10	0.54	-	-	7	-	2	1	-	-	-	2	2	1	1	-	-
Maude Ave	Sunnyvale Ave	Bayview Ave	6	0.71	-	-	3	-	2	-	3	-	-	2	-	-	2	-	-
Weddell Dr	Ross Dr	Borregas Ave	6	0.45	-	-	1	3	-	1	5	-	-	5	-	2	2	-	1
Almanor Ave	Vaqueros Ave	Mathilda Ave	5	0.59	-	-	-	3	1	-	-	-	2	1	1	-	1	-	-
Maude Ave	Mathilda Ave	San Angelo Ave	4	0.84	-	-	3	-	-	1	-	-	-	-	1	-	-	-	-
Lawrence Station Rd	Elko Dr	Anvilwood Ave	4	0.49	-	-	-	-	3	1	4	-	-	3	-	-	2	-	-
Kifer Rd	Commercial St	San Zeno Way	3	0.33	-	-	2	-	-	-	1	-	1	-	-	-	1	1	-
Kifer Rd	San Zeno Way	City Limit	3	0.79	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
Lakeside Dr	Oakmead Pkwy	Lakeway Dr	3	0.44	-	-	-	-	-	-	3	-	-	1	1	-	3	1	-
Residential Collector																			
Hollenbeck Ave	Homestead Rd	Grand Coulee Ave	15	0.48	-	-	4	2	5	2	4	2	3	2	4	-	2	1	-
Bernardo Ave	Ayala Dr	Cortez Dr	6	0.73	-	-	2	2	1	-	3	-	-	-	1	1	-	-	1
Ahwanee Ave	Mathilda Ave	San Aleso Ave	6	0.65	-	-	-	3	2	-	1	-	2	1	1	-	2	-	-
Bernardo Ave	Homestead Rd	Helena Dr	4	0.96	-	-	1	1	-	-	2	-	-	1	-	-	1	-	-
Henderson Ave	El Camino Real	Valerian Way	4	0.84	-	-	1	-	2	1	3	-	1	2	-	-	2	-	-
Duane Ave	Worley Ave	Fair Oaks Ave	4	0.89	-	-	-	3	1	-	4	-	-	4	-	-	3	1	-

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Bernardo Ave	Helena Ave	The Dalles	3	1.07	-	1	-	-	3	-	3	-	-	1	2	-	2	-	-
Hollenbeck Ave	El Camino Real	Danforth Dr	3	0.66	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Ahwanee Ave	Fair Oaks Ave	San Junipero Dr	3	0.60	-	-	-	1	-	-	2	-	1	2	-	-	1	-	-
Local																			
Acalanes Dr	McKinley Ave	Bernardo Ave	6	1.24	-	-	1	3	1	-	5	-	-	4	-	-	1	1	-
San Zeno Way	Sonora Ct	Kifer Rd	5	1.43	-	-	-	1	1	1	-	1	-	1	1	-	2	-	-
Wildwood Ave	Torrance Ave	Fairwood Ave	5	1.26	-	-	-	-	2	-	3	-	-	1	3	1	2	1	1
Rockefeller Dr	Mary Ave	Lime Dr	4	1.43	-	-	1	1	1	-	3	-	-	1	-	-	-	-	-
Middlefield Rd	Central Expy	City Limit	4	2.10	-	-	-	-	1	-	3	-	-	-	3	-	-	1	-
Westside Ave	Sunnyvale-Saratoga Rd	Freemont High School (dead end)	3	1.98	-	-	-	-	1	-	2	-	-	1	1	-	1	-	-
Arbutus Ave	Azara Pl/Firloch Ave	Azara Pl/Hawthorn Ave	3	1.79	-	-	-	-	1	-	3	-	-	1	1	-	-	-	-
Vaqueros Ave	Alamana Ave	Del Rey Ave	3	1.32	-	-	-	1	1	-	3	-	-	2	-	-	2	-	-
Innovation Way	Moffett Park Dr	Mathilda Ave	3	1.13	-	-	1	1	-	-	1	-	-	-	-	1	1	-	1

Table A4: Signalized Intersections Prioritized by Critical Crash Rate Differential (July 1, 2013 – June 30, 2018)

Legend: Probability of Crash Type Exceeding Threshold Proportion¹: 90-100% ■ 80-90% ■

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Signalized Intersections																	
Evelyn Ave & Mary Ave	29	0.4	-	-	4	4	9	2	7	-	2	9	8	1	4	2	-
Mathilda Ave & Maude Ave	70	0.32	-	-	15	10	29	1	3	2	2	19	25	1	15	5	-
Central Expwy & Mary Ave	69	0.25	1	-	18	6	31	3	5	1	2	12	29	2	22	8	1
El Camino Real & Wolfe Rd	66	0.24	-	1	14	11	21	3	5	-	4	22	21	2	22	3	-
Old San Francisco Rd & Reed Ave	42	0.23	-	-	8	6	16	2	4	-	1	8	16	2	5	3	1
Fremont Ave & Wolfe Rd	34	0.23	1	1	5	13	9	-	-	1	-	9	10	1	8	2	-
Cezanne Dr & El Camino Real	39	0.2	1	2	5	5	11	1	3	8	2	5	10	1	8	2	-
Heron Ave & Homestead Rd	24	0.18	-	-	6	1	13	-	-	1	1	1	11	-	5	2	-
El Camino Real & Sunnyvale Ave	50	0.17	-	-	6	11	13	3	4	2	7	14	9	1	15	4	-
Fremont Ave & Sunnyvale Saratoga Rd	54	0.16	-	-	7	8	21	1	4	3	5	7	15	2	11	5	-
Mathilda Ave & Ross Dr	46	0.14	-	2	13	7	12	3	3	3	1	8	11	-	12	4	-
Kifer Rd & San Zeno Way	19	0.14	-	1	5	3	2	2	1	-	1	2	2	-	1	1	-
El Camino Real & Fair Oaks Ave	50	0.13	-	1	10	5	22	1	4	3	3	9	16	2	15	2	-
Remington Dr & Sunnyvale Saratoga Rd	49	0.11	-	-	6	5	21	1	7	2	3	5	20	-	5	5	-
El Camino Real & Henderson Ave	39	0.11	1	-	8	3	17	-	2	3	3	11	11	1	13	3	1
Maria Ln & Wolfe Rd	22	0.11	-	-	6	5	6	1	1	-	1	6	6	2	8	1	2
Vienna Dr & Tasman Dr	16	0.09	-	-	2	1	4	1	6	2	-	5	6	1	5	-	1
Bernardo Ave & El Camino Real	51	0.08	-	-	9	8	23	-	1	3	1	13	22	-	9	3	-
Fair Oaks Ave & Tasman Dr	22	0.08	-	-	4	6	4	2	5	1	-	7	5	1	6	-	-
California Ave & Sunnyvale Ave	12	0.08	-	-	3	1	2	1	-	3	1	3	2	-	6	3	-

¹ Probability of Crash Type Exceeding Threshold Proportion is based on the probability that the long-term proportion of a specific crash type exceeds a threshold proportion for the site's reference population. See **Appendix B: Collision Analysis Methodology** for additional information.

² Critical Crash Rate (CCR) is a statistical threshold for screening sites to determine if the number of crashes are above the statistical range of crashes that could be expected to occur and indicative of a potential safety concern or issue. See **Appendix B: Collision Analysis Methodology** for additional information.

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
El Camino Real & S Mathilda Ave	61	0.07	-	-	14	16	20	3	3	-	-	14	16	2	15	6	1
Fair Oaks Ave & Olive Ave	23	0.07	-	1	3	7	8	-	1	2	-	7	2	-	6	3	-
California Ave & Mary Ave	13	0.07	-	-	5	-	5	-	-	-	2	-	5	1	1	-	-
Lawrence Expy & Tasman Dr	48	0.06	-	-	15	7	11	2	9	-	-	15	11	1	15	3	1
El Camino Real & Mary Ave	48	0.05	-	-	6	8	18	2	5	2	5	14	15	2	14	2	-
Lawrence Expy & Kifer Rd	43	0.05	-	-	10	8	20	-	-	1	-	8	18	2	5	3	1
Fair Oaks Ave & Arques Ave	29	0.05	-	-	6	5	10	3	1	-	-	6	12	-	3	2	-
Fair Oaks Ave & Old San Francisco Rd	28	0.05	-	-	4	6	13	1	1	-	-	4	13	1	6	1	-
Danforth Dr & Hollenbeck Ave	10	0.05	-	1	1	2	2	1	-	2	-	3	2	-	1	1	-
El Camino Real & Hollenbeck Ave	42	0.04	-	2	9	6	12	-	3	3	4	6	8	1	7	2	1
Duane Ave & Fair Oaks Ave	28	0.04	-	-	2	5	15	1	1	1	2	6	16	-	5	2	-
Caribbean Dr & Moffett Park Dr	16	0.04	-	1	1	4	4	1	4	-	-	5	6	-	5	2	-
Moffett Park Dr & Mathilda Ave	31	0.02	-	-	11	4	12	1	-	-	2	3	10	2	6	1	1
Bobwhite Ave & Fremont Ave	17	0.02	1	1	4	-	8	-	-	3	2	3	6	-	1	-	-
Olive Ave & Sunnyvale Ave	16	0.02	-	-	7	2	4	-	1	1	-	-	4	-	4	2	-
Maude Ave & EB SR 273 On-Ramp	5	0.02	-	-	2	-	-	-	2	-	1	2	-	-	-	1	-
Bernardo Ave & Fremont Ave	22	0.01	-	-	7	3	7	-	2	-	-	1	9	1	4	1	1
Arques Ave & Wolfe Rd	32	0	-	2	10	8	6	2	3	-	1	2	4	1	5	2	-
Commercial St & De Guigne Dr	19	0	-	-	3	4	5	1	3	2	-	6	5	-	3	2	-
Arques Ave & Sunnyvale Ave	9	0	-	-	1	1	1	-	2	-	3	3	1	1	3	-	-
El Camino Real & Poplar Ave	27	-0.02	-	-	5	4	10	-	1	2	2	6	6	-	6	1	-
Fair Oaks Ave & Maude Ave	25	-0.02	1	-	8	4	8	-	3	-	-	7	8	-	8	3	-
Caliente Dr & Fair Oaks Ave	20	-0.02	-	1	6	2	7	2	-	1	1	3	8	-	8	4	-
Lakehaven Dr & Sandia Ave	35	-0.03	-	1	8	8	12	-	2	-	1	11	13	1	16	1	-
Lawrence Expwy & Persian Dr	34	-0.03	-	-	2	9	17	1	1	-	-	10	14	2	10	2	1
Fremont Ave & Mary Ave	20	-0.03	1	-	3	3	8	-	1	-	3	4	6	-	7	-	-
Central Expwy Wboff/R & Wolfe Rd	13	-0.03	-	-	5	2	5	-	-	-	-	-	4	-	-	2	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Mc Kinley Ave & Sunnyvale Ave	11	-0.03	-	-	1	1	6	1	-	1	1	2	4	-	2	-	-
Homestead Rd & Wolfe Rd	28	-0.04	-	1								5	7	1	4	1	-
El Camino Real & Maria Ln	25	-0.04	1	-	3	2	7	-	4	2	4	6	7	1	9	3	1
Hollenbeck Ave & Homestead Rd	18	-0.04	-	-	1	2	9	-	3	1	1	5	9	-	3	3	-
Pastoria Ave & Washington Ave	11	-0.04	-	-	5	1	1	1	1	1	-	5	-	-	5	-	-
Duane Ave & Oakmead Pkwy	33	-0.05	-	-	6	4	19	2	-	-	1	10	14	-	10	1	-
Reed Ave/Monroe St & Lawrence Expwy	9	-0.05	1	-	3	2	3	-	-	-	-	3	4	-	5	-	-
Central Expwy & Oakmead Pkwy	8	-0.05	-	-	3	1	3	-	1	-	-	1	3	-	2	-	-
California Ave & Mathilda Ave	25	-0.06	-	-	1	3	12	-	5	-	2	2	12	-	4	2	-
Fair Oaks Ave & Weddell Dr	13	-0.06	-	-	1	1	6	-	3	2	-	6	6	-	2	1	-
Hollenbeck Ave & Remington Dr	12	-0.06	-	-	4	3	-	-	2	-	-	-	1	1	-	-	-
Knickerbocker Dr & Mary Ave	13	-0.07	-	-	1	-	7	-	1	-	3	1	5	2	3	2	1
Evelyn Ave & Mathilda Ave	13	-0.07	-	-	-	-	7	-	2	-	1	2	8	-	2	1	-
Iris Ave & South Wolfe Road	17	-0.08	-	-	2	3	7	-	1	-	-	3	6	1	4	3	1
Fair Oaks Ave & Iris Ave	15	-0.08	-	-	3	2	3	-	1	5	-	5	4	1	5	1	1
Reed Ave & Timberpine Ave	11	-0.08	-	-	3	1	6	-	-	-	-	2	5	-	2	1	-
Hendy Ave & Sunnyvale Ave	9	-0.08	-	-	2	3	-	1	2	-	-	1	3	-	1	1	-
Aster Ave & Evelyn Ave	6	-0.08	-	-	2	1	-	-	1	-	2	2	1	-	1	-	-
Mathilda Ave & Indio Way	22	-0.09	-	-	1	3	11	1	4	-	-	5	11	-	4	2	-
Ahwanee Av & Fair Oaks Ave	19	-0.09	-	-	5	6	6	-	-	1	1	5	2	-	1	2	-
Fremont Ave & Wright Ave	15	-0.09	-	-	1	2	3	-	5	1	1	3	2	-	1	2	-
Mathilda Ave & 237 EB Ramp	47	-0.1	-	-	17	12	5	-	3	-	-	4	9	1	8	3	-
Mathilda Ave & Talisman Dr	18	-0.1	-	-	1	8	5	-	4	-	-	4	5	-	4	3	-
Mathilda Ave & San Aleso Ave	23	-0.11	-	-	3	7	9	-	2	-	-	5	8	-	5	2	-
Evelyn Ave & Sunnyvale Ave	11	-0.11	-	-	-	2	3	-	1	1	4	3	3	-	3	1	-
Kifer Rd & Wolfe Rd	22	-0.12	-	1	6	-	9	-	1	-	4	3	8	-	2	-	-
Mathilda Ave & Washington Ave	20	-0.12	-	-	-	2	8	1	4	-	1	4	10	-	3	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Fremont Ave & Hollenbeck Ave	15	-0.12	-	-	-	1	8	-	2	1	1	2	9	-	2	2	-
Mathilda Ave & McKinley Ave	17	-0.13	-	-	2	2	9	-	1	-	-	3	8	-	2	4	-
Evelyn Ave & Wolfe Rd	17	-0.13	-	1	4	2	5	-	3	-	3	2	5	-	4	2	-
Evelyn Ave & Fair Oaks Ave	16	-0.13	-	-	2	1	4	-	2	3	2	5	4	-	4	2	-
Lawrence Expwy & Arques Ave	27	-0.14	-	-	4	8	10	-	2	-	-	7	8	1	4	1	-
Alberta Av & Harwick Dr	19	-0.14	-	-	3	1	8	-	2	1	2	6	9	-	5	1	-
Mathilda Ave & Iowa Ave	18	-0.15	-	-	3	4	8	-	-	-	2	3	8	-	2	1	-
Fair Oaks Ave & Wolfe Rd	17	-0.15	1	-	3	-	2	3	5	1	-	5	5	2	5	2	-
Manet Dr & Remington Dr	10	-0.15	1	-	1	-	2	-	1	2	2	2	2	1	2	-	1
El Camino Real & Grape Ave	20	-0.16	-	-	4	2	12	-	2	-	-	2	9	-	2	2	-
Mathilda Ave & Almanor Ave/Ahwanee Ave	36	-0.17	-	-	7	9	10	-	3	-	-	9	11	1	10	2	-
Mary Ave & Ticonderoga Dr	7	-0.17	-	-	-	1	3	3	-	-	-	-	3	1	1	-	-
El Camino Real & Murphy Ave	16	-0.18	-	-	5	-	3	2	1	-	2	1	3	-	2	2	-
Mathilda Ave & Olive Ave	15	-0.18	-	-	4	2	5	1	1	2	-	1	4	1	3	3	1
Alberta Av & Hollenbeck Ave	8	-0.18	-	-	-	-	3	-	-	4	1	1	3	1	-	-	-
Bernardo Ave & Heatherstone Way	6	-0.18	-	-	1	-	2	1	1	-	-	1	1	-	-	-	-
Mathilda Ave & WB SR 237 On/Off-ramps	30	-0.19	-	-	9	6	5	2	2	-	-	4	8	2	5	2	-
Mary Ave & Maude Ave	10	-0.19	-	-	1	-	3	-	3	-	2	3	2	-	1	-	-
Evelyn Ave & Reed Ave	7	-0.19	-	-	3	1	1	-	1	1	-	1	1	-	1	1	-
California Ave & Fair Oaks Ave	11	-0.2	-	-	2	2	1	-	3	-	1	3	1	-	2	-	-
Marion Way & Wolfe Rd	10	-0.2	-	-	-	2	3	-	1	3	1	3	3	-	3	-	-
Iowa Ave & Sunnyvale Ave	8	-0.2	-	-	1	1	5	-	-	1	-	-	6	-	1	1	-
Java Dr & Lockheed Martin Way	8	-0.2	-	-	4	1	-	-	2	-	-	1	-	-	1	-	-
Sunnyvale Saratoga Rd & Connemara Way/Cheyenne Dr	12	-0.21	-	-	2	-	5	-	1	2	-	4	7	-	1	1	-
Mary Ave & Washington Ave	9	-0.21	-	-	4	-	1	1	1	1	1	1	2	1	1	-	1
Belleville Way & Homestead Rd	4	-0.21	-	-	1	1	1	1	-	-	-	-	1	-	-	-	-
Sunnyvale Ave & Washington Ave	7	-0.22	-	-	2	2	1	-	2	-	-	4	1	-	3	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Mary Ave & Remington Dr	7	-0.22	-	-	4	-	1	-	-	-	1	-	1	1	-	2	1
Amd Pl & Duane Ave	6	-0.22	-	-	-	2	-	-	1	-	-	1	1	-	2	1	-
Homestead Rd & Wright Ave	5	-0.22	-	-	1	1	3	-	-	-	-	2	3	-	1	1	-
Stewart Dr & Wolfe Rd	9	-0.23	-	-	2	2	2	-	1	-	-	1	3	-	2	-	-
Reed Ave & Sequoia Dr	7	-0.23	-	-	3	1	1	-	-	2	-	-	1	-	1	1	-
Maude Ave & Sunnyvale Ave	6	-0.23	-	-	1	1	2	-	1	-	1	4	-	-	1	1	-
Central Expwy Ebon/R & Wolfe Rd	13	-0.24	-	-	1	2	10	-	-	-	-	4	9	-	1	-	-
Inverness Way & Wolfe Rd	9	-0.24	-	-	2	4	3	-	-	-	-	4	3	-	2	1	-
Charles St & Evelyn Ave	7	-0.24	-	-	-	-	4	-	2	-	1	2	4	-	1	-	-
Taaffe St & Washington Ave	4	-0.24	-	-	-	-	2	-	-	1	1	1	2	-	-	-	-
Fremont Ave & Rt 85 Nboff/R	12	-0.25	-	-	2	1	3	-	5	-	1	2	3	1	7	1	-
Mary Ave & The Dalles	6	-0.25	-	-	-	-	3	-	2	-	1	-	4	-	1	-	-
Cascade Dr & Mary Ave	6	-0.25	-	-	-	-	2	1	-	-	3	1	2	-	1	-	-
Enterprise Wy & Manila Dr	5	-0.25	-	-	-	-	3	-	1	-	1	1	2	-	-	-	-
Mathilda Ave & Danforth Dr	8	-0.26	-	-	1	1	2	-	2	2	-	3	3	-	1	3	-
Gail Ave & Old San Francisco Rd	6	-0.26	-	-	1	1	2	1	-	-	1	2	1	-	1	-	-
Bernardo Ave & Homestead Rd	6	-0.26	-	-	1	-	4	-	1	-	-	-	4	-	-	-	-
Oakmead Pkwy & Arques Ave	5	-0.26	-	-	1	-	1	-	1	-	-	-	1	-	-	1	-
Bernardo Ave & Washington Ave	5	-0.26	-	-	-	2	2	-	1	-	-	2	3	-	4	1	-
Fremont Ave & Rt 85 Sboff/R	10	-0.27	-	-	7	2	-	-	-	-	-	1	-	-	2	-	-
Fair Oaks Ave & Kifer Rd	7	-0.27	-	-	1	2	2	1	1	-	-	1	1	-	-	-	-
Iowa Ave & Mary Ave	6	-0.27	-	-	3	-	-	-	3	-	-	2	-	-	1	1	-
Lakeside Dr & Oakmead Pkwy	5	-0.28	-	-	1	-	1	1	1	-	-	-	1	-	3	1	-
Crossman Ave & Fair Oaks Ave	7	-0.29	-	-	2	-	1	-	3	-	-	-	1	-	1	1	-
Cascade Dr & Hollenbeck Ave	5	-0.29	-	1	1	2	1	-	-	-	1	-	3	-	1	-	-
Mango Ave & Remington Dr	3	-0.29	-	-	-	-	2	-	-	1	-	-	1	-	-	-	-
Homestead Rd & Lawrence Expwy	7	-0.3	-	-	1	-	6	-	-	-	-	2	5	-	1	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Belleville Way & Fremont Ave	5	-0.3	-	-	1	-	2	-	2	-	-	2	1	-	2	-	-
Innovation Way & Moffett Park Dr	4	-0.3	-	-	1	1	1	-	1	-	-	2	1	-	1	-	-
Heatherstone Ave & Mary Ave	4	-0.3	-	-	2	2	-	-	-	-	-	1	-	-	1	-	-
Mathilda Ave & Persian Dr	5	-0.31	-	-	-	1	2	-	2	-	-	4	2	-	3	1	-
Elko Dr & Lawrence Station Rd	4	-0.31	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-
Mathilda Ave & Innovation Way	4	-0.31	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-
Fair Oaks Ave & Fair Oaks Way	4	-0.31	-	-	-	-	2	-	2	-	-	2	2	-	2	-	-
De Guigne Drive & Duane Ave	4	-0.31	-	-	1	-	1	1	1	-	-	2	1	-	3	1	-
Mathilda Ave & 5th Ave	4	-0.31	-	-	-	-	1	-	2	-	-	2	1	-	1	-	-
Fieldfair Ct & Fremont Ave	4	-0.32	-	-	2	-	-	-	-	1	-	2	-	-	2	-	-
Caribbean Dr & Crossman Ave	4	-0.32	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-
Santa Trinita Ave & Arques Ave	4	-0.32	-	-	1	-	1	1	-	-	1	1	-	-	-	-	-
Maude Ave & Pastoria Ave	4	-0.32	-	-	-	-	3	-	-	-	1	-	2	-	-	-	-
Evelyn Ave & Frances St	3	-0.33	-	-	-	-	2	-	-	1	-	1	1	-	-	-	-
Lakeside Dr & Arques Ave	3	-0.34	-	-	1	-	1	-	1	-	-	1	1	-	1	-	-
Borregas Ave & Maude Ave	3	-0.34	-	-	-	-	2	-	-	1	-	1	1	-	1	-	-
Iowa Ave & Taaffe St	3	-0.34	-	-	-	1	-	-	1	-	1	1	1	-	-	-	-
Adobe Wells Mhp & Reamwood Ave	3	-0.34	-	-	-	-	1	-	1	-	1	1	-	-	-	-	-
Hollenbeck Ave & Torrington Dr	3	-0.34	-	-	1	1	1	-	-	-	-	-	1	-	-	-	-
Bordeaux Dr & Java Dr	3	-0.34	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Homestead Rd & Kennewick Dr	3	-0.34	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-

Table A5: Unsignalized Intersections Prioritized by Critical Crash Rate Differential (July 1, 2013 – June 30, 2018)

Legend: Probability of Crash Type Exceeding Threshold Proportion¹: 90-100% ■ 80-90% ■

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Unsignalized Intersections																	
Indio Way & Soquel Way	7	0.9	-	-	-	-	3	-	4	-	-	2	5	1	1	2	1
Fairwood Ave & Wildwood Ave	7	0.9	-	-	1	2	2	-	1	-	-	3	3	1	2	1	1
Mary Ave & Olive Ave	26	0.84	-	1	16	1	-	1	2	1	2	1	-	-	6	4	-
Caliente Dr & Johanna Ave	6	0.72	-	-	-	4	-	-	1	-	-	3	1	-	3	1	-
Angel Ave & Beemer Ave	6	0.72	-	-	-	-	6	-	-	-	-	1	6	1	3	1	-
Bayview Ave & Maude Ave	21	0.68	-	-	3	3	8	-	-	-	2	2	8	1	2	1	1
Blazingwood Dr & Sandia Ave	16	0.67	-	-	8	5	1	1	-	-	1	1	1	-	2	-	-
Ayala Dr & Bernardo Ave	17	0.65	-	2	-	6	2	2	2	1	2	2	3	1	5	2	-
Evelyn Ave & Murphy Ave	14	0.62	-	-	-	-	2	-	5	1	3	2	4	-	5	1	-
California Ave & San Anselmo Way	8	0.58	-	-	5	-	-	2	1	-	-	-	-	-	-	-	-
El Camino Real & Knickerbocker Dr	9	0.56	-	-	1	1	4	-	1	-	-	3	4	-	4	-	-
Bernal Ave & Caliente Dr	5	0.54	-	-	2	1	-	-	-	-	1	2	-	-	1	-	-
Acalanes Dr & Washington Ave	6	0.49	-	-	1	1	1	1	-	-	-	2	-	-	3	-	-
Carroll St & Mc Kinley Ave	6	0.49	-	-	2	-	1	1	-	-	1	-	-	-	-	-	-
Duane Ave & San Luisito Way	13	0.47	-	-	1	2	5	2	-	-	-	5	4	-	2	1	-
Murphy Ave & Washington Ave	9	0.44	-	-	2	1	2	-	1	1	-	4	-	-	5	-	-
Carroll St & Washington Ave	8	0.36	-	-	4	3	1	-	-	-	-	2	1	-	2	-	-
Blair Ave & Grape Ave	5	0.36	-	-	1	2	-	-	1	-	-	2	-	1	-	1	1
Blazingwood Dr & Bridgewood Way	5	0.36	-	-	-	2	-	-	1	-	-	2	-	-	1	-	-
Blair Ave & Blair Ct	4	0.35	-	-	1	2	-	-	1	-	-	1	-	1	1	-	-

¹ Probability of Crash Type Exceeding Threshold Proportion is based on the probability that the long-term proportion of a specific crash type exceeds a threshold proportion for the site's reference population. See **Appendix B: Collision Analysis Methodology** for additional information.

² Critical Crash Rate (CCR) is a statistical threshold for screening sites to determine if the number of crashes are above the statistical range of crashes that could be expected to occur and indicative of a potential safety concern or issue. See **Appendix B: Collision Analysis Methodology** for additional information.

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Aster Ave & Willow Ave	4	0.35	-	-	1	-	1	-	1	-	-	1	1	-	1	-	-
Valley Forge Dr & Yorktown Dr	4	0.35	-	-	-	-	1	-	-	-	1	-	2	-	-	-	-
Blythe Ave & Blythe Ct	4	0.35	-	-	-	1	-	2	1	-	-	3	-	-	2	-	-
Albatross Dr & Bittern Dr	4	0.35	1	-	-	1	1	-	-	1	1	1	-	-	1	1	-
Ayala Dr & Butano Ave	4	0.35	-	-	-	2	1	-	1	-	-	1	1	-	1	-	-
Kirkland Dr & Ontario Dr	4	0.35	-	-	1	-	-	-	1	-	-	-	-	-	1	-	-
Commercial St & Central Expwy Ramps	4	0.35	-	-	-	1	-	3	-	-	-	1	2	-	-	-	-
Arques Ave & Bayview Ave	4	0.35	-	-	-	-	4	-	-	-	-	-	3	-	1	-	-
Belladonna Ct & Grand Fir Ave	4	0.35	-	-	-	2	2	-	-	-	-	2	-	-	2	-	-
Calle Dorita & Calle Maria	4	0.35	-	-	-	-	4	-	-	-	-	-	3	-	2	1	-
Morse Ave & Roosevelt Ave	4	0.35	-	-	-	2	2	-	-	-	-	1	3	-	-	1	-
San Zeno Way & Sonora Ct	4	0.35	-	-	-	1	1	-	1	-	-	-	2	-	-	-	-
Ayala Dr & Leota Ave	4	0.35	-	-	1	2	-	-	-	-	-	3	-	-	2	-	-
Fair Oaks Way & Persian Dr	9	0.33	-	-	3	-	1	1	2	-	2	2	1	-	3	1	-
Mission College Blvd & Sandia Ave	6	0.28	-	-	2	1	1	-	2	-	-	1	2	-	3	-	-
Bernardo Ave & Iowa Ave	11	0.27	-	1	2	4	4	-	-	-	-	6	-	-	5	2	-
Henderson Ave & Valerian Way	8	0.27	-	-	1	1	2	-	2	-	-	2	1	-	2	1	-
Grand Fir Ave & Old San Francisco Rd	12	0.25	-	-	3	3	2	2	-	-	2	2	3	-	-	-	-
Evelyn Ave & Waverly St	8	0.25	-	-	1	-	1	1	2	-	3	4	1	-	3	-	-
Bernardo Ave & Mc Kinley Ave	9	0.24	-	-	5	1	2	1	-	-	-	1	3	-	3	1	-
Arques Ave & Morse Ave	4	0.22	-	-	2	-	1	-	1	-	-	1	2	-	3	1	-
Leota Ave & Olive Ave	3	0.22	-	-	1	1	-	-	-	-	-	1	-	-	2	1	-
Ahwanee Av & San Aleso Ave	7	0.2	-	-	1	-	1	2	1	-	1	1	-	1	1	2	1
El Camino Real & Sycamore Ter	25	0.19	-	-	1	4	19	-	1	-	-	4	17	1	4	5	-
Bernardo Ave & Knickerbocker Dr	11	0.18	-	-	9	-	1	-	-	-	1	-	1	-	-	2	-
California Ave & Frances St	5	0.18	-	-	1	1	-	-	1	1	-	1	1	-	-	-	-
Frances St & Washington Ave	5	0.18	-	-	-	-	-	-	3	-	1	1	1	-	2	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Duane Ave & San Rafael St	9	0.17	-	-	4	2	-	1	1	-	1	4	1	-	2	-	-
Carroll St & Evelyn Ave	8	0.17	-	-	4	1	1	-	-	1	1	-	1	-	2	-	-
Acalanes Dr & Bernardo Ave	7	0.17	-	-	2	2	1	-	-	1	-	1	-	-	-	-	-
Lakehaven Dr & Meadowlake Dr	7	0.17	-	-	-	-	1	1	2	1	-	2	-	-	-	-	-
Sunset Ave & Washington Ave	7	0.17	-	-	4	-	1	-	-	-	2	1	-	2	1	-	-
Acalanes Dr & Cortez Drive	3	0.17	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Borregas Ave & Garner Dr	3	0.17	-	-	-	3	-	-	-	-	-	1	-	-	1	-	-
Cobalt Way & Central Expwy On/Off-ramps	3	0.17	-	-	-	1	2	-	-	-	-	2	1	-	-	-	-
Socorro Ave & Wildwood Ave	3	0.17	-	-	1	-	-	-	-	-	-	-	1	-	1	1	-
Kern Ave & Lawrence Expwy On/Off-ramps	3	0.17	-	-	-	-	1	1	1	-	-	2	1	-	-	-	-
Dunholme Way & Floyd Ave	3	0.17	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
Alvarado Ave & San Juan Dr	3	0.17	-	-	-	2	-	1	-	-	-	1	-	-	1	-	-
Bellomo Ave & Maria Ln	3	0.17	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-
Buena Vista Ave & Private Mobile Home Rd	3	0.17	-	-	-	-	1	-	2	-	-	1	2	-	2	-	-
Arques Ave & Murphy Ave	3	0.17	-	-	-	-	2	-	1	-	-	1	3	-	-	-	-
Larkspur Ave & Ponderosa Ave	3	0.17	-	-	-	1	-	-	-	-	2	-	-	1	-	-	-
Miraloma Way & Lawrence Expwy On/Off-ramps	3	0.17	-	-	1	-	-	1	1	-	-	-	1	-	-	1	-
Frances St & Olson Wy	3	0.17	-	-	1	-	1	-	-	1	-	-	1	-	1	1	-
Bradford Dr & Ross Dr	3	0.17	-	-	1	-	1	-	-	-	-	2	-	-	-	-	-
Lakebird Dr & Silverlake Dr	3	0.17	-	-	2	-	-	1	-	-	-	1	-	-	1	-	-
Arques Ave & Lastreto Ave	3	0.17	-	1	-	1	1	-	1	-	-	1	1	-	2	-	-
Begonia Way & Grand Fir Ave	3	0.17	-	-	-	1	-	1	-	-	-	1	-	-	1	1	-
Calle Dorita & Calle Lupe	3	0.17	-	-	-	-	1	-	2	-	-	2	1	1	1	-	1
Blazingwood Dr & Prescott Ave	3	0.17	-	-	-	1	1	-	-	-	-	2	-	-	-	-	-
Avenida Ricardo & Calle Isabella	3	0.17	-	-	-	-	-	-	3	-	-	1	1	1	-	1	-
Borregas Ave & Carl Rd	3	0.17	-	-	-	-	-	-	3	-	-	1	1	-	1	-	-
Apollo Way & Cobalt Way	3	0.17	-	-	1	-	1	-	1	-	-	1	1	-	-	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
3Rd St & 4Th St	3	0.17	-	-	-	2	1	-	-	-	-	2	1	-	-	-	-
Coronach Ave & Helena Dr	3	0.17	-	-	1	-	-	-	-	1	-	-	-	-	-	1	-
Foxtail Dr & Golden Oak Ct	3	0.17	-	-	-	2	-	-	1	-	-	1	-	-	-	-	-
Duane Ave & San Juan Dr	7	0.15	-	-	1	2	-	1	-	-	-	1	1	-	-	-	-
Inverness Way & Longspur Ave	4	0.15	-	-	2	-	-	-	2	-	-	-	-	-	-	-	-
El Camino Real & Helen Ave	23	0.13	-	4	4	1	8	-	2	4	2	7	9	-	7	-	-
Fair Oaks Ave & Taylor Ave	15	0.13	-	1	5	5	4	-	-	-	1	2	2	-	4	-	-
Remington Dr & Tilton Dr	7	0.13	-	-	3	1	1	-	-	-	2	1	1	-	-	-	-
Bernardo Ave & Olive Ave	6	0.12	-	-	1	1	1	-	1	-	1	1	2	-	-	1	-
Arcadia Ter & Fair Oaks Ave	14	0.11	-	-	3	3	4	-	1	1	2	3	3	-	4	3	-
Hollenbeck Ave & The Dalles	9	0.11	-	-	1	3	2	-	1	-	-	2	1	-	1	-	-
Remington Dr & Spinosa Dr	7	0.11	-	-	2	-	3	-	-	1	1	-	3	-	1	-	-
Lakehaven Dr & Silverlake Dr	6	0.11	-	-	2	2	-	-	-	-	-	2	-	-	1	1	-
Harvard Ave & Hollenbeck Ave	6	0.11	-	-	2	-	2	-	-	-	-	-	2	-	-	-	-
Azure St & Remington Dr	9	0.1	-	-	3	2	-	-	1	-	1	1	1	-	-	-	-
Borregas Ave & Weddell Dr	7	0.1	-	-	-	1	1	-	2	1	1	2	2	-	3	-	-
Bernardo Ave & Yorktown Dr	5	0.1	-	-	1	-	-	1	2	-	-	1	-	-	1	2	-
El Camino Real & Remington Dr	14	0.08	-	-	4	4	1	-	-	2	3	5	2	-	6	1	-
Columbia Ave & Fair Oaks Ave	12	0.08	-	1	1	5	4	-	-	-	1	5	3	-	2	1	-
Grand Coulee Ave & Hollenbeck Ave	7	0.08	-	1	1	1	1	-	1	-	1	1	2	-	2	1	-
Glendale Ave & Morse Ave	5	0.08	-	-	1	1	1	-	1	-	-	1	1	-	1	-	-
Henderson Ave & Rockrose Ave	5	0.08	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-
Persian Dr & Plaza Dr	5	0.08	-	-	2	-	2	-	-	-	1	4	-	-	3	-	-
Noriega Ave & Washington Ave	5	0.08	-	-	-	3	1	1	-	-	-	2	-	2	2	1	-
All America Way & Olive Ave	5	0.08	-	-	-	-	2	-	1	1	-	2	1	-	-	-	-
Golden Oak Dr & Iris Ave	5	0.08	-	-	1	2	1	-	-	-	-	3	-	-	1	-	-
Foxtail Dr & Iris Ave	5	0.08	-	-	2	1	1	-	-	1	-	2	1	-	1	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Alberta Av & Quebec Ct	5	0.08	-	-	2	1	1	1	-	-	-	1	1	-	1	-	-
Lillick Dr & Thunderbird Ave	3	0.08	-	-	2	-	-	-	1	-	-	1	-	-	1	-	-
Carroll St & Iowa Ave	3	0.08	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Leota Ave & Mc Kinley Ave	3	0.08	-	-	2	-	-	-	-	-	1	-	-	-	-	1	-
California Ave & Commercial St	3	0.08	-	-	-	-	1	-	-	-	-	1	1	-	-	1	-
Morse Ave & Taylor Ave	3	0.08	-	-	-	1	-	-	-	-	2	1	-	-	-	-	-
Roosevelt Ave & Taylor Ave	3	0.08	-	-	-	-	-	1	-	-	-	1	-	-	1	-	-
Arbor Ave & Worley Ave	3	0.08	-	-	1	1	1	-	-	-	-	2	-	-	1	-	-
Bellflower Ave & Grand Fir Ave	3	0.08	-	-	-	1	1	-	-	-	-	2	-	-	-	-	-
Lawrence Expy & Lakewood Dr	19	0.07	-	-	3	4	8	1	1	-	1	5	8	-	8	3	-
Michelangelo Dr & Remington Dr	9	0.07	1	-	4	-	1	-	1	2	1	1	1	-	5	-	-
Lily Ave & Timberpine Ave	6	0.07	-	-	-	2	1	1	2	-	-	5	1	-	5	-	-
Central Expwy & Potrero Ave	20	0.06	-	-	-	1	15	-	3	-	1	1	17	1	2	-	1
Homestead Rd & Ontario Dr	10	0.06	-	-	4	-	1	1	1	-	1	2	2	-	2	-	-
Eleanor Way & Fremont Ave	10	0.06	-	-	-	2	4	-	-	2	1	2	2	1	4	-	1
Olive Ave & Pastoria Ave	6	0.06	-	-	2	-	1	1	-	1	1	-	1	-	1	-	-
Bernardo Ave & Cortez Drive	5	0.06	-	-	2	2	-	-	-	-	-	2	-	-	3	1	-
Charles St & Iowa Ave	5	0.06	-	-	4	1	-	-	-	-	-	-	-	-	1	-	-
Mathilda Ave & Del Rey Ave	18	0.05	-	-	7	1	4	1	2	1	-	-	6	1	7	1	-
De Guigne Dr & Santa Real Ave	7	0.05	-	-	5	-	-	-	-	-	2	-	-	-	-	-	-
Blair Ave & Mary Ave	6	0.04	-	-	3	-	1	-	1	-	1	1	1	-	-	-	-
Heron Ave & Inverness Way	3	0.04	-	-	-	1	-	-	1	-	1	-	-	-	1	-	-
Fair Oaks Ave & US 101 SB Off-Ramp	14	0.03	-	-	3	1	4	-	2	-	-	1	5	1	3	2	1
Persian Dr @ EB SR 273 Off-Ramp (to Fair Oaks Ave)	8	0.03	-	-	4	1	-	1	1	-	-	1	-	-	1	-	-
Fall River Ter & Sunnyvale Saratoga Rd	5	0.03	-	-	3	1	-	-	-	-	-	-	-	-	1	1	-
California Ave & Murphy Ave	3	0.03	-	-	1	2	-	-	-	-	-	1	-	-	1	-	-
Bayview Ave & California Ave	3	0.03	-	-	-	2	-	-	-	-	-	1	-	1	1	-	1

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
California Ave & Oak Ct	3	0.03	-	-	-	-	-	-	2	-	-	2	-	-	1	-	-
Caribbean Dr & WB SR 273 On-ramp	11	0.02	-	-	1	4	4	1	1	-	-	1	3	1	-	1	1
Fair Oaks Ave & Mc Kinley Ave	8	0.02	-	-	2	3	2	-	-	-	-	3	1	-	2	1	-
Mary Ave & Valencia Ave	6	0.02	-	-	3	-	2	-	1	-	-	2	1	-	1	-	-
Maude Ave & Murphy Ave	5	0.02	-	-	3	1	-	-	-	1	-	1	-	-	2	-	-
Hollenbeck Ave & Sheraton Dr	5	0.02	-	-	1	1	-	-	2	-	-	1	-	-	2	-	-
Maude Ave & Worley Ave	5	0.02	-	-	-	2	1	1	-	-	-	2	-	1	-	-	-
Evelyn Ave & Pastoria Ave	5	0.02	1	1	1	1	-	-	2	-	1	2	-	-	-	-	-
Poinciana Dr & Tamarack Ln	4	0.02	-	-	1	-	1	1	-	-	1	1	1	-	2	1	-
Duane Ave & Worley Ave	4	0.02	-	-	1	-	-	-	2	-	-	2	1	-	3	-	-
Calla Dr & Gail Ave	4	0.02	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-
Morse Ave & Persian Dr	4	0.02	-	-	-	-	-	-	2	-	2	-	1	-	1	-	-
Hazelton Ave & Sunnyvale Ave	4	0.02	-	-	1	1	1	-	-	-	1	1	1	-	2	-	-
Henderson Ave & Lupine Dr	4	0.02	-	-	2	-	1	-	-	-	-	2	-	-	1	-	-
Helen Ave & Tamarack Ln	4	0.02	-	-	-	2	1	-	-	-	-	4	-	-	1	-	-
Gainsborough Dr & Manet Dr	4	0.02	-	-	-	-	-	2	-	-	1	3	-	-	1	-	-
Arbor Ave & Fair Oaks Ave	9	0.01	-	-	1	-	3	1	3	-	1	3	4	-	5	3	-
Fremont Ave & Warner Ave	7	0.01	-	-	5	-	1	-	-	-	-	-	1	-	-	-	-
Almanor Ave & Mary Ave	5	0.01	-	-	-	-	-	1	4	-	-	4	4	-	3	-	-
Bernardo Ave & Blair Ave	4	0.01	-	-	1	1	-	-	-	-	1	-	1	-	-	-	-
Evelyn Ave & Sunset Ave	4	0.01	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
Evelyn Ave & Mathilda Pl	4	0.01	-	-	-	-	-	-	1	-	3	1	2	-	1	1	-
Lawrence Expy & 101 SB On Ramp	24	0	-	-	9	2	9	-	2	-	1	5	8	-	6	-	-
Elizabeth Way & Wolfe Rd	7	0	-	-	1	-	3	1	-	1	-	2	2	-	2	-	-
Dartshire Way & Wolfe Rd	7	0	-	2	2	-	3	-	-	1	1	2	2	-	2	-	-
Carson Dr & Mary Ave	6	0	-	-	1	2	1	-	-	-	-	3	1	1	2	-	1
Rt 273 Auxiliary Rd & Rt 273 Ebon/R	6	0	-	-	-	1	4	-	-	-	-	-	3	-	1	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
America Ave & Arques Ave	5	0	-	-	2	-	1	-	1	-	-	3	-	-	-	-	-
Aries Way & Washington Ave	3	0	-	-	-	-	1	-	2	-	-	1	-	-	1	-	-
California Ave & Sobrante Way	3	0	-	-	-	1	1	-	1	-	-	1	-	1	1	-	-
California Ave & Pajaro Ave	3	0	-	-	-	2	-	-	-	-	-	1	-	-	1	-	-
Duane Ct & Santa Ynez St	3	0	-	-	-	1	1	-	1	-	-	-	1	-	-	-	-
Central Expwy & Santa Elena Way	12	-0.01	-	-	-	1	10	-	-	-	1	-	10	-	-	-	-
Eden Ave & Fair Oaks Ave	8	-0.01	-	-	2	1	2	1	2	-	-	3	2	2	3	2	-
Arques Ave & Globalfoundries Dwy	6	-0.01	-	1	3	1	-	-	-	-	2	1	1	-	-	-	-
Duane Ave & Johanna Ave	4	-0.01	-	-	-	3	-	-	1	-	-	1	-	-	1	-	-
Britton Ave & Duane Ave	4	-0.01	-	-	-	1	1	-	-	-	2	1	-	-	2	-	-
Central Ave & Old San Francisco Rd	5	-0.02	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-
Ahwanee Av & Morse Ave	4	-0.02	-	-	-	2	-	1	-	-	-	1	-	-	1	-	-
Henderson Ave & Lily Ave	4	-0.02	-	-	1	-	-	-	2	-	-	2	-	-	3	-	-
Borregas Ave & Duane Ave	4	-0.02	-	-	3	-	-	-	-	-	1	4	1	-	3	1	-
Persian Dr & Ross Dr	4	-0.02	-	-	1	-	2	-	-	-	-	1	-	-	1	-	-
Charles St & Washington Ave	3	-0.02	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-
Florence St & Washington Ave	3	-0.02	-	-	1	-	1	-	-	-	-	1	-	-	-	-	-
Cypress Ave & Fair Oaks Ave	7	-0.03	-	-	2	3	-	2	-	-	-	1	-	1	3	1	-
Gary Ave & Primrose Ave	6	-0.03	-	-	3	-	1	-	-	-	-	-	1	-	-	-	-
Eleanor Way & Wolfe Rd	6	-0.03	-	-	2	1	-	1	-	-	-	2	3	-	1	-	-
Maude Ave & Morse Ave	4	-0.03	-	-	1	1	-	-	-	-	1	1	-	1	1	-	1
Maude Ave & Stowell Ave	4	-0.03	-	-	3	1	-	-	-	-	-	-	-	-	1	-	-
Mathilda Ave & Dunsmuir Ter	8	-0.04	-	-	-	-	4	-	4	-	-	2	5	-	2	1	-
Bend Dr & Hollenbeck Ave	4	-0.04	-	-	-	1	1	-	1	1	-	2	-	-	-	-	-
Evelyn Ave & Marshall Ave	4	-0.04	-	-	-	-	1	-	1	-	1	3	-	-	1	-	-
Evelyn Ave & Lincoln Ave	4	-0.04	-	-	-	3	-	-	-	1	-	1	1	-	1	-	-
Homestead Rd & Samedra St	3	-0.04	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Crescent Ave & Sunnyvale Saratoga Rd	8	-0.05	-	-	-	-	7	-	-	1	-	1	7	-	-	2	-
Reed Ave & Bougainvillea Ter	5	-0.05	-	-	2	3	-	-	-	-	-	2	-	-	1	-	-
Duane Ave & Morse Ave	4	-0.05	-	-	-	-	2	-	1	1	-	-	-	1	2	-	1
Cezanne Dr & Old San Francisco Rd	4	-0.05	-	-	-	-	2	-	2	-	-	2	2	1	1	-	1
Ithaca Ave & Knickerbocker Dr	3	-0.05	-	-	1	-	-	1	1	-	-	1	-	-	-	-	-
Bittern Dr & Harwick Dr	3	-0.05	-	-	-	-	-	-	1	-	1	-	1	-	1	-	-
Ferndale Ave & Morse Ave	3	-0.05	-	-	-	1	1	-	-	-	1	-	-	-	-	-	-
Borregas Ave & Persian Dr	3	-0.05	-	1	-	-	2	-	-	-	1	3	-	-	2	-	-
Coolidge Ave & Pastoria Ave	3	-0.05	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
Miramar Way & Tamarack Ln	3	-0.05	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Columbine Ave & Timberpine Ave	3	-0.05	-	-	-	-	1	-	-	-	1	-	1	-	-	-	-
Alberta Av & Norland Dr	3	-0.05	-	-	1	-	-	-	1	1	-	-	1	-	-	-	-
Alberta Av & Richelieu Pl	3	-0.05	-	-	1	1	-	-	-	1	-	-	-	-	-	-	-
Sequoia Dr & Shasta Fir Way	3	-0.05	-	-	-	1	1	-	-	-	-	1	1	-	1	-	-
Alberta Av & Tenaka Pl	3	-0.05	-	-	-	2	1	-	-	-	-	1	-	-	-	1	-
Anchor Bay Ter & Sunnyvale Ave	3	-0.05	-	-	-	-	-	-	2	-	-	1	1	1	1	-	1
Cascade Dr & Selo Dr	3	-0.05	-	-	-	2	-	-	1	-	-	1	-	-	-	-	-
Sunnyvale Ave & Taylor Ave	3	-0.05	-	-	-	2	1	-	-	-	-	2	-	-	2	-	-
Central Expwy & Central Expwy Wbon/R	12	-0.06	-	-	-	-	9	-	1	-	-	1	9	-	-	-	-
Central Expwy & San Bernardino Way Off-ramp	7	-0.06	1	-	1	-	3	1	2	-	-	3	4	1	2	1	-
Central Expwy & Middlefield Rd On-Ramp	7	-0.06	-	-	-	4	1	-	2	-	-	3	2	-	3	2	-
Fair Oaks Ave & Rt 101 Nboff/R	6	-0.06	-	-	2	1	3	-	-	-	-	4	1	-	3	2	-
Hollenbeck Ave & CVS/Orchard Dwy	5	-0.06	-	-	-	2	-	-	2	-	1	-	-	-	1	-	-
Fremont Ave & Sydney Dr	4	-0.06	-	-	2	-	2	-	-	-	-	-	2	-	-	-	-
Fremont Ave & Kingfisher Ter	4	-0.06	-	-	2	-	-	-	1	1	-	1	-	-	1	-	-
Remington Dr & Apricot Pit Apts Dwy	4	-0.06	-	-	1	-	1	1	1	-	-	-	1	-	1	-	-
Fremont Ave & Lillian Ave	4	-0.06	-	-	1	-	2	-	-	-	1	1	2	-	2	1	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Iowa Ave & Sunset Ave	3	-0.06	-	-	-	-	1	-	-	-	2	1	-	-	2	-	-
Brookfield Ave & Knickerbocker Dr	3	-0.06	-	-	1	1	1	-	-	-	-	1	1	-	1	-	-
Amador Ave & San Ramon Ave	3	-0.06	-	-	1	-	1	-	-	-	-	1	-	-	1	-	-
Inverness Way & Meadowlark Ln	3	-0.06	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Bayview Ave & Duane Ave	3	-0.06	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-
Knickerbocker Dr & Persimmon Ave	3	-0.06	-	1	-	-	-	-	-	1	1	-	-	-	-	1	-
The Dalles & Wright Ave	3	-0.06	-	-	1	-	-	-	-	-	1	1	1	-	-	1	-
Candlewood Ave & Candlewood Ct	3	-0.06	-	-	-	1	1	-	1	-	-	1	2	-	3	1	-
Bremerton Dr & Mary Ave	3	-0.06	-	-	1	-	-	1	-	-	-	1	-	-	1	-	-
Mathilda Ave & NB US 101 On-ramp	10	-0.07	-	-	-	4	3	1	2	-	-	2	5	-	-	1	-
Mathilda Ave & NB US 101 Off-ramp	10	-0.07	-	-	2	1	6	-	-	-	-	3	6	-	4	2	-
Lawrence Expwy & NB US 101 Off-ramp	10	-0.07	-	-	2	2	5	-	-	-	-	4	4	-	2	1	-
Central Expwy & Mary Ave Off-ramp	10	-0.07	-	-	-	-	8	-	2	-	-	5	6	-	2	1	-
Mathilda Ave (NB) & Evelyn Ave	6	-0.07	-	-	1	3	-	-	2	-	-	1	1	-	1	-	-
El Camino Real & Taaffe St	6	-0.07	-	1	-	-	-	-	2	1	1	2	1	-	2	-	-
Taylor Ave & Wolfe Rd	5	-0.07	-	-	1	1	-	-	1	-	2	3	-	-	1	1	-
All America Way & Mathilda Ave	5	-0.07	-	-	-	1	2	-	1	-	1	2	2	1	2	-	1
Bryan Ave & Fair Oaks Ave	4	-0.07	-	-	1	-	-	1	1	-	-	-	1	-	-	1	-
Maude Ave & Potrero Ave	4	-0.07	-	-	1	-	2	-	-	-	-	-	1	-	1	-	-
Fair Oaks Ave & Garland Ave	4	-0.07	-	-	2	-	1	-	1	-	-	-	1	-	1	-	-
Fremont Ave & Picasso Dr	4	-0.07	-	-	-	-	2	-	1	-	-	1	2	-	1	-	-
Hammerwood Ave & Old Mountain View Alviso Rd	3	-0.07	-	1	2	1	-	-	-	-	-	1	-	-	1	-	-
Kiel Ct & Weddell Dr	3	-0.07	-	1	-	-	-	1	2	-	-	2	-	1	2	-	1
Hollenbeck Ave & Knickerbocker Dr	3	-0.07	-	-	-	1	1	-	-	-	1	-	1	-	3	-	-
Maude Ave & San Angelo Ave	3	-0.07	-	-	1	-	-	-	-	1	-	1	1	-	1	-	-
Helena Dr & Mary Ave	3	-0.07	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-
Maude Ave & Roosevelt Ave	3	-0.07	-	-	1	-	-	-	1	-	1	-	-	-	-	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
El Camino Real & Pinto Palm Ter	5	-0.08	-	-	-	1	1	1	1	-	1	5	-	-	4	-	-
Central Expwy & San Bernardino Way	5	-0.08	-	-	-	-	4	-	1	-	-	-	4	-	-	-	-
Fremont Ave & Nelson Way	4	-0.08	-	1	1	-	1	-	-	-	2	-	1	-	1	-	-
Balsam Ave & Fair Oaks Ave	4	-0.08	-	-	2	-	1	-	1	-	-	-	2	-	1	1	-
Crescent Ave & Manet Dr	3	-0.08	-	-	-	1	2	-	-	-	-	2	-	-	1	1	-
Deodar Way & Evelyn Ave	3	-0.08	-	-	-	-	1	-	2	-	-	1	1	-	1	1	-
Bayview Ave & Evelyn Ave	3	-0.08	-	-	-	-	1	1	-	-	1	1	2	-	1	-	-
Reed Ave & Willow Ave	3	-0.08	-	-	-	-	1	-	-	-	1	1	-	-	1	1	-
Central Avenue & Evelyn Ave	3	-0.08	-	-	1	-	2	-	-	-	-	-	-	-	2	1	-
Tasman Dr & L St	3	-0.08	-	-	-	1	-	1	1	-	-	3	-	-	2	-	-
Reed Ave & Reed Ter	3	-0.08	-	-	1	-	1	-	1	-	-	2	-	-	1	-	-
El Camino Real & Summerwinds Nursery Dwy	5	-0.09	-	-	-	1	4	-	-	-	-	-	3	-	1	-	-
Lawrence Expwy/Caribbean Dr & EB SR 273 On-Ramp	5	-0.09	-	-	-	-	5	-	-	-	-	-	5	1	-	-	-
Maude Ave & Wolfe Rd	4	-0.09	-	1	-	1	-	1	1	-	1	1	-	-	2	-	-
Palo Verde Way & Wolfe Rd	4	-0.09	-	-	4	-	-	-	-	-	-	-	-	-	1	1	-
Cumulus Ave & Sunnyvale Saratoga Rd	4	-0.09	-	-	-	-	1	-	2	-	1	1	1	-	1	-	-
Fremont Ave & La Bella Ave	3	-0.09	-	-	1	-	1	-	-	-	-	-	1	-	-	-	-
Borregas Ave & Moffett Park Dr	3	-0.09	-	-	-	-	-	2	-	-	1	1	-	-	1	-	-
Fremont Ave & Selo Dr	3	-0.09	-	-	1	-	1	-	1	-	-	1	1	-	-	1	-
Floyd Ave & Fremont Ave	3	-0.09	-	-	1	-	1	-	1	-	-	-	1	-	-	-	-
Mary Ave & Sutter Ave	3	-0.09	-	-	1	1	-	-	-	-	-	-	-	-	-	1	-
Arques Ave & Silicon Image Dwy	3	-0.09	-	1	2	-	-	-	1	-	-	1	-	-	1	-	-
Miraloma Way & San Vicente Way	3	-0.09	-	-	-	1	2	-	-	-	-	-	1	-	1	-	-
Carroll St & Old San Francisco Rd	3	-0.09	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
Santa Elena Way & Arques Ave	3	-0.09	-	-	1	-	1	-	1	-	-	1	1	-	2	1	-
Duane Ave & El Capitan Ter	3	-0.09	-	-	2	-	-	-	1	-	-	1	1	-	-	-	-
Mary Ave & Middlefield Rd	3	-0.09	-	-	-	-	2	-	1	-	-	1	3	-	-	-	-

Intersection	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
El Camino Real & Avenue-El Camino Oaks Dwy	4	-0.1	-	-	1	2	1	-	-	-	-	-	1	-	-	-	-
Rt 101 Sboff/R & Lawrence Expwy	4	-0.1	-	-	2	2	-	-	-	-	-	1	-	-	1	-	-
Rt 273 Eboff/R & Lawrence Expwy	4	-0.1	-	1	-	2	1	-	-	-	-	1	1	-	1	-	-
Eden Ave & Fair Oaks Ave	3	-0.1	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
Bellomo Ave & Wolfe Rd	3	-0.1	-	-	1	1	-	1	-	-	-	1	-	-	2	-	-
Mathilda Ave & Booker Ave	3	-0.1	-	-	-	1	1	-	-	-	-	-	2	-	-	1	-
Mary Ave & EB Central Expwy Off-ramp	3	-0.1	-	-	-	-	1	-	1	-	-	-	2	-	1	1	-
Miraloma Way & Central Expwy On/Off-ramps	3	-0.1	-	-	-	-	1	-	2	-	-	1	1	-	2	-	-
Caribbean Dr & WB SR 273 Off-ramp	3	-0.11	-	-	-	1	2	-	-	-	-	-	2	-	-	-	-
Hendy Ave & Kifer Rd	3	-0.11	-	-	1	-	-	-	2	-	-	1	1	-	2	-	-
Cobalt Way & Central Expwy On-ramp	3	-0.11	-	-	-	-	3	-	-	-	-	-	3	-	-	-	-
Fair Oaks Ave & Rt 101 Sbon/R	3	-0.11	-	-	-	-	3	-	-	-	-	1	3	1	-	1	-
El Camino Real & Frances St	3	-0.11	-	-	-	-	2	-	1	-	-	1	2	-	2	-	-
Wolfe Rd & Sunrise Ter	3	-0.11	-	-	1	-	1	-	-	-	1	-	1	-	-	1	-
Lakebird Dr & Palamos Ave	3	-0.11	1	-	-	-	1	-	2	-	-	1	3	-	2	1	-
Soquel Way & Centra Expwy On/Off-ramps	3	-0.11	-	-	-	-	2	-	1	-	-	1	2	-	-	-	-

Table A6: Corridor Segment Types Prioritized by Critical Crash Rate Differential (July 1, 2013 – June 30, 2018)

Legend: Probability of Crash Type Exceeding Threshold Proportion¹: 90-100% ■ 80-90% ■

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
County Expressway																			
Central Expy	Commercial St	Wolfe Rd	7	0.8	-	-	-	1	6	-	-	-	-	-	6	-	-	1	-
Lawrence Expy	SB Lawrence Expy to SB US 101 Ramp	NB US 101 to Lawrence Expy Ramp	4	0.68	-	-	1	1	1	-	1	-	1	2	2	-	2	-	-
Central Expy	San Bernardino Way	Soquel Way	5	0.67	-	-	-	-	1	-	1	-	-	1	2	-	1	-	-
Lawrence Expy	Persian Dr	SR 237 EB Ramps	3	0.63	-	-	-	1	1	-	-	-	-	1	1	-	2	1	-
Central Expy	Middlefield Rd Off-Ramp	Middlefield Rd On-Ramp	3	0.62	-	-	-	-	1	-	2	-	-	1	1	-	1	-	-
Central Expy	Mary Ave Intersection	Mary Ave East Ramps	8	0.61	-	-	-	-	8	-	-	-	-	-	7	-	-	1	-
Lawrence Expy	Oakmead Pkwy	US 101 SB Off-Ramp	3	0.6	-	-	1	-	1	-	1	-	-	2	1	-	1	2	-
Lawrence Expy	Kifer Rd	San Zeno Way	3	0.59	-	-	-	-	2	-	1	-	-	-	2	-	-	-	-
Central Expy	Middlefield Rd	City Limit	4	0.57	1	-	-	-	2	-	2	-	-	1	3	-	3	1	-
Lawrence Expy	Reed Ave	San Zeno Way	5	0.55	-	-	-	-	3	-	2	-	-	1	3	1	2	-	1
Central Expy	Wolfe Rd East Ramps	Wolfe Rd West Ramps	51	0.54	-	-	-	3	48	-	-	-	-	2	45	1	1	3	1
Central Expy	Arques Ave East Ramps	Arques Ave West Ramps	13	0.52	-	-	-	1	8	-	4	-	-	1	11	-	-	5	-
Central Expy	Commercial St	San Vincente Way	12	0.5	-	1	-	3	6	1	5	-	1	3	6	-	3	-	-
Class I Arterial																			
Mathilda Ave	El Camino Real	Danforth Dr	3	0.57	-	-	-	-	-	1	2	1	-	1	-	1	1	-	1
El Camino Real	Henderson Ave	Poplar Ave	11	0.55	1	-	1	4	5	-	2	1	-	4	5	-	1	1	-
Mathilda Ave	Ahwanee Ave	San Aleso Ave	7	0.55	-	-	-	2	4	-	1	-	-	1	3	-	5	1	-
Sunnyvale Saratoga Rd	Remington Dr	Crescent Ave	8	0.53	-	-	1	1	5	-	-	1	1	1	5	-	1	2	-
Mathilda Ave	Dunsmuir Terrace	California Ave	8	0.53	-	-	-	2	2	-	2	-	-	2	4	-	2	-	-
Mathilda Ave	Maude Ave	Del Rey Ave	4	0.53	-	-	-	2	-	-	1	-	-	2	-	-	1	-	-

¹ Probability of Crash Type Exceeding Threshold Proportion is based on the probability that the long-term proportion of a specific crash type exceeds a threshold proportion for the site's reference population. See **Appendix B: Collision Analysis Methodology** for additional information.

² Critical Crash Rate (CCR) is a statistical threshold for screening sites to determine if the number of crashes are above the statistical range of crashes that could be expected to occur and indicative of a potential safety concern or issue. See **Appendix B: Collision Analysis Methodology** for additional information.

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Mathilda Ave	Innovation Way	Java Dr	4	0.53	-	-	-	1	1	-	3	-	-	3	1	-	-	-	-
El Camino Real	Cezanne Dr	Sunnyvale Ave	14	0.51	1	-	2	1	5	1	3	1	1	5	5	-	7	2	-
El Camino Real	Knickerbocker Dr	City Limit	3	0.51	-	-	1	-	1	-	1	-	-	-	1	-	1	-	-
Mathilda Ave	Maude Ave	Indio Way	12	0.5	-	-	-	2	10	-	-	-	-	1	10	1	1	-	1
Wolfe Rd	Kifer Rd	Evelyn Ave	5	0.5	-	-	-	-	4	-	1	-	-	1	4	-	-	-	-
Sunnyvale Saratoga Rd	Alberta Ave	Cheyenne Dr	3	0.5	-	-	-	2	1	-	-	-	1	-	1	-	-	1	-
El Camino Real	Fair Oaks Ave	Cezanne Dr	14	0.49	-	-	-	3	8	1	-	1	2	2	7	-	3	1	-
El Camino Real	Mathilda Ave	Pastoria Ave	14	0.48	-	-	1	3	7	-	1	1	2	3	6	1	3	-	1
El Camino Real	Bernardo Ave	Grape Ave	10	0.48	1	-	-	3	5	-	1	1	1	1	6	1	2	1	-
El Camino Real	Wolfe Rd	Maria Ln	9	0.48	-	-	-	3	3	-	4	-	1	-	3	-	3	1	-
Sunnyvale Saratoga Rd	Fremont Ave	Crescent Ave	18	0.47	-	-	5	2	3	-	8	-	1	5	2	1	5	1	1
Mathilda Ave	Ahwanee Ave	US 101 SB Ramps	9	0.47	-	-	-	6	2	-	-	-	3	1	1	-	2	-	-
Sunnyvale Saratoga Rd	Fremont Ave	Cheyenne Dr	8	0.46	-	-	1	1	6	-	-	-	-	-	4	1	1	1	-
Sunnyvale Saratoga Rd	Harwick Way	Homestead Rd	7	0.46	-	-	-	1	3	2	3	1	2	2	5	1	2	1	-
El Camino Real	Mary Ave	Grape Ave	6	0.46	-	-	-	2	1	-	3	-	-	2	3	-	2	2	-
El Camino Real	Pastoria Ave	Mary Ave	20	0.42	-	-	6	4	6	-	4	2	5	2	5	-	4	2	-
El Camino Real	Maria Ln	Fair Oaks Ave	21	0.41	-	1	3	6	9	-	4	1	-	3	7	-	6	2	-
Class II Arterial																			
Sunnyvale Saratoga Rd	El Camino Real	Fall River Ter	8	0.92	-	-	6	1	1	1	-	-	-	1	-	-	1	1	-
Mary Ave	Fremont Ave	Bremerton Dr	4	0.89	-	-	1	1	1	-	1	-	-	-	2	-	1	2	-
Mary Ave	The Dalles Ave	Cascade Dr	6	0.81	-	-	2	1	1	-	2	-	-	2	1	1	1	-	1
Mary Ave	Homestead Rd	Helena Dr	3	0.79	-	-	-	-	1	-	2	-	2	-	-	-	1	-	-
Sunnyvale Ave	Old San Francisco Rd	Olive Ave	3	0.79	-	-	1	-	2	-	-	-	-	-	-	-	1	1	-
Evelyn Ave	Mary Ave	City Limit	12	0.75	-	-	2	-	5	1	5	1	2	3	4	1	4	1	1
Wolfe Rd	Fremont Ave	Eleanor Way	3	0.74	-	-	-	-	1	-	1	-	1	2	1	-	2	-	-

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Wolfe Rd	Eleanor Way	Elizabeth Way	3	0.71	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-
Fair Oaks Ave	Garland Ter	Reed Ave	3	0.71	-	-	-	1	2	-	-	-	-	-	2	1	-	2	-
Evelyn Ave	Wolfe Rd	Fair Oaks Ave	6	0.7	-	-	1	-	3	1	4	-	-	1	1	-	3	-	-
Wolfe Rd	Ponderosa Ave	Periwinkle Ter	3	0.7	-	-	1	-	-	-	2	-	-	-	-	-	1	1	-
Fair Oaks Ave	Reed Ave	Olive Ave	4	0.68	-	-	-	4	-	-	4	-	-	1	1	1	4	-	-
Fair Oaks Ave	California Ave	Arques Ave	6	0.66	-	-	-	1	4	-	1	-	-	-	4	-	-	1	-
Fremont Ave	Sunnyvale Saratoga Rd	Bobwhite Ave/Manet Dr	11	0.65	-	1	3	2	1	-	1	1	3	1	1	1	2	1	1
Wolfe Rd	El Camino Real	Maria Ln	7	0.63	-	-	2	1	1	1	1	-	-	-	2	-	-	-	-
Wolfe Rd	Gary Ave/Primrose Ave	Iris Ave	6	0.6	-	-	1	3	2	-	2	-	1	1	1	-	3	1	-
Wolfe Rd	Iris Ave	Reed Ave	13	0.57	-	-	-	6	4	-	8	-	-	6	2	1	5	-	1
Wolfe Rd	Homestead Rd	Inverness Way	5	0.55	-	-	2	-	1	-	3	1	-	2	1	-	1	1	-
Wolfe Rd	Inverness Way	Marion Way	4	0.54	-	-	1	-	2	-	2	-	-	2	2	-	2	-	-
Commercial/Industrial Collector																			
Maude Ave	Mathilda Ave	San Angelo Ave	4	0.84	-	-	3	-	-	1	-	-	-	-	1	-	-	-	-
Kifer Rd	San Zeno Way	City Limit	3	0.79	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
Maude Ave	Sunnyvale Ave	Bayview Ave	6	0.71	-	-	3	-	2	-	3	-	-	2	-	-	2	-	-
Almanor Ave	Vaqueros Ave	Mathilda Ave	5	0.59	-	-	-	3	1	-	-	-	2	1	1	-	1	-	-
Maude Ave	Pastoria Ave	Mathilda Ave	10	0.54	-	-	7	-	2	1	-	-	-	2	2	1	1	-	-
Lawrence Station Rd	Elko Dr	Anvilwood Ave	4	0.49	-	-	-	-	3	1	4	-	-	3	-	-	2	-	-
Weddell Dr	Ross Dr	Borregas Ave	6	0.45	-	-	1	3	-	1	5	-	-	5	-	2	2	-	1
Lakeside Dr	Oakmead Pkwy	Lakeway Dr	3	0.44	-	-	-	-	-	-	3	-	-	1	1	-	3	1	-
Kifer Rd	Commercial St	San Zeno Way	3	0.33	-	-	2	-	-	-	1	-	1	-	-	-	1	1	-
Residential Collector																			
Bernardo Ave	Helena Ave	The Dalles	3	1.07	-	1	-	-	3	-	3	-	-	1	2	-	2	-	-
Bernardo Ave	Homestead Rd	Helena Dr	4	0.96	-	-	1	1	-	-	2	-	-	1	-	-	1	-	-
Duane Ave	Worley Ave	Fair Oaks Ave	4	0.89	-	-	-	3	1	-	4	-	-	4	-	-	3	1	-
Henderson Ave	El Camino Real	Valerian Way	4	0.84	-	-	1	-	2	1	3	-	1	2	-	-	2	-	-

Facility	Cross Street 1	Cross Street 2	Crashes	Local CCR Differential ²	Fatal Crashes	Severe Crashes	Broadside	Sideswipe	Rear End	Head On	Other	Pedestrian	Bike	Impaired	Aggressive	Distracted	Dark	Wet	Phone
Bernardo Ave	Ayala Dr	Cortez Dr	6	0.73	-	-	2	2	1	-	3	-	-	-	1	1	-	-	1
Hollenbeck Ave	El Camino Real	Danforth Dr	3	0.66	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Ahwanee Ave	Mathilda Ave	San Aleso Ave	6	0.65	-	-	-	3	2	-	1	-	2	1	1	-	2	-	-
Ahwanee Ave	Fair Oaks Ave	San Junipero Dr	3	0.6	-	-	-	1	-	-	2	-	1	2	-	-	1	-	-
Hollenbeck Ave	Homestead Rd	Grand Coulee Ave	15	0.48	-	-	4	2	5	2	4	2	3	2	4	-	2	1	-
Local																			
Middlefield Rd	Central Expy	City Limit	4	2.1	-	-	-	-	1	-	3	-	-	-	3	-	-	1	-
Westside Ave	Sunnyvale Saratoga Rd	Freemont High School (dead end)	3	1.98	-	-	-	-	1	-	2	-	-	1	1	-	1	-	-
Arbutus Ave	Azara Pl/Firloch Ave	Azara Pl/Hawthorn Ave	3	1.79	-	-	-	-	1	-	3	-	-	1	1	-	-	-	-
San Zeno Way	Sonora Ct	Kifer Rd	5	1.43	-	-	-	1	1	1	-	1	-	1	1	-	2	-	-
Rockefeller Dr	Mary Ave	Lime Dr	4	1.43	-	-	1	1	1	-	3	-	-	1	-	-	-	-	-
Vaqueros Ave	Alamana Ave	Del Rey Ave	3	1.32	-	-	-	1	1	-	3	-	-	2	-	-	2	-	-
Wildwood Ave	Torrance Ave	Fairwood Ave	5	1.26	-	-	-	-	2	-	3	-	-	1	3	1	2	1	1
Acalanes Dr	McKinley Ave	Bernardo Ave	6	1.24	-	-	1	3	1	-	5	-	-	4	-	-	1	1	-
Innovation Way	Moffett Park Dr	Mathilda Ave	3	1.13	-	-	1	1	-	-	1	-	-	-	-	1	1	-	1

B. COLLISION ANALYSIS METHODOLOGY

Memorandum

Date: July 6, 2020
To: Ralph Garcia; City of Sunnyvale
From: Steve Davis and Taylor Whitaker; Fehr & Peers
Darryl DePencier, Ben Huie, and Devin Ciriaco; Kimley-Horn
Subject: **Sunnyvale Roadway Safety Plan Collision Analysis**

SJ18-1842

This memorandum describes the data collection, analysis techniques, and results for collisions analyses conducted for the Sunnyvale Roadway Safety Plan. The primary goal of this analysis is the identification of locations with elevated risk of collisions either through their collision histories or their similarities to other locations that have more active collision patterns.

1. Data Collection

Collision data for the five-year period spanning July 1, 2013 through June 30, 2018 – the five most recent years of data available at the time the project was undertaken – were collected from the City of Sunnyvale’s Crossroads Collision Software (Crossroads). This system has access to the latest police reports, allowing validation of the City’s data with Transportation Injury Mapping System (TIMS), which provides access to California crash data using the Statewide Integrated Traffic Records System (SWITRS) data for injury and fatal collisions. This helps to confirm that all relevant data is included.

Vehicular count data and roadway attributes (e.g. number of lanes, intersection traffic control, functional classification) for the Citywide roadway network was sourced through information provided by the City and outputs from the City’s travel demand model. The citywide vehicular traffic volumes are visually represented in **Figure 1**. Traffic volumes from Caltrans freeways were excluded from this evaluation.

The collected data were spatially referenced and mapped in ArcGIS. Each collision was assigned to the nearest intersection within 250 feet, or the nearest roadway segment if no intersection was within range. A raw count of crashes was calculated for each intersection and roadway segment, and intersection collisions were separated by signalized and unsignalized locations.

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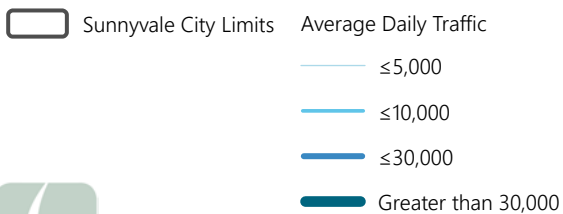
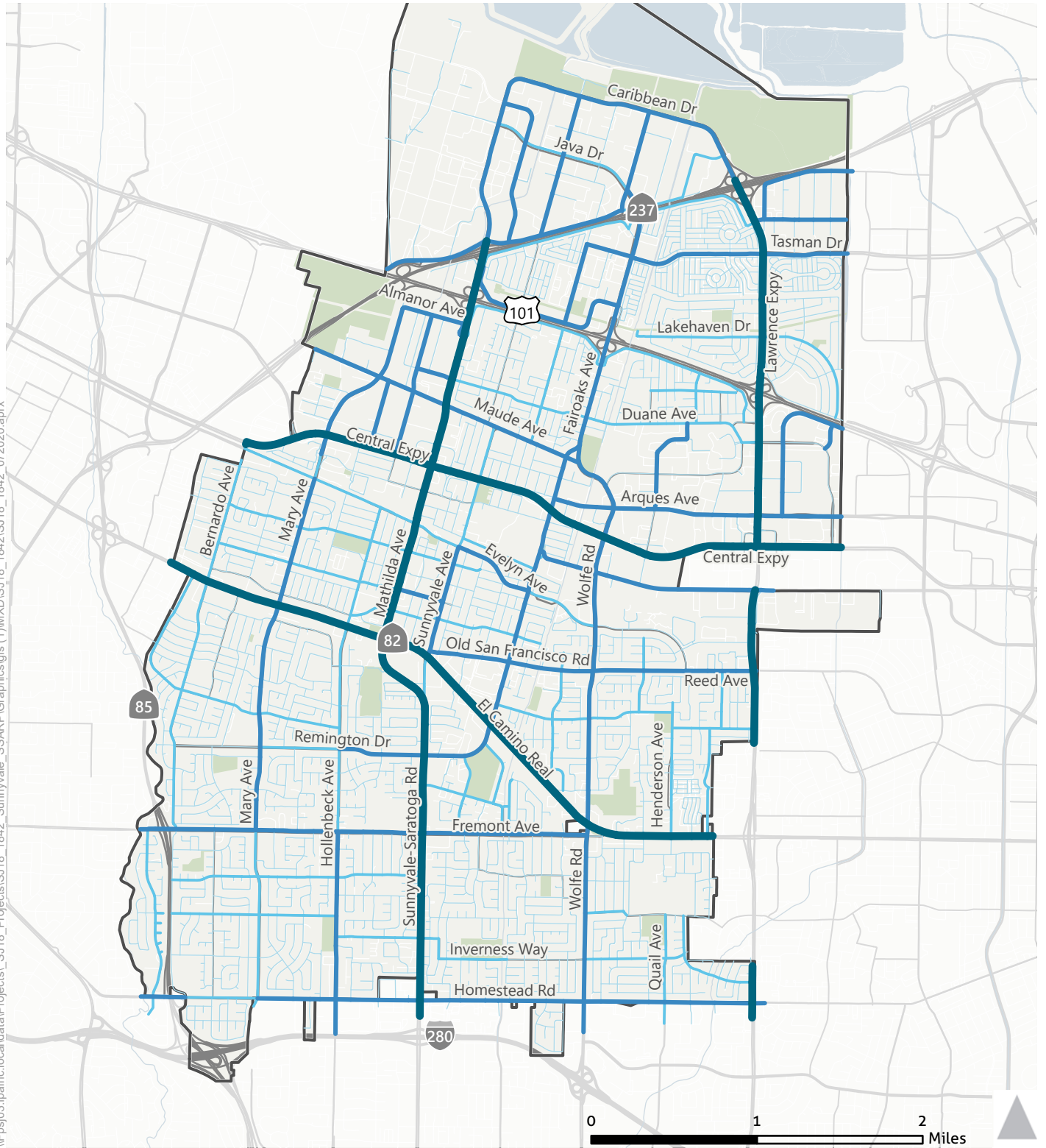


Figure 1

Citywide Vehicular Traffic Volumes





2. Collision History Analysis

2.1 Total Collisions

Approximately 5,811 collisions occurred within public right-of-way between July 1, 2013 and June 30, 2018 according to reported data. The time periods have been re-classified into five discrete one-year periods for the purposes of this analysis:

- Year 1 – July 1, 2013 to June 30, 2014
- Year 2 – July 1, 2014 to June 30, 2015
- Year 3 – July 1, 2015 to June 30, 2016
- Year 4 – July 1, 2016 to June 30, 2017
- Year 5 – July 1, 2017 to June 30, 2018

Figure 2 displays all Citywide collision activity for the five-year study period using data processed through Crossroads. **Figure 3** shows all collisions by type for each year and indicates that rear-end collisions are consistently the most common collision type within the City, followed by broadside and sideswipe collisions.

Knowing the recorded causes of collisions can help identify safety factors systemwide that may contribute to collisions. **Figure 4** provides a breakdown of causality for all recorded collisions. Of all the causes of collisions, approximately 62 percent are a result of unsafe speed, unsafe lane changing, unsafe starting/backing, following too closely, and improper turning.

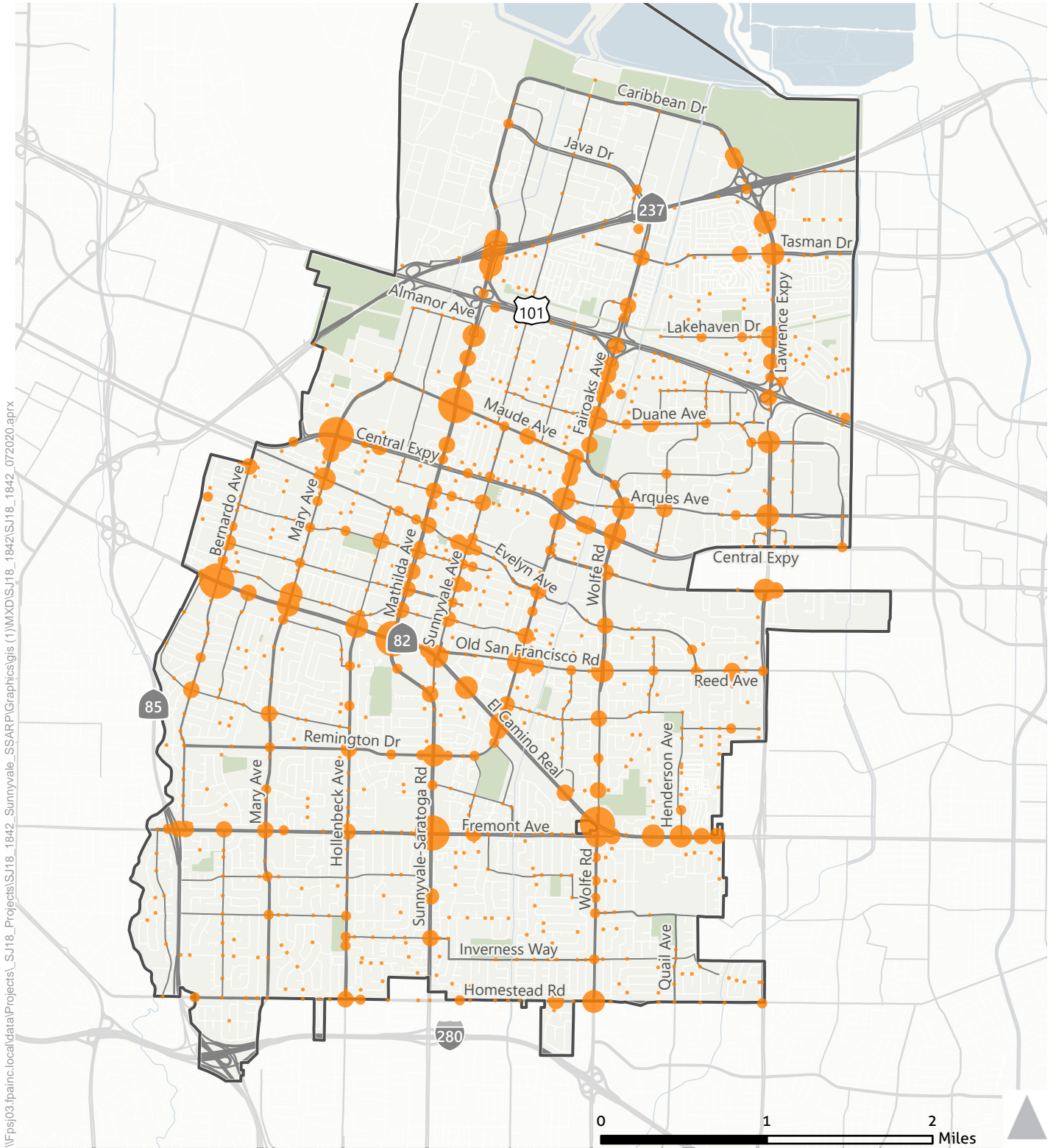


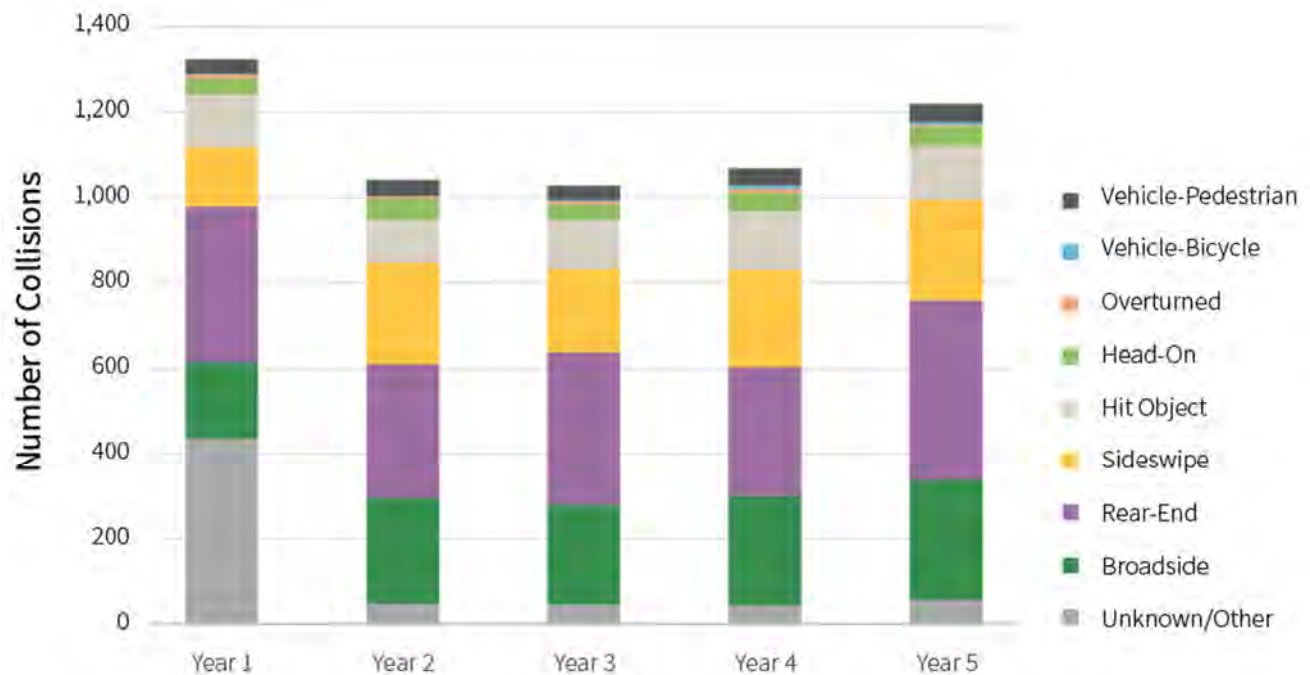
Figure 2

Citywide Collision Locations
(July 1, 2013 – June 30, 2018)





Figure 3: Citywide Collisions by Type (July 1, 2013 – June 30, 2018)



Collision types describe how a crash is reported by law enforcement based upon the parties who were involved and generally describes the manner in which contact was made between the involved parties.

Vehicle-Pedestrian collisions are any crash involving both a motor vehicle and a pedestrian.

Vehicle-Bicycle collisions are any collision involving both a motor vehicle and a bicyclist.

An **Overturned** collision is any type of crash that results in at least one vehicle rotating 90 degrees or more side-to-side or end-to-end (also known as a "rollover.")

A **Head-on** collision is between two vehicles where the primary point of contact was the front of both vehicles.

Hit Object collisions are between a vehicle and non-vehicular object in or near the roadway.

Sideswipe collisions are between vehicles, typically traveling the same direction, where the primary point of contact was the side of the vehicles.

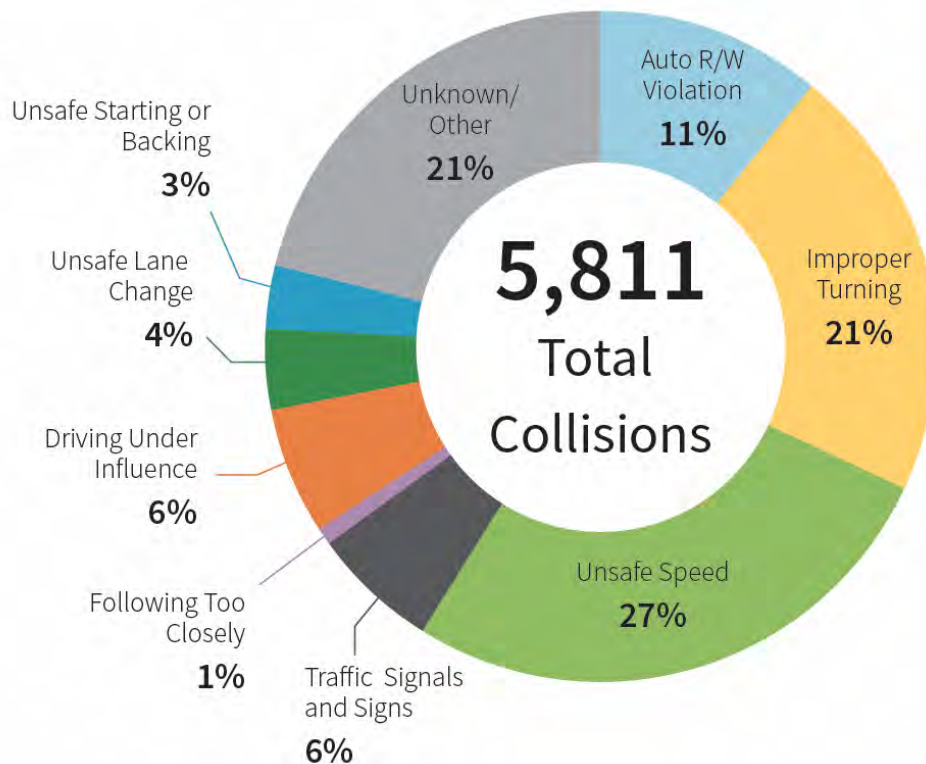
A **Rear-end** collision is between two vehicles traveling in the same direction where the front of one vehicle contacts the rear of another.

Broadside collisions are between vehicles on conflicting paths where the front of one vehicle contacts the side of another.

Other collisions describe any reported collision that was not consistent with one of the primary collision types above.



Figure 4: Citywide Collision Causes (July 1, 2013 – June 30, 2018)



Collision causes describe the primary reason(s) for a crash reported by law enforcement based upon citations or violations of the California Vehicle Code (CVC).

Auto Right-of-Way (R/W) Violation refers to a driver infringing upon the right-of-way of another party in violation of CVC 21800-21809.

Improper Turning identifies a collision where a party made a left or right turn in violation of CVC 22100-22113.

Unsafe Speed refers to a collision where a party is identified to be traveling at a speed exceeding that deemed reasonable or prudent for conditions in violation of CVC 22350.

Traffic Signals and Signs describes a party disobeying a traffic control device such as a traffic signal or roadside sign in violation of CVC 38280-38302.

Following Too Closely refers to a driver of a motor vehicle driving behind another vehicle at distance that is too short to be reasonable or prudent for conditions in violation of CVC 21703.

Driving Under Influence identifies a collision where a driver is found to have been operating a vehicle while impaired by a substance – typically alcohol – in violation of CVC 23152.

Unsafe Lane Change describes a collision where a party moves between two lanes or deviates course in a hazardous manner and/or without signaling appropriately in violation of CVC 22107.

Unsafe Starting or Backing refers to a driver unsafely beginning movement of a stopped vehicle or backing a vehicle onto a roadway in violation of CVC 22106.

Unknown/Other refers to a collision for which the primary cause was either not reported or was not consistent with any of the CVC violations described above.



Identifying the outcomes of the collision (the injuries or type of damage which occurred) is a key part of assessing the environment and safety factors around the site of the collision. **Figure 5** displays the collision outcomes and severities for each year in the study period. Over the five-year period studied, there were a total of 24 fatal collisions and 65 collisions resulting in severe injury.

Figure 5: Citywide Collision Outcomes (July 1, 2013 – June 30, 2018)

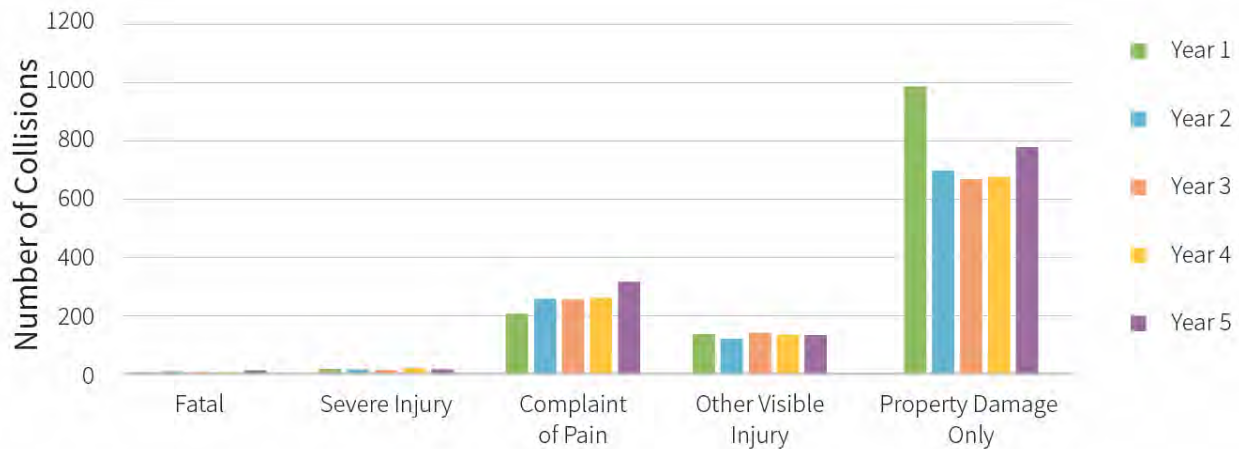
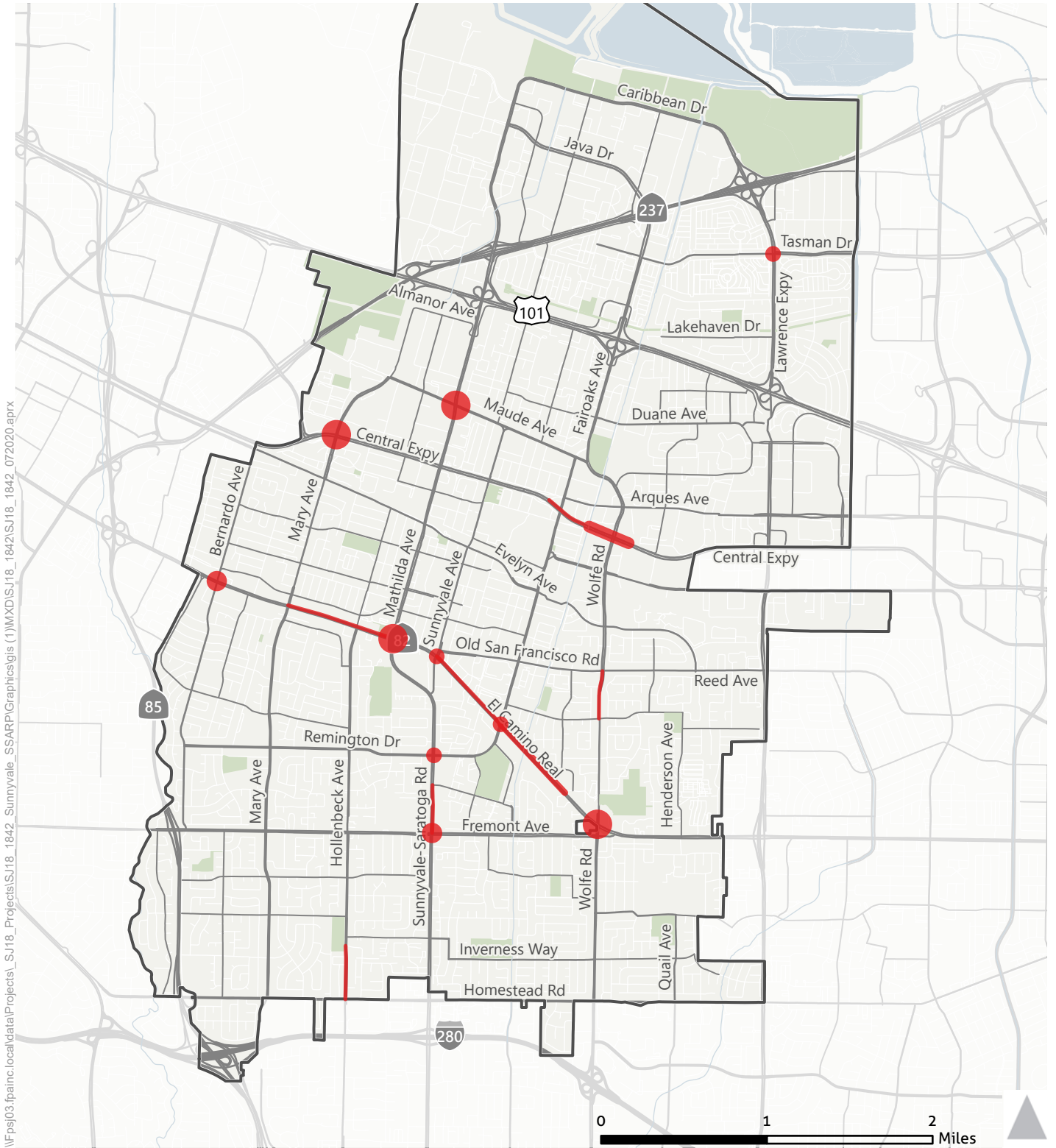


Figure 6 shows the ten intersections and ten roadway segments which had the highest number of collisions. The highest collision locations align with arterial roadways, including El Camino Real and the County Expressways. In many cases, these coincide with the High Injury Network identified in the Sunnyvale Vision Zero Plan, which accounts for 60% of the fatal and severe injury collisions in the City on just 7% of its roadway network. The top five collision intersections and roadway segments by classification have been identified in **Tables 1 and 2**, respectively.

Table 1: Top Collision Intersections

Location	Total Collisions (5-year Period)
Signalized Intersections	
Mathilda Avenue & Maude Avenue	70
Central Expressway & Mary Avenue	69
El Camino Real & Wolfe Road	66
El Camino Real & S Mathilda Avenue	61
Fremont Avenue & Sunnyvale-Saratoga Road	54
Unsignalized Intersections	
Mary Avenue & Olive Avenue	26
El Camino Real & Sycamore Terrace	25
Lawrence Expressway & 101 SB On-Ramp	24
El Camino Real & Helen Avenue	23
Bayview Avenue & Maude Avenue	21

Source: Fehr & Peers, Kimley-Horn, 2020.



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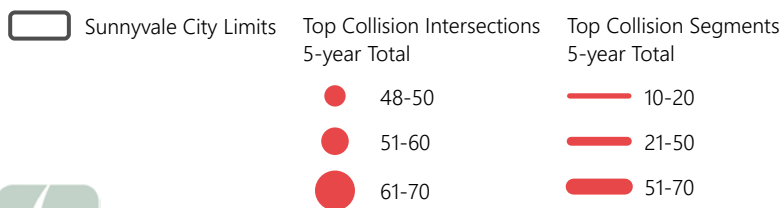


Figure 6
Top Ten Citywide Collision Intersections and Segments



Table 2: Top Collision Roadway Segments

Segment	From	To	Total Collisions (5-year Period)
County Expressway			
Central Expressway	Wolfe Rd East Ramps	Wolfe Rd West Ramps	51
Central Expressway	Arques Ave East Ramps	Arques Ave West Ramps	13
Central Expressway	Commercial St	San Vincente Way	12
Central Expressway	Mary Ave Intersection	Mary Ave East Ramps	8
Central Expressway	Commercial St	Wolfe Rd	7
Class I Arterial			
El Camino Real	Maria Ln	Fair Oaks Ave	21
El Camino Real	Pastoria Ave	Mary Ave	20
Sunnyvale-Saratoga Road	Fremont Ave	Crescent Ave	18
El Camino Real	Mathilda Ave	Pastoria Ave	14
El Camino Real	Fair Oaks Ave	Cezanne Dr	14
Class II Arterial			
Wolfe Road	Iris Ave	Reed Ave	13
Evelyn Avenue	Mary Ave	City Limit	12
Fremont Avenue	Sunnyvale-Saratoga Rd	Bobwhite Ave/Manet Dr	11
Sunnyvale-Saratoga Road	El Camino Real	Fall River Ter	9
Wolfe Road	El Camino Real	Maria Ln	7
Commercial/Industrial Collector			
Maude Ave	Pastoria Ave	Mathilda Ave	10
Maude Ave	Sunnyvale Ave	Bayview Ave	6
Weddell Dr	Ross Dr	Borregas Ave	6
Almanor Ave	Vaqueros Ave	Mathilda Ave	5
Maude Ave	Mathilda Ave	San Angelo Ave	4
Residential Collector			
Hollenbeck Ave	Homestead Rd	Grand Coulee Ave	15
Bernardo Ave	Ayala Dr	Cortez Dr	6
Ahwanee Ave	Mathilda Ave	San Aleso Ave	6
Bernardo Ave	Homestead Rd	Helena Dr	4
Henderson Ave	El Camino Real	Valerian Way	4
Local			
Acalanes Dr	McKinley Ave	Bernardo Ave	6
San Zeno Way	Sonora Ct	Kifer Rd	5
Wildwood Ave	Torrance Ave	Fairwood Ave	5
Rockefeller Dr	Mary Ave	Lime Dr	4
Westside Avenue	Sunnyvale-Saratoga Rd	Dead End	3

Source: Fehr & Peers, Kimley-Horn, 2020.

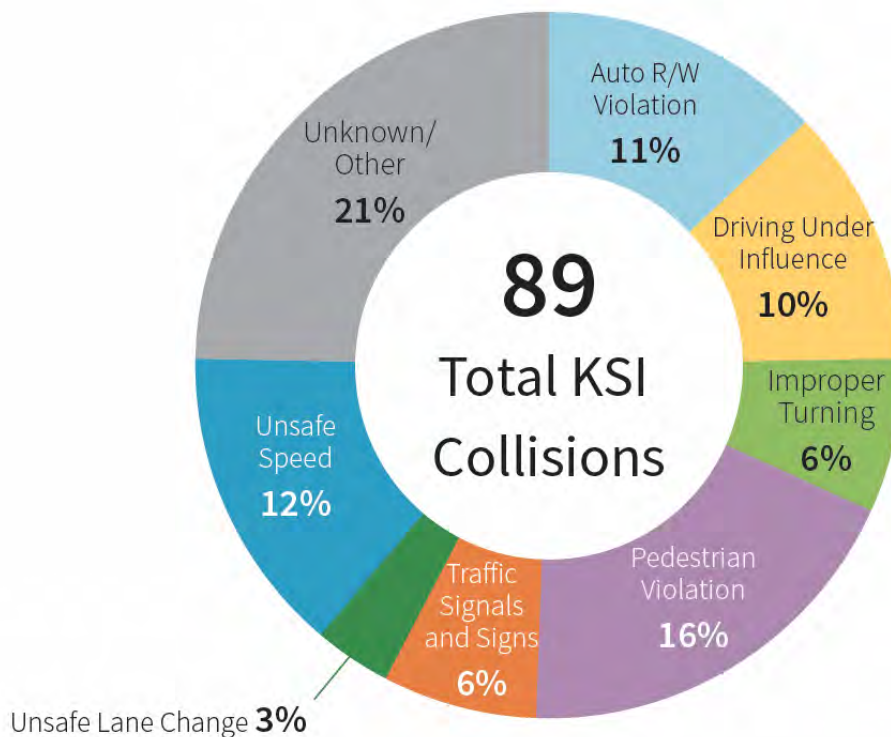


2.2 Fatal & Severe Injury Collisions

Identifying locations and contributing factors of fatal and severe injury collisions – also known as Killed or Severely Injured (KSI) collisions – is a key step in detecting any patterns in location or design of the roadway/ intersection that are potentially affecting their occurrence. **Figure 8** shows the locations of the 89 fatal and severe injury collisions that occurred within the City. Most KSI collisions occurred at or near intersections rather than at mid-block locations along roadway segments. In addition, the fatal collisions typically occurred on a Class I or Class II arterial. **Figure 7** displays the percentage of KSI collisions by their cited cause, with unsafe speed and pedestrian violations representing the greatest causes by citation.

Of the 89 total KSI collisions, 48 involved active transportation modes – 33 were pedestrian-involved and 15 were bicycle-involved. The top intersections and roadway segments where KSI collisions occurred are shown in **Tables 3 and 4**, respectively.

Figure 7: Citywide Fatal and Severe Injury Collision Causes
(July 1, 2013 – June 30, 2018)



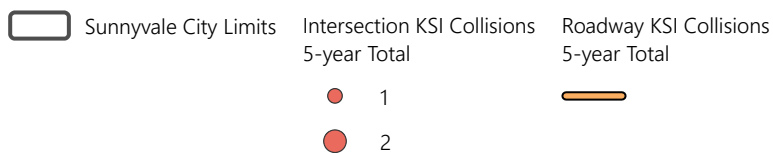
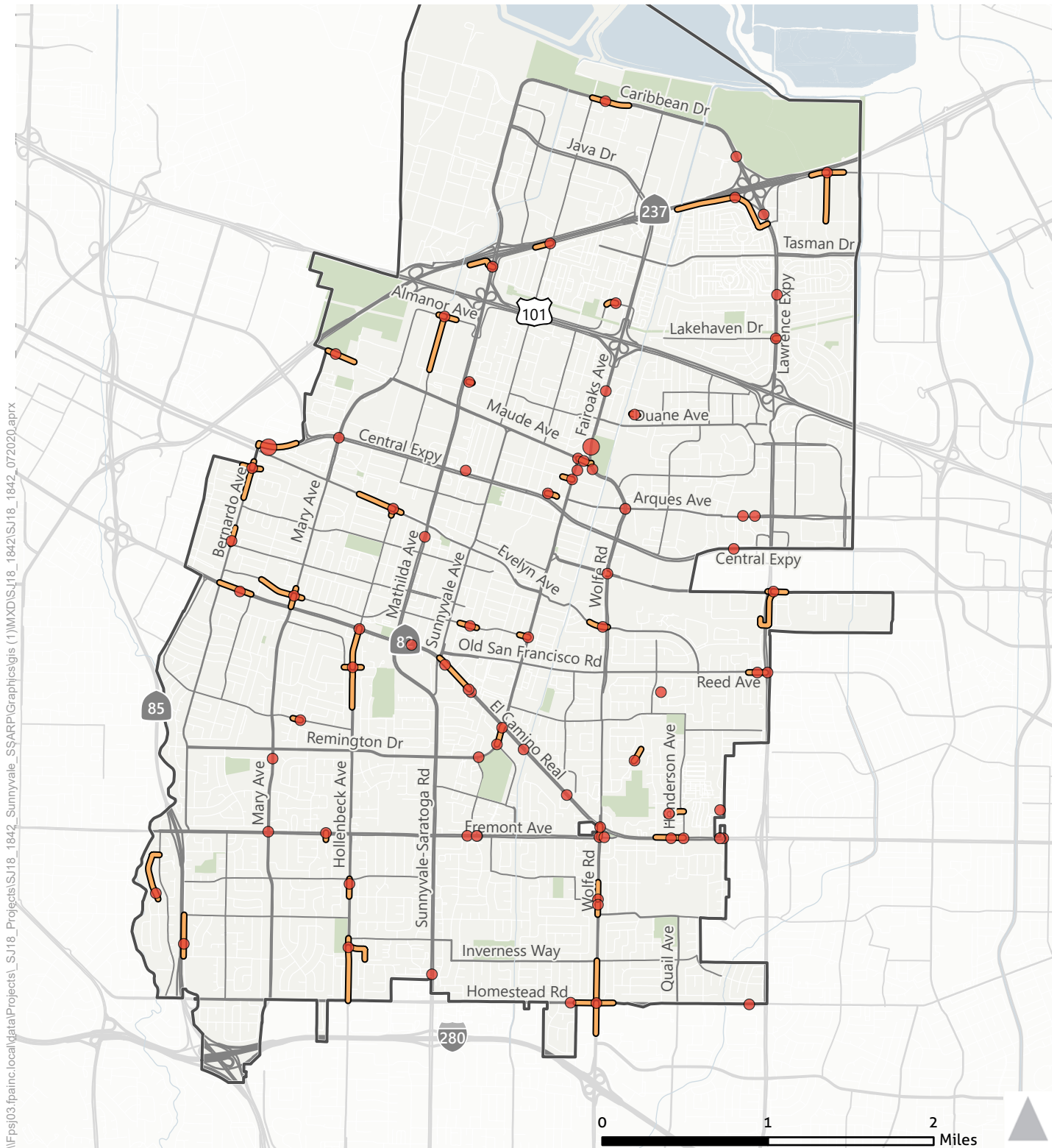


Figure 8

Citywide Fatal and Severe Injury Collision Locations (July 1, 2013 – June 30, 2018)





Table 3: Top KSI Collision Intersections

Location	KSI Collisions (5-year Period)	Total Collisions (5-year Period)	Bike/Ped Collisions (5-year Period)
<i>Signalized</i>			
El Camino Real & Cezanne Drive	3	39	10
Mathilda Avenue & Ross Drive	2	46	4
El Camino Real & Hollenbeck Avenue	2	42	7
Fremont Avenue & Wolfe Road	2	34	1
Wolfe Road & Arques Avenue	2	32	1
Fremont Avenue & Bobwhite Avenue / Manet Drive	2	17	5
Central Expressway & Mary Avenue	1	69	3
El Camino Real & Wolfe Road	1	66	4
El Camino Real & Fair Oaks Avenue	1	50	6
El Camino Real & Henderson Avenue	1	39	6
<i>Unsignalized</i>			
El Camino Real & Helen Avenue	4	23	6
Bernardo Avenue & Ayala Drive	2	17	3
Wolfe Road & Dartshire Way	2	7	2
Evelyn Avenue & Pastoria Avenue	2	5	1
Mary Avenue & Olive Avenue	1	26	3
Fair Oaks Avenue & Taylor Avenue	1	15	1
Fair Oaks Avenue & Columbia Avenue	1	12	1
Bernardo Avenue & Iowa Avenue	1	11	0
Remington Drive & Michelangelo Drive	1	9	3
Hollenbeck Avenue & Grand Coulee Avenue	1	7	1

Source: Fehr & Peers, Kimley-Horn, 2020.



Table 4: Top KSI Collision Roadway Segments

Location	From	To	KSI Collisions (5-year Period)	Total Collisions (5-year Period)	Bike/Ped Collisions (5-year Period)
County Expressway					
Central Expressway	Commercial Street	San Vicente WB On-Ramp	1	12	1
Central Expressway	Middlefield Road	City Limit	1	4	0
Class I Arterial					
El Camino Real	Maria Lane	Fair Oaks Avenue	1	21	1
El Camino Real	Cezanne Drive	Sunnyvale Avenue	1	14	2
El Camino Real	Henderson Avenue	Poplar Avenue	1	11	1
El Camino Real	Bernardo Avenue	Grape Avenue	1	10	2
Class II Arterial					
Fremont Avenue	Sunnyvale-Saratoga Road	Bobwhite Avenue/ Manet Drive	1	11	4
Residential Collector					
Bernardo Avenue	Helena Avenue	The Dalles Avenue	1	3	0

Source: Fehr & Peers, Kimley-Horn, 2020.

2.3 Bicycle- and Pedestrian-involved Collisions

Pedestrian Collisions

Collisions between vehicles and pedestrians more frequently result in a severe injury or fatality. Identifying the historical patterns of these collisions is a large component in the analysis process. As shown in **Figure 9**, during the study period, a total of 201 pedestrian-involved collisions occurred. Of the 201 collisions, 12 resulted in fatality, 21 were reported with severe injury, 78 with visible injuries, and 79 with complaints of pain. **Figure 10** displays the locations of pedestrian collisions and **Table 5** identifies what action the pedestrian was taking at the time of collision. Pedestrians in these collisions were most frequently identified as crossing in a crosswalk at an intersection. The location with the greatest number of pedestrian collisions was the intersection of El Camino Real and Cezanne Drive, which includes permissive left-turn movements across parallel crosswalks.



Figure 9: Citywide Pedestrian Collision Outcomes
 (July 1, 2013 – June 30, 2018)

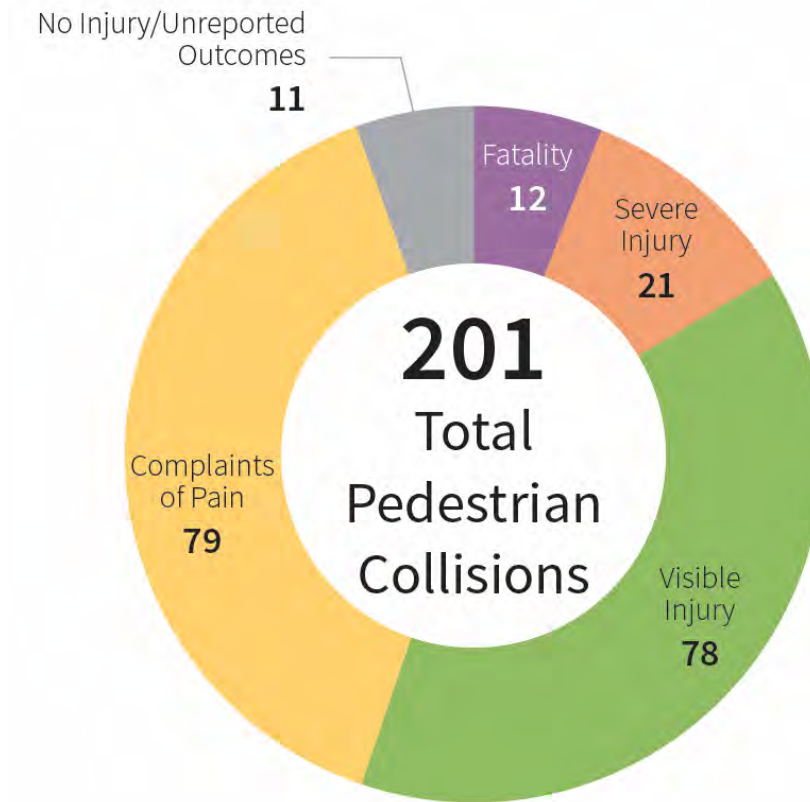


Table 5: Action of Pedestrian in Collision

Year	Crossing in Crosswalk at Intersection	Crossing in Crosswalk Not at Intersection	Crossing Not in Crosswalk	In Road (Walking along Roadway)	Not in Road	Total
Year 1	28	3	7	4	8	35
Year 2	35	1	9	3	2	45
Year 3	16	0	3	5	7	19
Year 4	31	1	8	2	4	40
Year 5	28	0	9	4	2	37
Total	138	5	36	18	23	176

Source: Fehr & Peers, Kimley-Horn, 2020.

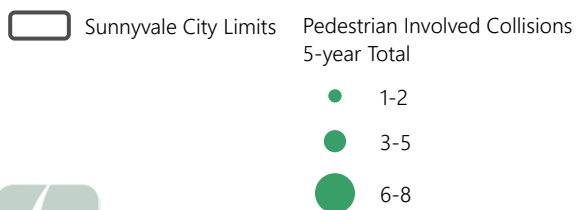
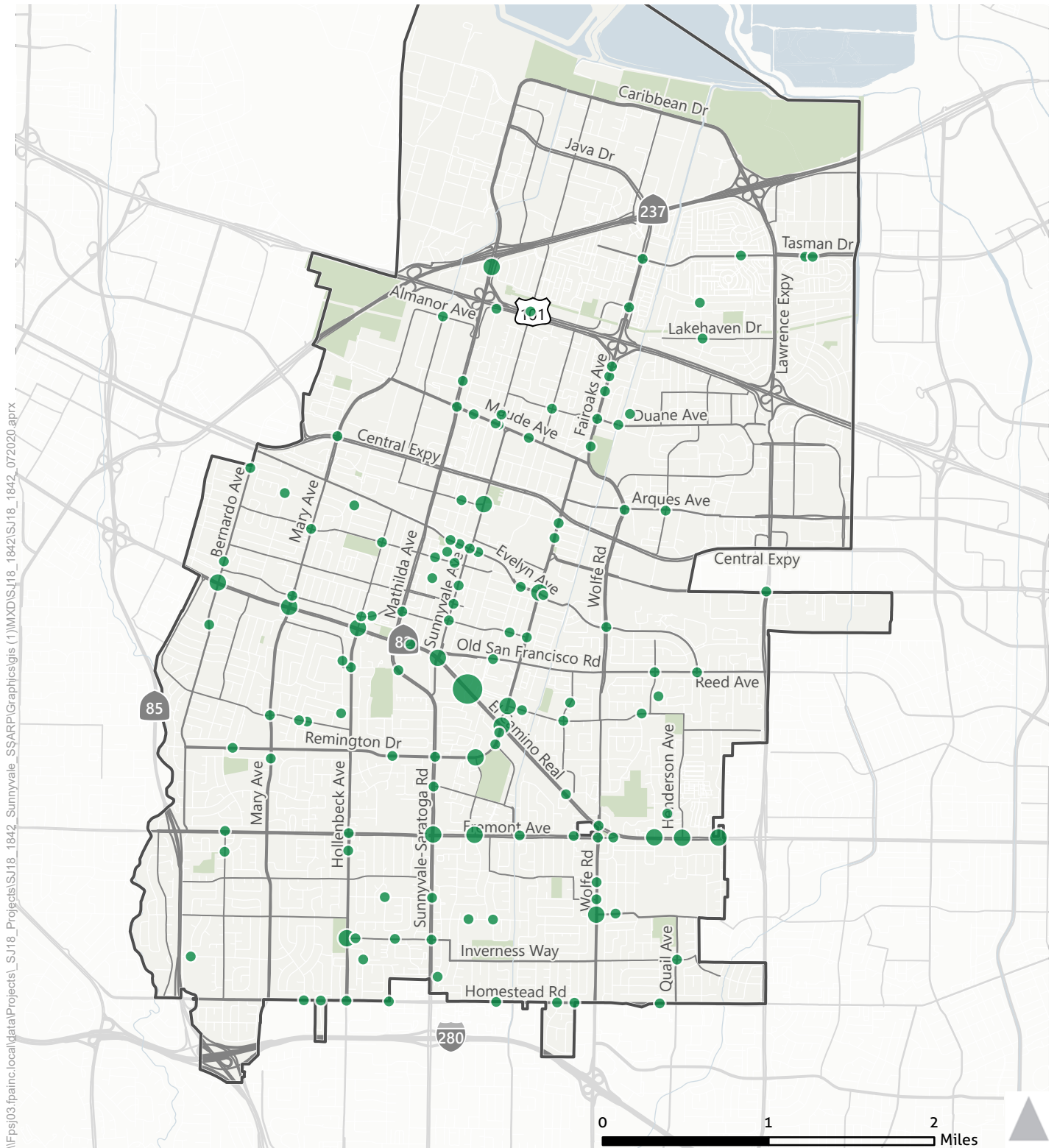


Figure 10

Pedestrian-involved Collisions (July 1, 2013 – June 30, 2018)



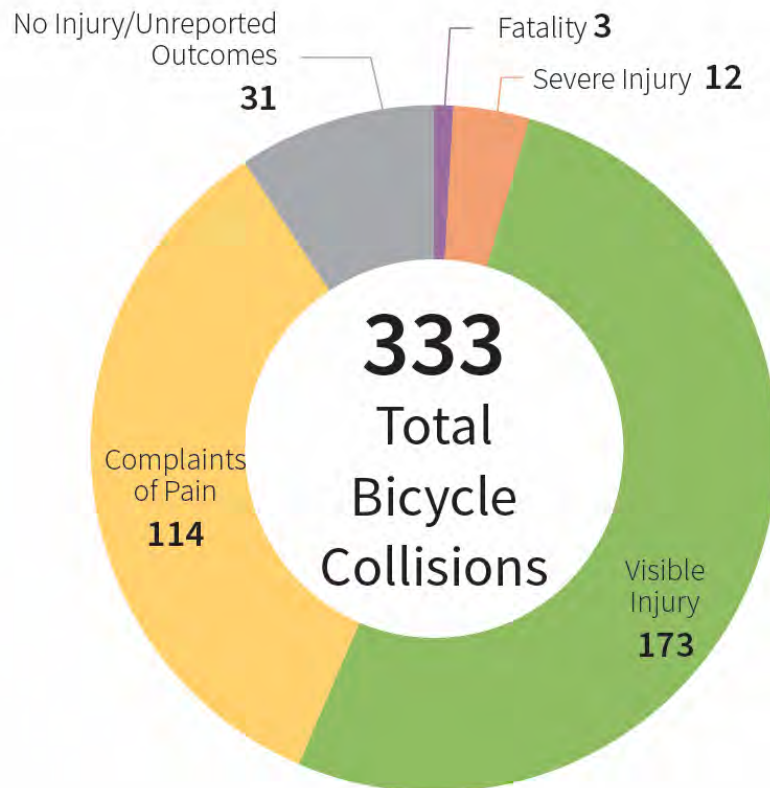


Bicycle Collisions

Like pedestrian collisions, the identification of vehicle-bicycle collision locations is important in understanding areas of the network where there are factors that may be affecting the safety of these transportation modes. As seen in **Figure 11**, of the 333 bicycle-involved collisions, 3 resulted in a fatality, 12 were reported with severe injury, 173 with visible injury, and 114 with complaints of pain. These collisions are visually represented in **Figure 12**. The location with the highest number of bicycle-involved collisions is the intersection of El Camino Real and Sunnyvale Saratoga Road, which was substantially modified between mid-2016 and mid-2017 to eliminate channelized right-turns and improve crosswalks. Six of the seven bicycle-involved collisions at this location occurred prior to completion of this improvement project, and five of these collisions were of types that would have been addressed by the implemented countermeasures.

The locations with the next highest number of bicycle-involved collisions are the intersections of Fremont Avenue at Sunnyvale Saratoga Road, which is adjacent to Fremont High School and two corners currently being planned for redevelopment, and El Camino Real at Mary Avenue. Both are relatively large intersections with a high level of exposure for bicyclists crossing either roadway.

Figure 11: Citywide Bicycle Collision Outcomes
(July 1, 2013 – June 30, 2018)



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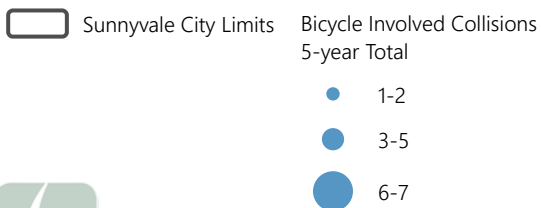
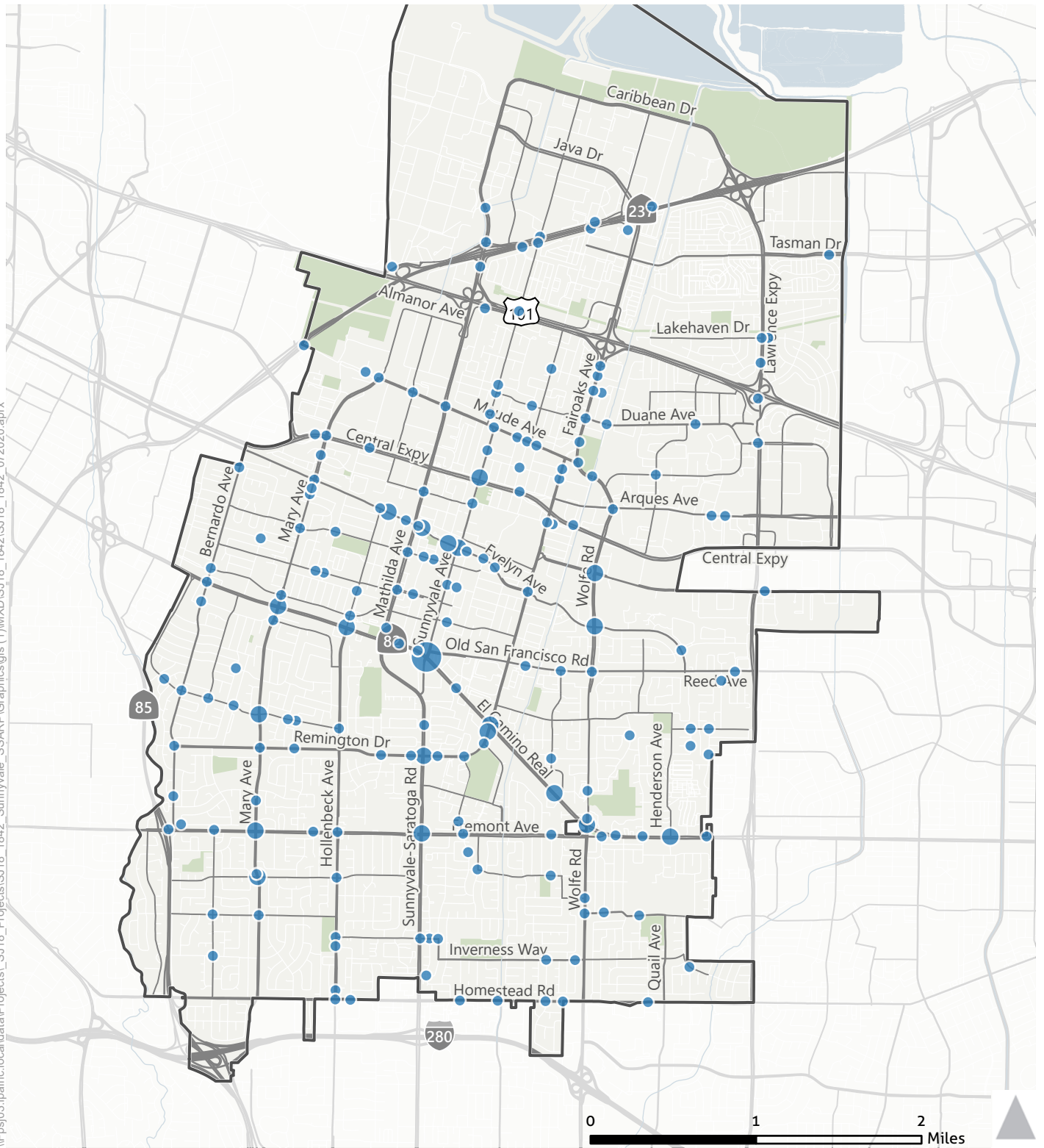


Figure 12

Bicycle-involved Collisions (July 1, 2013 – June 30, 2018)





2.4 Vehicular Run-off-Road and Night-time Collisions

Single Vehicle/Run-off-Road Collisions

A reported vehicular collision with fixed objects typically indicates that the vehicle collided with immobile objects outside of the travel lanes. These are often collisions with light poles, signage, personal property, or other objects outside of the roadway surface. Fixed-object collisions are most frequently classified as head-on, sideswipe, broadside, or overturned vehicles. **Figure 13** shows the locations of collisions of vehicles from 2013-2018. Tasman Drive between Fair Oaks Avenue and Lawrence Expressway has experienced a high number of fixed object collisions within the study period. The highest number of fixed object collisions occurs at the intersection of Evelyn Avenue and Mary Avenue. A notable characteristic of both locations is a high level of side friction caused by adjacent modes within a constrained right-of-way that includes objects within the desired clear zone on both shoulders as well as in the median.

Vehicular Night-time Collisions

Collisions occurring during periods of darkness (typically at night) are often categorized by whether streetlights are present and operating. **Figure 14** visually displays the locations of vehicular collisions during the study period during dark periods both with and without the presence of functioning streetlights reported. Collisions of both types may occur at some locations, which is typically indicative of infrastructure changes or equipment malfunction.

El Camino Real within the study area has a high number of collisions at dark at most major cross-streets. In addition, Mathilda Avenue between Maude Avenue and SR-237 has a high number of collisions at dark. Each is a wide, major arterial roadway corridor that relies upon median lighting for some segments. Mathilda Avenue north of Ahwanee Avenue/Almanor Avenue is currently being reconstructed, which will include adjustments to roadway lighting.

The two intersections with the highest number of collisions at dark are the intersection of Central Expressway and Mary Avenue and the intersection of El Camino Real and Wolfe Road. Both locations are large intersections which are owned by partner agencies.

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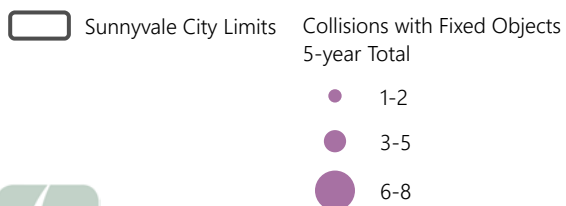
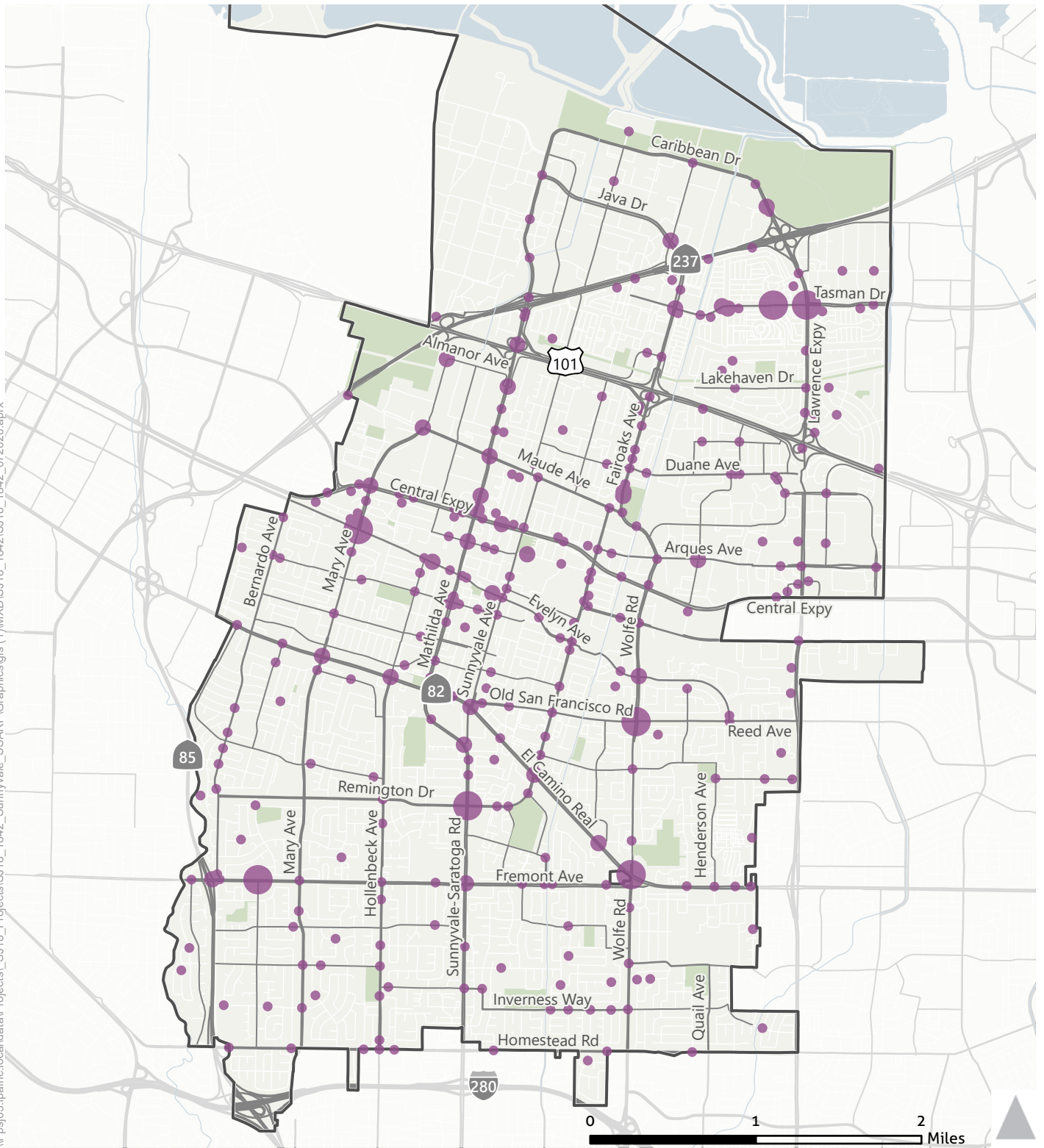
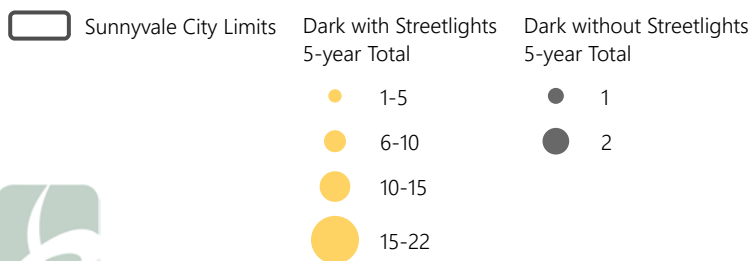
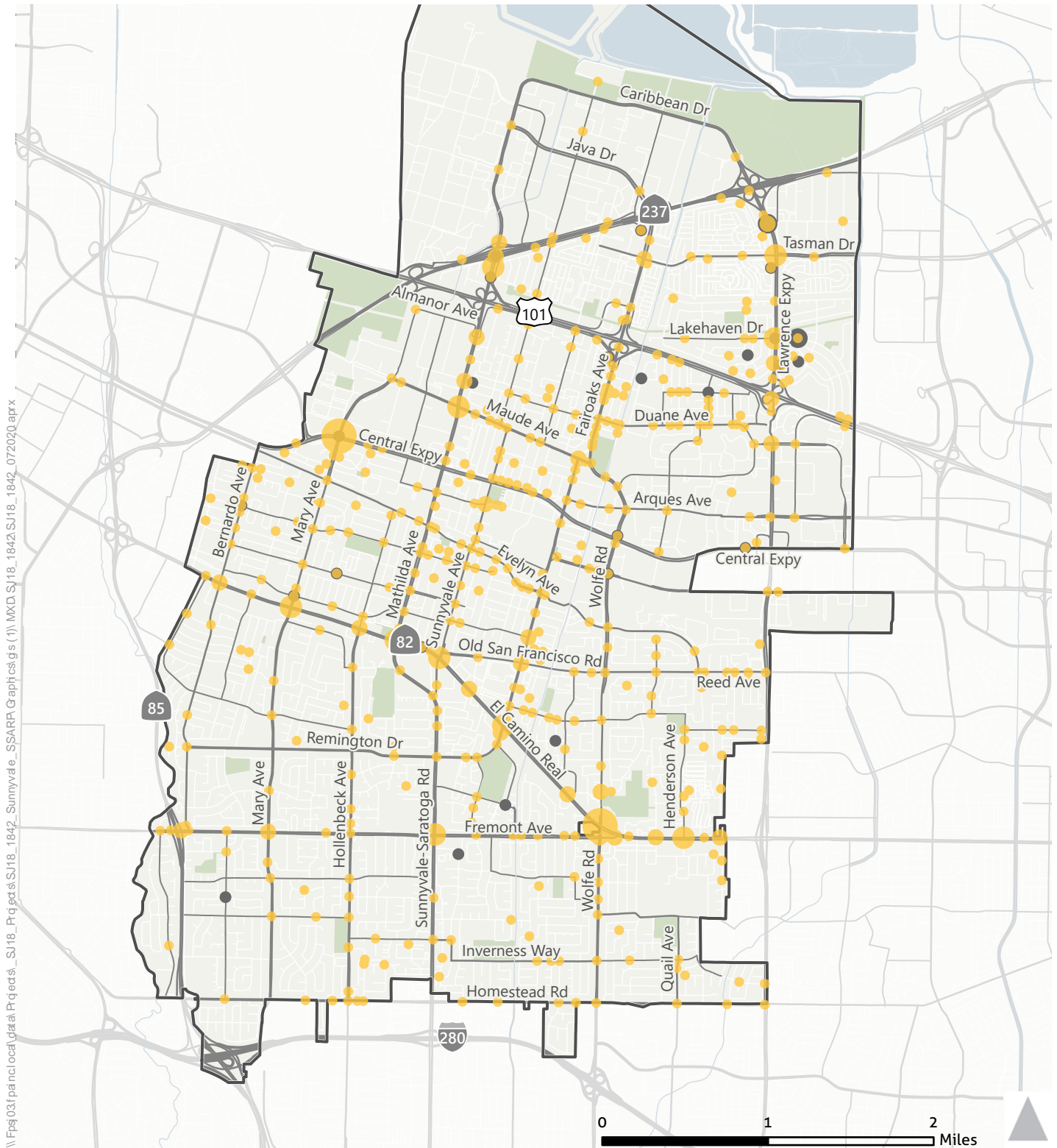


Figure 13

Vehicular Collisions with Fixed Objects (July 1, 2013 – June 30, 2018)





Note: Locations may have collisions of both types resulting from changes to or malfunction of lighting infrastructure.

Figure 14

Vehicular Collisions at Dark (July 1, 2013 – June 30, 2018)





2.5 Vehicular Risky Driving Collisions

Driving Under the Influence

Identifying locations of collisions involving drivers under the influence of substances is important in understanding if there are areas of the roadway network where these occur in greater concentration. Of the 549 collisions in which at least one driver was impaired, 21 resulted in severe injuries and six resulted in a fatality. Over 200 of these collisions resulted in either visible injury or complaint of pain by the involved parties. These collisions are visually represented in **Figure 15**. These collisions are often addressed through education and enforcement in addition to engineering solutions which seek to reduce collision severity and frequency.

Aggressive Driving

Aggressive driving identifies collisions where the responsible driver engaged in unsafe speeding, following too closely, or improper passing. Of the 1,655 aggressive driving collisions, 623 resulted in either visible injury or complaint of pain by the involved parties. Eight collisions resulted in severe injury and four resulted in a fatality. These collisions are visually represented in **Figure 16**. The location with the highest number of aggressive driving collisions is the intersection of Mary Avenue and Central Expressway, which is likely in part because it is one of the few signalized intersections along a largely access-controlled portion of Central Expressway stretching from Mountain View to Santa Clara.

In addition, there are many aggressive driving collisions on Mathilda Avenue between SR-237 and El Camino Real and on El Camino Real throughout the study area. Both are busy, high-capacity arterial roadways with coordinated signal timing and/or long cycle lengths, which can lead to speeding during off-peak periods.

Distracted Driving

Distracted driving is a challenge area that identifies collisions where the driver responsible for the collision was engaging in another activity that took their attention away from driving, thus increasing the chance of a crash. The database includes an attribute for inattention as a factor in crashes. It also has a field for cell phone use. Both crashes with inattention and handheld cell phone use have been trending upward in recent years, which is a growing concern for many communities. Of the 175 distracted driving collisions, 69 resulted in either visible injury or complaint of pain by the involved parties. No severe injury or fatal collisions were reported in distracted driving collisions. These collisions are visually represented in **Figure 17**.

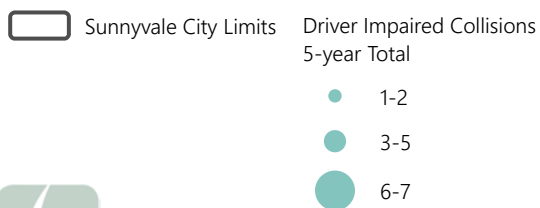
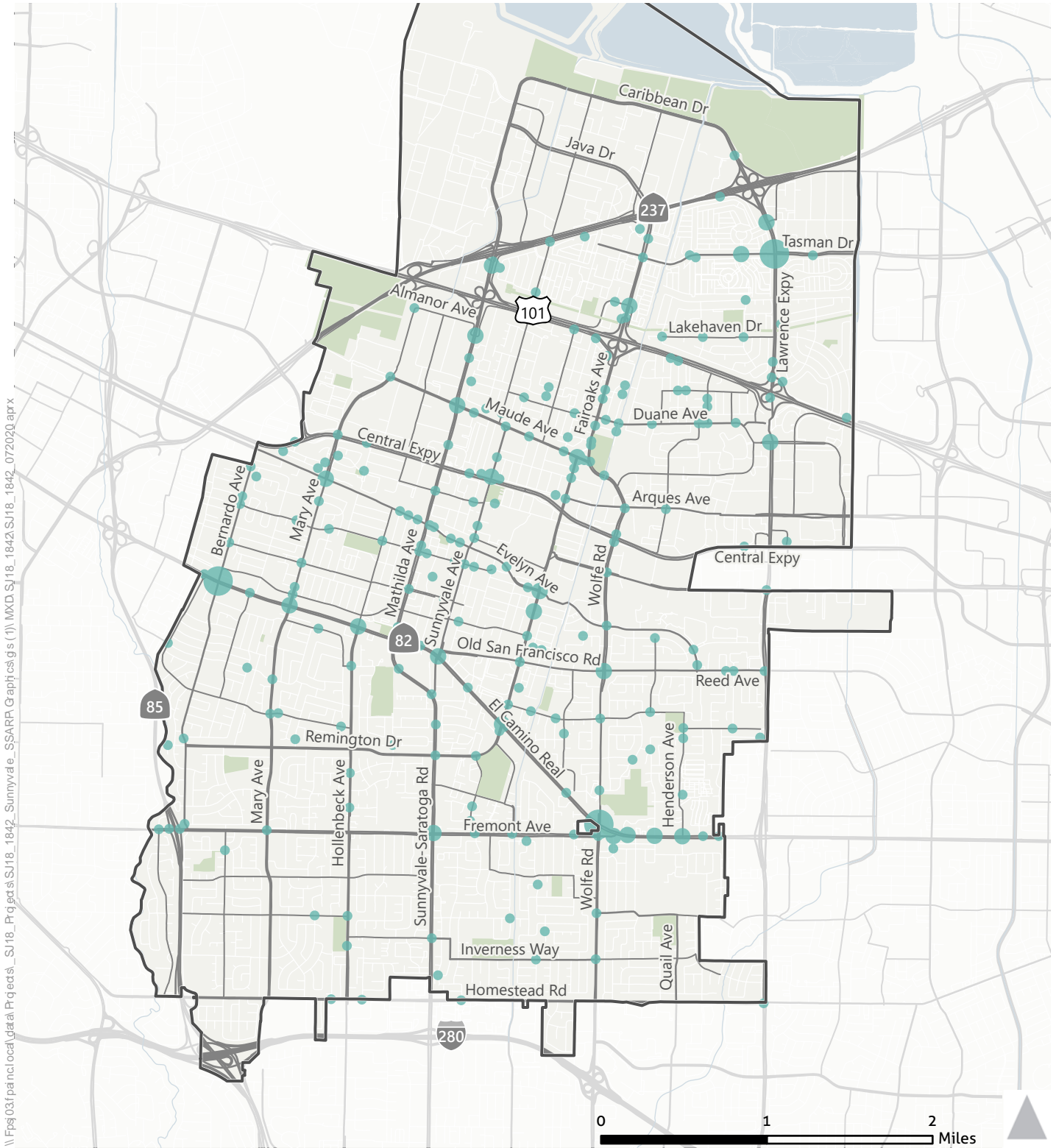


Figure 15

Driver-impaired Collisions (July 1, 2013 – June 30, 2018)



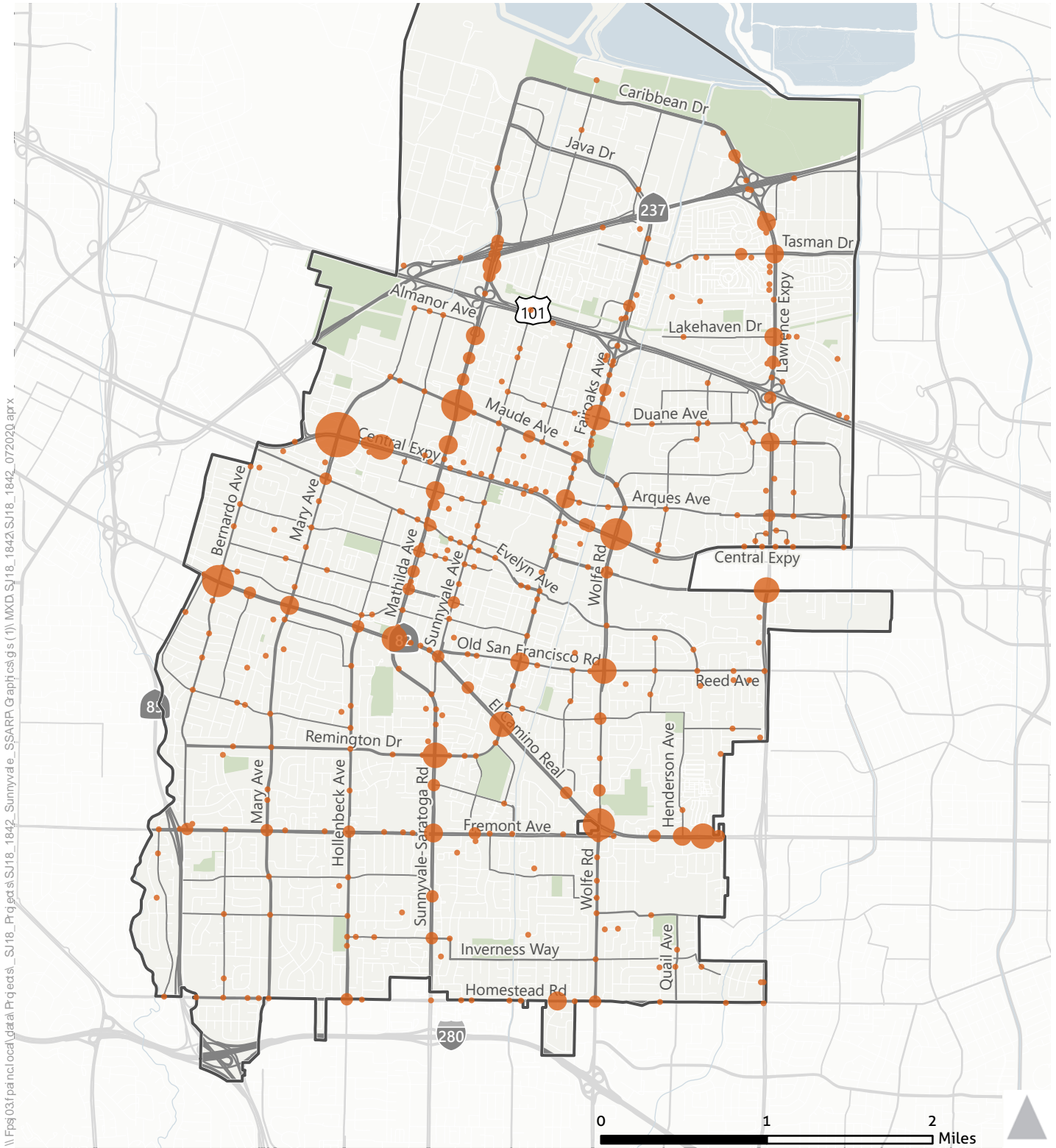
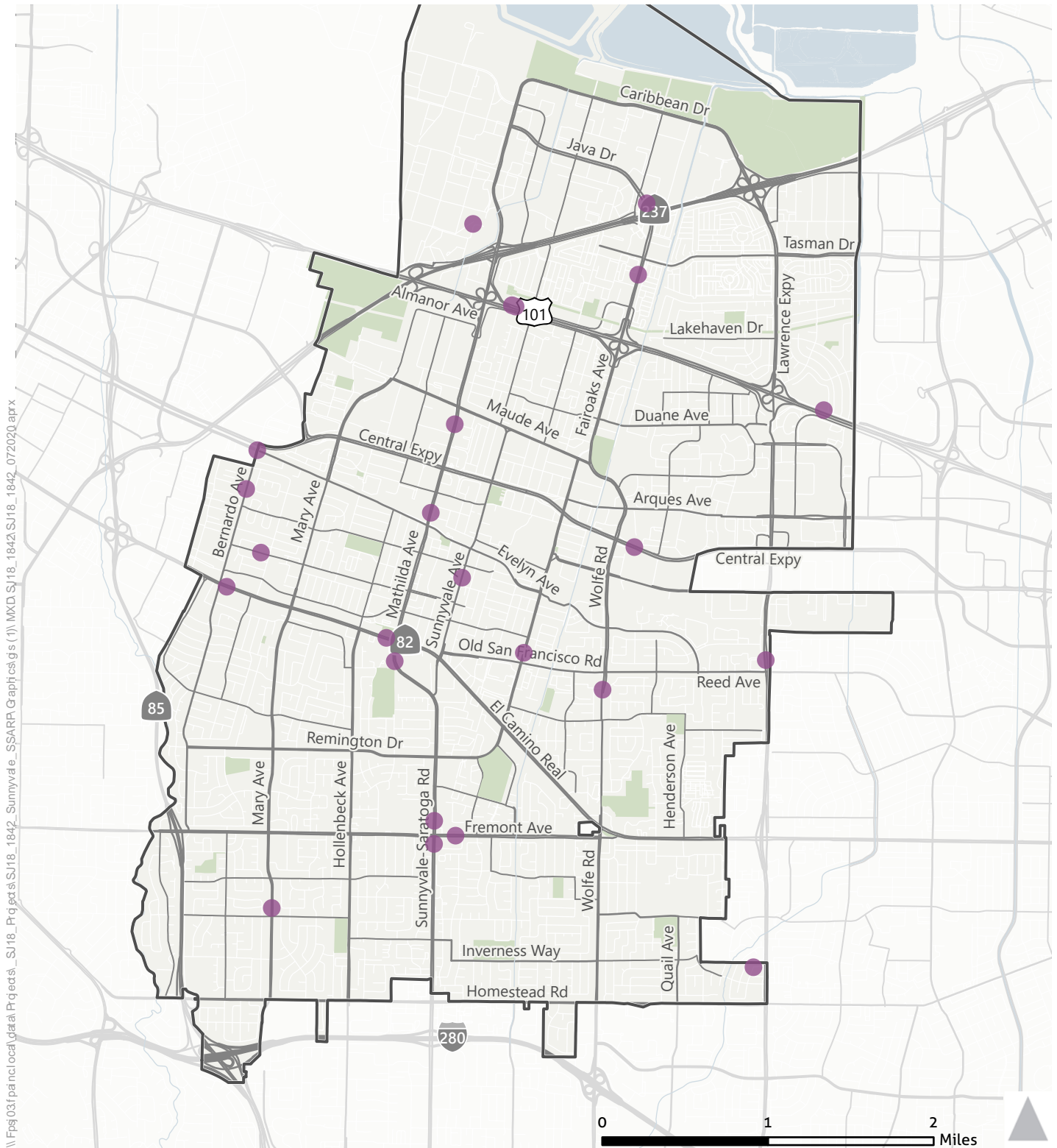




Figure 16

Aggressive Driving Collisions (July 1, 2013 – June 30, 2018)





 Sunnyvale City Limits
  Distracted Driving Collisions
5-year Total

1

Figure 17

Distracted Driving Collisions
 (July 1, 2013 – June 30, 2018)





3. Collision Rate & Systemic Analysis

A systemic approach to safety focuses on evaluating an entire roadway network, identifying high-risk roadway characteristics and driver behaviors based upon crash history. A systemic analysis can also employ analysis of collision rates to identify locations with a proportionally higher number of collisions rather than relying upon the raw number of collisions identified in the collision history. These methods can both help to identify locations in the City which may have potential for future collisions rather than strictly identifying those where collisions have already occurred.

3.1 Local Roads Safety Manual Methods

The *Local Roadway Safety Manual: A Manual for California's Local Road Owners* (Version 1.5, April 2020) purpose is to encourage local agencies to pursue a proactive approach to identifying and analyzing safety issues, while preparing to compete for project funding opportunities. A proactive approach is defined as analyzing the safety of the entire roadway network through either a one-time, network wide analysis, or by routine analyses of the roadway network.¹

According to the *Local Roadway Safety Manual* (LRSM), "The California Department of Transportation (Caltrans) – Division of Local Assistance is responsible for administering California's federal safety funding intended for local safety improvements."

To provide the most benefit and to be competitive for funding, the analysis leading to countermeasure selection should focus on both intersections and roadway segments and be considerate of roadway characteristics and traffic volumes. The result should be a list of locations that are most likely to benefit from cost-effective countermeasures, preferably prioritized by benefit/cost ratio. The manual suggests using a mixture of quantitative and qualitative measures to identify and rank locations that considers both crash frequency and crash rates. These findings should then be screened for patterns such as crash types and severity to aid in the determination of issues causing higher numbers of crashes and the potential countermeasures that could be most effective. Qualitative analysis should include field visits and a review of existing roadway characteristics and devices. The specific roadway context can then be used to assess what conditions may increase safety risk at the site and systemic level.

Countermeasure selection should be supported using Crash Modification Factors (CMFs) or Crash Reduction Factors (CRFs). These factors are the peer reviewed product of before and after research that quantifies the expected rate of collision reduction that can be expected from a given countermeasure. If more than one countermeasure is under consideration, the LRS provides guidance on how to apply CMFs appropriately.

¹ Local Roadway Safety Manual (Version 1.5) 2020. Page 5.



3.2 Highway Safety Manual Methods

"The AASHTO *Highway Safety Manual* (HSM), published in 2010, presents a variety of methods for quantitatively estimating crash frequency or severity at a variety of locations."² This four-part manual is divided into Parts: A) Introduction, Human Factors, and Fundamentals, B) Roadway Safety Management Process, C) Predictive Method, D) Crash Modification Factors.

Chapter 4 of Part B of the HSM discusses the Network Screening process. The Network Screening Process is a tool for an agency to analyze their entire network and identify/rank locations that (based on the implementation of a countermeasure) are most likely to realize a reduction in the frequency of collisions.

The HSM identifies five steps in this process:³

1. **Establish Focus:** Identify the purpose or intended outcome of the network screening analysis. This decision will influence data needs, the selection of performance measures and the screening method that can be applied.
2. **Identify Network and Establish Reference Populations:** Specify the types of sites or facilities being screened (i.e., segments, intersections, geometrics) and identify groupings of similar sites or facilities.
3. **Select Performance Measures:** There are a variety of performance measures available to evaluate the potential to reduce crash frequency at a site. In this step, the performance measure is selected as a function of the screening focus and the data and analytical tools available.
4. **Select Screening Method:** There are three principle screening methods described in this chapter (i.e., ranking, sliding window, peak searching). Each method has advantages and disadvantages; the most appropriate method for a given situation should be selected.
5. **Screen and Evaluate Results:** The final step in the process is to conduct the screening and analysis and evaluate the results.

The HSM provides several statistical methods for screening roadway networks to identify high risk locations based on overall collision histories. In addition to flat crash quantities, the method used in this study is referred to as Critical Crash Rate.

3.3 Critical Crash Rate

Reviewing the number of collisions at a location is a good way to understand the cost to society incurred at the local level but does not give a complete indication of the level of risk for those who use that intersection or roadway segment daily. The Highway Safety Manual describes the Critical Crash Rate method which provides a statistical review of locations to determine where risk

² AASHTO, *Highway Safety Manual*, 2010, Washington D.C.,
<http://www.highwaysafetymanual.org/Pages/About.aspx>

³ AASHTO. *Highway Safety Manual*. 2010. Washington, DC. Page 4-2.



is higher than that experienced by other similar locations. It is also the first step in analyzing for patterns that may suggest systemic issues that can be addressed at that location, and proactively at others to prevent new safety challenges from emerging.

The Critical Crash Rate compares the observed crash rate to the expected crash rate at a location based on facility type and volume using a locally calculated average crash rate for the specific type of intersection or roadway segment being analyzed. Based on traffic volumes and a weighted citywide crash rate for each facility type, a critical crash rate threshold is established at the 95% confidence level to determine locations with higher crash rates that are unlikely to be random. The threshold is calculated for each location individually based on its traffic volume and the crash profile of similar facilities.

Figure 1: Critical Crash Rate Formula

$$R_{c,i} = R_a + \left[P \times \sqrt{\frac{R_a}{MEV_i}} \right] + \left[\frac{1}{(2 \times (MEV_i))} \right]$$

Where,

$R_{c,i}$ = Critical crash rate for intersection i

R_a = Weighted average crash rate for reference population

P = P -value for corresponding confidence level

MEV_i = Million entering vehicles for intersection i

Source: Highway Safety Manual

Data Needs

CCR can be calculated using:

- Daily entering volume for intersections, or VMT for roadway segments;
- Intersection control types to separate them into like populations;
- Roadway functional classification to separate them into like populations;
- Collision records in GIS or tabular form including coordinates or linear measures.

Strengths

- Reduces low volume exaggeration
- Considers variance
- Establishes comparison threshold



3.3 Critical Crash Rate Methodology

The Process of analyzing the CCR and comparing locations (separately by intersections and segments) is a multi-step process. The following is a high-level description of the process undertaken to develop the initial ranking of locations.

The first step in the process was to establish a city-wide crash rate for each facility population. These populations are broken into two categories with sub-categories:

- Intersection:
 - Signalized
 - Unsignalized
- Roadway Classification:
 - County Expressway
 - Class I and Class II Arterial
 - Commercial/Industrial Collector
 - Residential Collector
 - Local

The individual crash rate for each location was then calculated based on the associated traffic volume. This volume was either collected through data count resources or calculated based on the roadway classification. The next step was to establish a Significance Threshold. This Threshold was used to determine what level of exceedance (how much the crash rate exceeded the critical crash rate) a location needs to have based on traffic volume to provide a high level of confidence that the collision occurring at the location is not random. For this study, a confidence level of 95% was used. The local crash rates were then compared to Significance Threshold to see if each location exceeded the expected CCR and if so, by how much.

After this analysis was completed, the locations were ranked by their categories according to that level of exceedance. The critical crash rate analysis identified locations that have statistically higher crash rates than other similar locations as shown in **Appendix A**.

3.4 Probability of Specific Crash Types Exceeding Threshold Proportion

The Highway Safety Manual describes the methodology for determining the probability that crash type is greater than an identified threshold proportion. This helps to identify locations where a crash type is more likely to occur.

Data Needs

The probability of a specific crash type can be determined using collisions records with location data, and classifications of the locations (intersections or segments) studied.



Strengths

- Can be used as a diagnostic tool
- Considers variance in data
- Not affected by selection bias

The HSM methodology first determines the frequency of a specific collision type at an individual location, then determines the observed proportion of that collision type relative to all collision types at that location. A threshold proportion is then determined for the specific collision type; HSM suggests utilizing the proportion of the collision type observed in the entire reference population (e.g. throughout the entire City of Sunnyvale).

These proportions are then utilized to determine the probability that the proportion of a specific crash type is greater than the long-term expected proportion of that crash type.

Figure 2: Probability of Specific Crash Types Exceeding Threshold Proportion

$$P(p_i > \overline{p}_i^* / N_{observed,i} / N_{observed,i(TOTAL)}) = 1 - \text{betadist}(\overline{p}_i^*, a + N_{observed,i}, \beta + N_{observed,i(TOTAL)} - N_{observed,i})$$

Where:

\overline{p}_i^* = Threshold proportion

p_i = Observed proportion

$N_{observed,i}$ = Observed target crashes for a site i

$N_{observed,i(TOTAL)}$ = Total number of crashes for a site i

Source: Highway Safety Manual

Tables included in **Appendix A** show the number of crashes occurring at locations in Sunnyvale by crash type, and highlights locations in which the probability of those crash types exceeding the threshold proportion is greater than 33%. The tables separately reflect roadway segments/corridors, signalized intersections, and unsignalized intersections.

The rankings include a breakdown of crash type as well as crashes occurring in the dark, in wet conditions, or with an impaired driver. Causality types were not included in this analysis, as there are often inconsistencies in recorded causality data which limit the accuracy of intersection or segment-level analysis.



3.5 Collision Profiles

Based upon the analysis of collision history, collision rates, and contextual factors, collision profiles or typologies can be identified. These profiles describe roadway characteristics and/or driver behaviors that are found to be leading to collisions, and can therefore be used in a systemic methodology to proactively identify locations which have similar contexts but may have experienced fewer collisions in the past.

Collision profiles were also developed as part of the Sunnyvale Vision Zero Plan, with ten specific profiles representing the top KSI collision patterns across the City defined and evaluated. The Vision Zero Plan also identified candidate countermeasures for each of the ten profiles. The Roadway Safety Plan data analysis indicates that the same ten profiles, shown in **Table 6**, continue to represent a large proportion of the fatal and severe injury crashes.

Table 6: Collision Profiles

Collision Profile	% of All KSI (# of All KSI)	% of Auto KSI (# of Auto KSI)	% of Bike KSI (# of Bike KSI)	% of Ped KSI (# of Ped KSI)
Conflicting Through Movement at Intersection	31% (28)	46% (19)	60% (9)	
Left Turn at Signalized Intersection	25% (22)	24% (10)	20% (3)	27% (9)
Walking or Bicycling on Major Roadway (Expressway, Arterial, or Collector)	18% (16)		67% (10)	18% (6)
60+ Year Old Pedestrians at Intersection	17% (15)			45% (15)
Unmarked Pedestrian Crossing	15% (13)			39% (13)
Speed-related Conflict	13% (12)	20% (8)	7% (1)	9% (3)
Influence of Drugs or Alcohol	11% (10)	17% (7)	13% (2)	3% (1)
Midblock Bicycle Conflict	7% (6)		43% (6)	
Red Light Violation at Signalized Intersection	7% (6)	7% (3)	13% (2)	3% (1)
Children Walking or Biking Near School	2% (2)		13% (2)	

Note: Because an individual collision may be categorized under multiple profiles, the values in the tables do not sum to 100%. Cells without a percentage represent profiles where zero KSI collisions occurred for a given mode.

Source: Fehr & Peers, 2020.



Investigation into the locations, associated collisions types, and contextual characteristics for these profiles was conducted. Additional considerations for some typologies were identified, including:

- Signalized intersections which do not have protected left-turn phases for all movements were found to have an increased occurrence of undesirable interactions between all modes. Ten intersections with this condition were collectively found to be the site 11% of KSI collisions and 7% of bicycle/pedestrian-involved collisions Citywide. As identified in the Vision Zero ***“Left Turn at Signalized Intersection”*** profile, the addition of protected turn phases and/or leading pedestrian intervals may be appropriate countermeasures for this condition.
- Unsignalized intersections where queuing and/or a lack of available gaps make maneuvers challenging, particularly at side-street stops, were found to have an increased potential for ***“Conflicting Through Movement at Intersection”*** collisions. Sight distance was observed to be limited by vehicles parked or queued on the major roadway in many locations. In addition to previously identified countermeasures, adjustments to intersection geometrics and control features may help to improve visibility.
- Many intersections with the greatest occurrence of ***“Red Light Violation at Signalized Intersection”*** collisions have signal equipment that is not standard with current guidance from the California Manual of Uniform Traffic Control Devices (CA MUTCD) pertaining to the number, placement, or size of signal heads. Most intersections along El Camino Real have a single mast-arm signal head to govern three through travel lanes, while some older traffic signal installations in the City still employ 8” traffic signal heads. As visibility of signal indications is positively correlated to driver compliance, upgrading traffic signal hardware may be an appropriate countermeasure at locations with this collision type in addition to previously identified countermeasures such as dilemma-zone detection and signal timing adjustments.

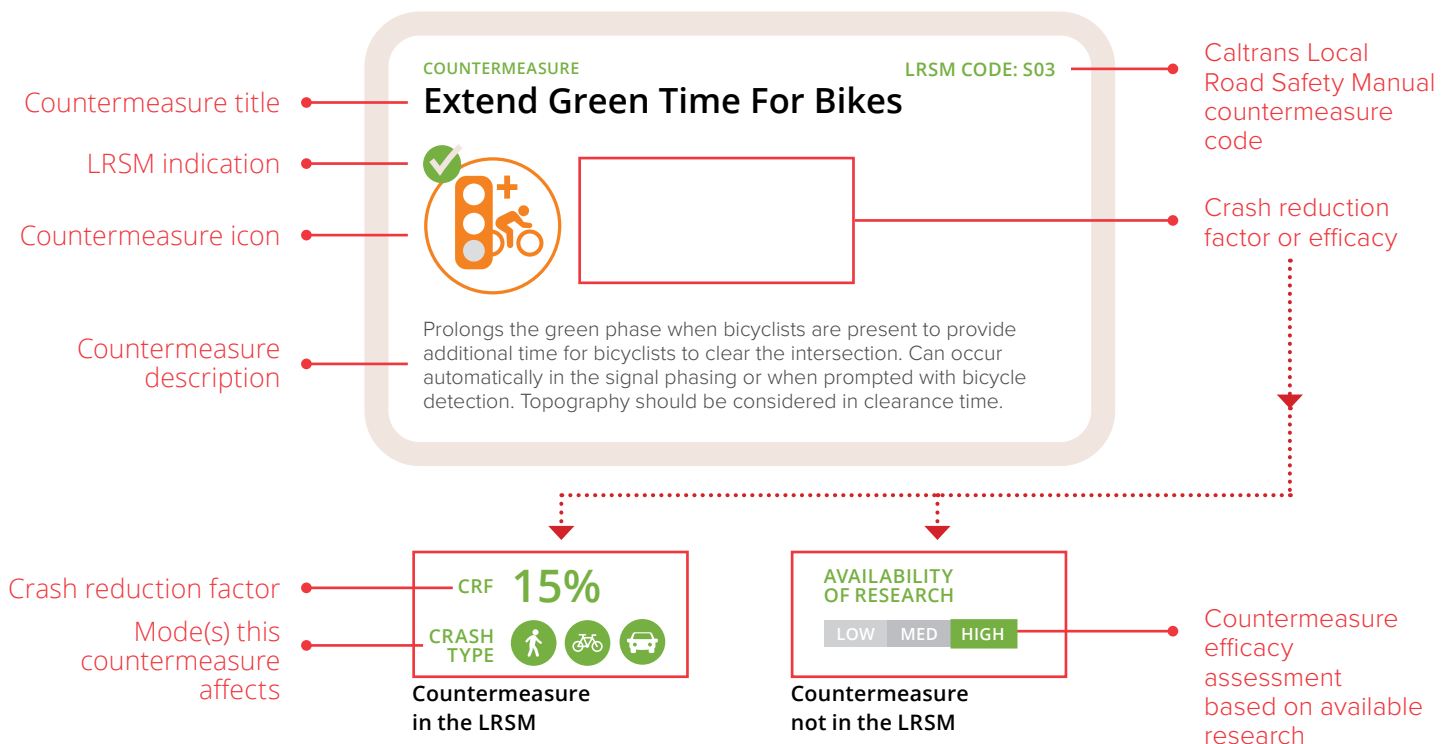
C. SAFETY COUNTERMEASURE TOOLBOX

Safety Countermeasures Toolbox

This Toolbox presents 88 safety countermeasures applicable in different roadway contexts across Sunnyvale. Many of these countermeasures are recommended for the 20 project locations of interest included in this report.

Many of the countermeasures are Caltrans-approved, with an associated Crash Reduction Factor (CRF) and crash type (i.e., all modes, bicycle and pedestrian crashes only, etc.) as outlined in the 2020 California Local Roadway Safety Manual (LRSM). The higher the CRF (100% being the highest), the greater the expected reduction in crashes. Countermeasures not in the LRSM are scored on a “low-medium-high” AVAILABILITY OF RESEARCH scale based on proven safety studies; otherwise, denoted as “N/A” when limited safety studies are available. The higher the AVAILABILITY OF RESEARCH rating, the greater the expected reduction in crashes.

What You'll See Inside:



Safety Research Sources

A Vision for Transportation Safety, SFMTA and SFDPH for TRB, 2015.

Application of Pedestrian Crossing Treatments for Streets and Highways, NCHRP, 2016.

California Local Roadway Safety Manual, Caltrans, FHWA & SafeTrec, 2020.

Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, NCHRP, 2017.

Evaluation of Bicycle-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014.

Evaluation of Pedestrian-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014.

Safety Countermeasures Toolbox

SUMMARY OF COUNTERMEASURES



A. SIGNAL TIMING & PHASING

Additional Signal Heads ✓
 Extend Green Time For Bikes ✓
 Extend Pedestrian Crossing Time ✓
 Extend Yellow and All Red Time ✓
 Flashing Yellow Turn Phase
 Green Wave ✓
 Leading Pedestrian Interval ✓
 New Traffic Signal ✓
 Pedestrian Phase Recall
 Pedestrian Scramble ✓
 Permissive Lefts To Protected ✓
 Reduce Cycle Lengths ✓
 Separate Right-Turn Phasing

B. INTERSECTION & ROADWAY DESIGN

Close Slip Lane
 Convert 2-Way Stop to All-Way Stop ✓
 Lane Narrowing
 New Sidewalk ✓
 Partial Closure/Diverter ✓
 Protected Intersection
 Raised Intersection ✓
 Raised Median ✓
 Realign Intersection to 90 Degrees
 Repurpose Extra Travel Lanes
 Road Diet ✓
 Roundabout ✓
 Speed Humps or Speed Tables
 Splitter Island ✓
 Turn Radius Reduction
 Widen Shoulder ✓

C. SIGNS & MARKINGS

Advance Stop Bar ✓
 Advance Yield Markings ✓
 Bicycles May Use Full Lane Sign ✓
 No Right Turn On Red
 Parking Restrictions/Daylighting ✓
 Radar Speed Feedback Sign ✓
 Time-Based Turn Restriction
 Turn Prohibition
 Wayfinding
 Yield To Pedestrians Sign ✓

D. BIKEWAY DESIGN

Bicycle Crossing (Solid Green Paint)
 Bicycle Ramps
 Bicycle Signal/Exclusive Bike Phase ✓
 Bike Box ✓
 Bike Detection
 Bike Friendly Drains

D. BIKEWAY DESIGN *(continued)*

Class I Bicycle Path Or Trail ✓
 Class II Bike Lane ✓
 Class IV Separated Bikeway ✓
 Floating Transit Island
 Green Bike Lane Conflict Zone Markings
 Mixing Zone
 "On Roadway" Bicycle Sign ✓
 Parking Buffer
 Shared Sidewalk Sign
 Signing and Striping in Support of Bicycle Boulevard ✓
 Traffic Calming in Support of Bicycle Boulevard
 Trail Crossing
 Two-Stage Turn Queue Bike Box
 Widen Sidewalk

E. PEDESTRIAN CROSSINGS

ADA Ramps & Audible Push Button Upgrades ✓
 Curb Extensions
 Extended Time Pushbutton ✓
 High-Visibility Crosswalk ✓
 Pedestrian Countdowns ✓
 Pedestrian Detection ✓
 Pedestrian Hybrid Beacon ✓
 Pedestrian Lighting ✓
 Pedestrian Median Barrier ✓
 Pedestrian Refuge Island ✓
 Raised Crosswalk ✓
 Remove Crossing Prohibition ✓
 Restripe Crosswalk ✓
 Rectangular Rapid Flashing Beacon ✓
 Upgrade Curb Ramp

F. OTHER

Access Management/Close Driveway
 Curbside Management
 Far-Side Bus Stop
 Intersection, Street-Scale Lighting ✓
 Keep Roadway Clear Of Debris
 Remove Obstructions For Sightlines ✓

G. LOW-COST AND QUICK-BUILD

Hardened Centerline ✓
 Paint and Plastic Curb Extension
 Paint and Plastic Median ✓
 Paint and Plastic Mini Circle
 Paint and Plastic Pedestrian Refuge Area ✓
 Paint and Plastic Separated Bikeway ✓
 Paint and Plastic Turn Radius Reduction
 Traffic Diverter

A. SIGNAL TIMING & PHASING

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

LRSM CODE: S02

Additional Signal Heads



CRF **15%**
CRASH TYPE   

Additional signal heads allow drivers to anticipate signal changes farther away from intersections, decreasing the likelihood of driver error resulting in a collision.

COUNTERMEASURE

LRSM CODE: S03

Extend Green Time For Bikes



CRF **15%**
CRASH TYPE   

Prolongs the green phase when bicyclists are present to provide additional time for bicyclists to clear the intersection. Can occur automatically in the signal phasing or when prompted with bicycle detection. Topography should be considered in clearance time.

COUNTERMEASURE

LRSM CODE: S03

Extend Pedestrian Crossing Time



CRF **15%**
CRASH TYPE   

Increases time for pedestrian walk phases, especially to accommodate vulnerable populations such as children and the elderly.

COUNTERMEASURE

LRSM CODE: S03

Extend Yellow and All Red Time



CRF **15%**
CRASH TYPE   

Extending yellow and all red time allows drivers and bicyclists to safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection.

COUNTERMEASURE

Flashing Yellow Turn Phase



AVAILABILITY OF RESEARCH
LOW MED HIGH

Flashing yellow turn arrow alerts drivers to proceed with caution and decide if there is a sufficient gap in oncoming traffic to safely make a turn. To be used only when a pedestrian walk phase is not called. Protected only phases should be used when pedestrians are present.

COUNTERMEASURE

LRSM CODE: S03

Green Wave



CRF **15%**
CRASH TYPE   

Occurs when a series of traffic signals are coordinated to allow for uninterrupted bicycle traffic flow through those intersections in at least one direction. Coordinating signals to allow for bicyclist progression gives bicyclists and pedestrians more time to safely cross through the 'green wave' intersections.

COUNTERMEASURE

LRSM CODE: S03

Leading Pedestrian Interval



CRF **60%**
CRASH TYPE  

Gives people walking a head start, making them more visible to drivers turning right or left. "WALK" signal comes on a few seconds before the cars get their green light. May be used in combination with No Right Turn on Red restrictions.

COUNTERMEASURE

LRSM CODE: NS03

New Traffic Signal



CRF **25%**
CRASH TYPE   

New traffic signals can help to organize travel of all modes at an intersection, limiting interactions between vehicles, pedestrians, and bicyclists with conflicting movements. Using this countermeasure for HSIP applications requires documentation of signal warrants.

A. SIGNAL TIMING & PHASING

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

Pedestrian Phase Recall



AVAILABILITY
OF RESEARCH

LOW MED HIGH

Signals can be put in "recall" for key time periods of day such as peak business hours or school drop-off/pick-up times. During these periods the "WALK" signal would be displayed every signal cycle without prompting by a pedestrian push button.

COUNTERMEASURE

LRSM CODE: S19PB



CRF 40%

CRASH TYPE



This is a form of pedestrian 'walk' phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians to safely cross through the intersection in any direction, including diagonally.

COUNTERMEASURE

LRSM CODE: S06/S07

Permissive Lefts to Protected



CRF 30%-55%

CRASH TYPE



Provides a protected green arrow phase for left turning vehicles while showing a red light for both on-coming traffic and parallel pedestrian crossings. Eliminates conflicts between pedestrians and left-turning vehicles.

COUNTERMEASURE

LRSM CODE: S03

Reduce Cycle Lengths



CRF 15%

CRASH TYPE



Traffic signal cycles should be kept short (preferably 90 seconds maximum) to reduce pedestrian delay. When delay is significant, pedestrians are more inclined to ignore signal indications.

COUNTERMEASURE

Separate Right-Turn Phasing



AVAILABILITY
OF RESEARCH

LOW MED HIGH

Provides a green arrow phase for right-turning vehicles. Avoids conflicts between right-turning traffic and bicyclists or pedestrians crossing the intersection on their right.

B. INTERSECTION & ROADWAY DESIGN

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

Close Slip Lane



AVAILABILITY
OF RESEARCH

LOW MED HIGH

Modifies the corner of an intersection to remove the sweeping right turn lane for vehicles. Results in shorter crossings for pedestrians, reduced speed for turning vehicles, better sight lines, and space for landscaping, green infrastructure, and other amenities.

COUNTERMEASURE

LRSM CODE: NS02

Convert 2-Way Stop to All-Way Stop



CRF 50%

CRASH TYPE



Converting 2-way stops to all-way stops prevents motorists, bicyclists, and pedestrians from having to cross free-flowing lanes of traffic at a side-street stop-controlled intersection and reduces the risk of collision.

COUNTERMEASURE

Lane Narrowing



AVAILABILITY
OF RESEARCH

LOW MED HIGH

A reduction in lane width produces a traffic calming effect by encouraging motorists to travel at slower speeds where existing lanes are over-designed, lowering the risk of collision with bicyclists, pedestrians, and other motorists.

COUNTERMEASURE

LRSM CODE: R34PB

New Sidewalk



CRF 80%

CRASH TYPE



Sidewalks and walkways are "pedestrian lanes" that provide people with space to travel within the public right-of-way that is separated from roadway vehicles. They are associated with reduced crashes where pedestrians were walking along the roadway.

COUNTERMEASURE

LRSM CODE: S14/NS15

Partial Closure/Diverter



CRF 50%

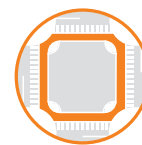
CRASH TYPE



A roadway treatment that restricts through vehicle movements using physical diversion while allowing bicyclists and pedestrians to proceed through an intersection in all directions.

COUNTERMEASURE

Protected Intersection



AVAILABILITY
OF RESEARCH

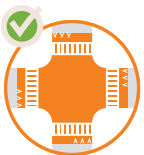
LOW MED HIGH

Protected intersections use corner islands, curb extensions, and colored paint to delineate the bicycle path across an intersection and allow a two-stage left-turn for bicycles parallel to the crosswalk. Provides space for drivers to yield outside the travel lane.

COUNTERMEASURE

LRSM CODE: R36PB

Raised Intersection



CRF 35%

CRASH TYPE



Elevates the intersection to bring vehicles to the sidewalk level. Serves as a traffic calming measure by extending the sidewalk context across the road.

COUNTERMEASURE

LRSM CODE: S12/NS14/R08

Raised Median



CRF 25%

CRASH TYPE



A concrete or landscaped area, between the two directions of travel. Reduces vehicular speeding and discourages risky turning movements.

B. INTERSECTION & ROADWAY DESIGN

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

Realign Intersections to 90 Degrees



AVAILABILITY
OF RESEARCH

LOW MED HIGH

By eliminating acute or obtuse angles between intersection roadways, intersection sight distance may be improved, allowing motorists to see pedestrians more easily.

COUNTERMEASURE

Repurpose Extra Travel Lanes



AVAILABILITY
OF RESEARCH

LOW MED HIGH

Repurposing travel lanes at spot locations, such as extra receiving lanes at an intersection, is a strategy used to make space for other safety improvements such as, widening sidewalks, creating space for bicycle, pedestrian, or transit lanes, and other improvements.

COUNTERMEASURE

LRSM CODE: R14

Road Diet



CRF 30%

CRASH
TYPE



Depending on the street, road diets may change the number of lanes, turn lanes, center turn lanes, bike lanes, parking lanes, and/or sidewalks. Road diets optimize street space to benefit all users by improving the safety and comfort of pedestrians and bicyclists, and reducing vehicle speeds and the potential for rear end collisions.

COUNTERMEASURE

LRSM CODE: S16/NS04/NS05

Roundabout



CRF VARIES

CRASH
TYPE



Roundabouts are circular intersections designed to eliminate left turns by requiring traffic to travel in a counter-clockwise direction and exit to the right. Installed to manage vehicular speeds, reduce pedestrian exposure, improve safety at intersections through eliminating angle collisions, and help traffic flow more efficiently.

COUNTERMEASURE

Speed Humps or Speed Tables



AVAILABILITY
OF RESEARCH

LOW MED HIGH

These traffic calming devices use vertical deflection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds to avoid damage to the undercarriage of an automobile.

COUNTERMEASURE

LRSM CODE: NS13

Splitter Island



CRF 40%

CRASH
TYPE



A raised area that separates the two directions of travel on the minor street approach at an unsignalized intersection or roundabout. Helps channelize traffic in opposing directions of travel. Typically installed at skewed intersections or where speeds on minor roads are high.

COUNTERMEASURE

Turn Radius Reduction



AVAILABILITY
OF RESEARCH

LOW MED HIGH

Modifies the corner of an intersection to reduce turning radii for vehicles. Results in shorter crossings for pedestrians, reduced speed for turning vehicles, better sight lines, and space for landscaping, green infrastructure, and other amenities.

COUNTERMEASURE

LRSM CODE: R15

Widen Shoulder



CRF 30%

CRASH
TYPE



Widened shoulders create a separated space for bicyclists and also provide motor vehicle safety benefits, such as space for inoperable vehicles to pull out of the travel lane.

C. SIGNS & MARKINGS

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

LRSM CODE: S20PB

Advance Stop Bar



CRF **15%**
CRASH TYPE  

A stop bar placed 5 to 7 feet ahead of the crosswalk at stop signs and signals reduces instances of vehicles encroaching on the crosswalk.

COUNTERMEASURE

LRSM CODE: NS07

Advance Yield Markings



CRF **25%**
CRASH TYPE   

Yield lines are placed 20 to 50 feet in advance of pedestrian crossings to increase visibility of pedestrians. Can reduce the likelihood of a multiple-threat crash at unsignalized midblock crossings.

COUNTERMEASURE

LRSM CODE: NS05

Bicycles May Use Full Lane Sign



CRF **15%**
CRASH TYPE   

A sign placed on roads with lanes that are too narrow to allow safe side-by-side passing to indicate that bicyclists may occupy the full lane. This discourages unsafe passing by motorists.

COUNTERMEASURE

No Right Turn On Red



AVAILABILITY OF RESEARCH
LOW MED HIGH

Can help prevent crashes between vehicles turning right on red from one street and through vehicles on the cross street, and crashes involving pedestrians. Should be considered where exclusive pedestrian "WALK" phases, LPIs, sight distance issues, or high pedestrian volumes are present.

COUNTERMEASURE

LRSM CODE: NS11

Parking Restrictions/Daylighting



CRF **20%**
CRASH TYPE   

By restricting parking at curbs in front of intersection crosswalks, sight lines are cleared between pedestrian crossings and oncoming motorists, reducing the risk of collision. Reducing visibility obstructions caused by parked vehicles, known as daylighting, allows all users to better gauge interactions.

COUNTERMEASURE

LRSM CODE: R26

Radar Speed Feedback Sign



CRF **30%**
CRASH TYPE   

A roadway treatment that uses radar to alert drivers to their actual speed relative to the posted speed limit, encouraging drivers who exceed to the speed limit to slow down.

COUNTERMEASURE

Time-Based Turn Restriction



AVAILABILITY OF RESEARCH
LOW MED HIGH

Restricts left-turns or right-turns during certain time periods when there may be increased potential for conflict (e.g., peak periods, school hours).

COUNTERMEASURE

Turn Prohibition



AVAILABILITY OF RESEARCH
LOW MED HIGH

Bans left or right turns at locations where a turning vehicle may conflict with pedestrians in the crosswalk or where opposing traffic volume is high. Reduces pedestrian interaction with vehicles when crossing. Important tool when road diets are infeasible and a grid network of streets is present.

C. SIGNS & MARKINGS

 LRSM COUNTERMEASURE

COUNTERMEASURE

Wayfinding



AVAILABILITY OF RESEARCH

LOW MED HIGH

A network of signs that highlight nearby pedestrian and bicycle facilities. Can help to reduce crossings at locations with poor sight distance or limited crossing enhancements.

COUNTERMEASURE

LRSM CODE: NS06

Yield To Pedestrians Sign



CRF 15%

CRASH TYPE



The "Yield Here to Pedestrians" (e.g. R1-5, R1-5a) signs alert drivers about the presence of pedestrians. These signs are required with Advance Yield Lines. Other sign types (e.g. R1-6) can be placed on the centerline in the roadway.

D. BIKEWAY DESIGN

 LRSM COUNTERMEASURE

COUNTERMEASURE

Bicycle Crossing (Solid Green Paint)



AVAILABILITY OF RESEARCH

LOW MED HIGH

Solid green paint across an intersection that signifies the path of the bicycle crossing. Increases visibility and safety of bicyclists traveling through an intersection.

COUNTERMEASURE

Bicycle Ramps



AVAILABILITY OF RESEARCH

LOW MED HIGH

Connects bicyclists from the road to the sidewalk or a shared use path.

COUNTERMEASURE

LRSM CODE: S03

Bicycle Signal/Exclusive Bike Phase



CRF 15%

CRASH TYPE



A traffic signal directing bicycle traffic across an intersection. Separates bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements. May be applicable for Class IV facilities when the bikeway is brought up to the intersection.

COUNTERMEASURE

LRSM CODE: S20PB

Bike Box



CRF 15%

CRASH TYPE



A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

COUNTERMEASURE

Bike Detection



AVAILABILITY OF RESEARCH

LOW MED HIGH

Bike detection is used at signalized intersections, either through use of push-buttons, in-pavement loops, or by video or infrared cameras, to call a green light for bicyclists and reduce delay for bicycle travel. Discourages red light running by bicyclists and increases convenience of bicycling.

COUNTERMEASURE

Bike Friendly Drains



AVAILABILITY OF RESEARCH

LOW MED HIGH

Bike friendly drains avoid placing grating in the right-of-way that may pose a hazard to bicyclists by increasing their risk of falling.

COUNTERMEASURE

LRSM CODE: R34PB

Class I Bicycle Path or Mixed Use Trail



CRF 80%

CRASH TYPE



Provides a completely separate right of way that is designated for the exclusive use of people riding bicycles and walking with minimal cross-flow traffic. Paths and trails offer opportunities for the lowest stress bicycle travel.

COUNTERMEASURE

LRSM CODE: R32PB

Class II Bike Lane



CRF 35%

CRASH TYPE



Using designated lane markings, pavement legends, and signage, bike lanes provide dedicated street space for bicyclists, typically adjacent to the outer vehicle travel lane.

D. BIKEWAY DESIGN

 LRSM COUNTERMEASURE

COUNTERMEASURE

LRSM CODE: R33PB

Class IV Separated Bikeway



CRF **45%**
CRASH TYPE  

Space on the roadway set aside for the exclusive use of bicycles and physically separated from vehicle traffic. Types of separation may include, but are not limited to, grade separation, flexible posts, physical barriers, or on-street parking.

COUNTERMEASURE

Floating Transit Island



AVAILABILITY OF RESEARCH
LOW MED HIGH

An in-street transit boarding island is used in conjunction with a Class IV bike facility, separating transit traffic from bicycle traffic, reducing conflict between the two modes and lowering the risk of collision.

COUNTERMEASURE

Green Bike Lane Conflict Zone Markings



AVAILABILITY OF RESEARCH
LOW MED HIGH

Green pavement within a bicycle lane to increase visibility of bicyclists and to reinforce bicycle priority. The green pavement can be either as a corridor treatment or as a spot treatment in conflict areas such as frequently used driveways.

COUNTERMEASURE

Mixing Zone



AVAILABILITY OF RESEARCH
LOW MED HIGH

Places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Lane markings delineate space for bicyclists and motorists within the same lane and indicate the intended path for bicyclists to reduce conflict with turning motor vehicles.

COUNTERMEASURE

LRSM CODE: NS06/R22

"On Roadway" Bicycle Sign



CRF **15%**
CRASH TYPE   

Street sign that communicates to drivers that bicyclists are on the road. Signs enhance visibility for bicyclists, reminding drivers that they are on the road.

COUNTERMEASURE

Parking Buffer



AVAILABILITY OF RESEARCH
LOW MED HIGH

Pavement markings denoting door zone of parked vehicles to help bicyclists maintain safe positioning on the roadway.

COUNTERMEASURE

Shared Sidewalk Sign



AVAILABILITY OF RESEARCH
LOW MED HIGH

Signs communicate to pedestrians that bicyclists may also use the sidewalk and that bicyclists must yield to pedestrians.

COUNTERMEASURE

LRSM CODE: R32PB

Signing and Striping in Support of Bicycle Boulevard



CRF **35%**
CRASH TYPE  

Bicycle boulevards are roads that encourage low automobile traffic volumes and speeds through signing and striping while giving bicyclists priority and encouraging non-motorized travel.

D. BIKEWAY DESIGN

COUNTERMEASURE

Traffic Calming in Support of Bicycle Boulevard



AVAILABILITY OF RESEARCH

LOW MED HIGH

Traffic calming includes measures that encourage slower speeds to bring automobile speeds closer to those of bicyclists. This has the effect of reducing in-lane passing, improving driver perception and reaction time, and reducing the severity of collisions.

COUNTERMEASURE

Trail Crossing



AVAILABILITY OF RESEARCH

LOW MED HIGH

A continental crosswalk with a bike stamp in the middle, placed at locations where trails intersect with or cross the roadway.

COUNTERMEASURE

Two-Stage Turn Queue Bike Box



AVAILABILITY OF RESEARCH

LOW MED HIGH

This roadway treatment provides bicyclists with a means of safely making a left or right turn at a multi-lane signalized intersection from a bike lane or cycle track on the opposite side of the lane. In this way, bicyclists are protected from the flow of traffic while waiting to turn.

COUNTERMEASURE

Widen Sidewalk



AVAILABILITY OF RESEARCH

LOW MED HIGH

Wide sidewalks can provide space for both pedestrians and bicyclists to use a shared facility. Wide sidewalks can be important for locations with high volumes of pedestrians.

E. PEDESTRIAN CROSSINGS

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

LRSM CODE: S17PB

ADA Ramps & Audible Push Button Upgrades



CRF 25%

CRASH TYPE  

Curb ramps and push buttons must comply with Americans with Disability Act (ADA) standards for accessibility. Pushbuttons should be visible and conveniently located for pedestrians waiting at a crosswalk. Accessible pedestrian signals, including audible push buttons, improve access for pedestrians who are blind or have low vision.

COUNTERMEASURE

Curb Extensions



AVAILABILITY OF RESEARCH

LOW MED HIGH

Widens the sidewalk at intersections or midblock crossings to shorten the pedestrian crossing distance, to make pedestrians more visible to vehicles, and to reduce the speed of turning vehicles.

COUNTERMEASURE

LRSM CODE: S17PB

Extended Time Pushbutton



CRF 25%

CRASH TYPE  

A pushbutton that can be pressed to request extra time for crossing the crosswalk, beyond the standard crossing time. Ideal near senior-serving land uses.

COUNTERMEASURE

LRSM CODE: NS6/NS17/NS18

High-Visibility Crosswalk



CRF 25%-35%

CRASH TYPE   

A crosswalk that is designed to be more visible to approaching drivers. Crosswalks should be designed with continental markings, also known as ladder markings, and use high-visibility material such as inlay tape or thermoplastic tape instead of paint.

COUNTERMEASURE

LRSM CODE: S17PB

Pedestrian Countdowns



CRF 25%

CRASH TYPE  

Displays "countdown" of seconds remaining on the pedestrian signal. Countdown indications improve safety for all road users, and are required for all newly installed traffic signals where pedestrian signals are installed.

COUNTERMEASURE

LRSM CODE: S17PB

Pedestrian Detection



CRF 25%

CRASH TYPE  

An intersection treatment that relies on sensors to detect when a pedestrian is waiting at a crosswalk and automatically trigger the pedestrian 'walk' phase.

COUNTERMEASURE

LRSM CODE: NS23PB

Pedestrian Hybrid Beacon



CRF 55%

CRASH TYPE  

Pedestrian-activated beacon used at mid-block crosswalks and side-street stop controlled crossing locations to notify oncoming motorists to stop with a series of red and yellow lights.

COUNTERMEASURE

LRSM CODE: S1, NS1, R1

Pedestrian Lighting



CRF 35%-40%

CRASH TYPE    NIGHT TIME

At pedestrian crossings, research indicates pedestrian lighting should be placed 10 feet from the crosswalk, in between the approaching vehicles and the crosswalk. At intersections, pedestrian lighting should also be placed before the crosswalk on the approach into the intersection.

E. PEDESTRIAN CROSSINGS

✓ LRSM COUNTERMEASURE

COUNTERMEASURE

LRSM CODE: S13PB/R10PB

Pedestrian Median Barrier



CRF **35%**
CRASH TYPE  

Pedestrian median barriers restrict pedestrians from crossing the median at locations where nearby crossings are available and midblock crossings may have poor sight distance or insufficient crossing enhancements for the conditions.

COUNTERMEASURE

LRSM CODE: S12/NS19PB

Pedestrian Refuge Island



CRF **25%-45%**
CRASH TYPE   

Pedestrian refuge islands provide a 6' minimum protected area for pedestrians at the center of the roadway. They reduce the exposure time for pedestrian crossing the intersection. They simplify crossings by allowing pedestrians to focus in one direction of traffic at a time.

COUNTERMEASURE

LRSM CODE: R36PB

Raised Crosswalk



CRF **35%**
CRASH TYPE  

The crosswalk is elevated to match the sidewalk to make pedestrians more visible to approaching vehicles. Typically located at midblock crossings, they encourage motorists to yield to pedestrians and reduce vehicle speed.

COUNTERMEASURE

LRSM CODE: S18PB

Remove Crossing Prohibition



CRF **25%**
CRASH TYPE  

Removes existing crossing prohibitions and provides marked crosswalk and other safety enhancements for pedestrians to cross the street.

COUNTERMEASURE

LRSM CODE: NS07

Restripe Crosswalk



CRF **25%**
CRASH TYPE  

Periodic restriping of crosswalks is necessary to ensure the traffic markings are visible. Crosswalk may be restriped with high visibility markings.

COUNTERMEASURE

LRSM CODE: NS22PB/R37PB

Rectangular Rapid Flashing Beacon



CRF **35%**
CRASH TYPE  

Pedestrian-activated flashing lights and additional signage enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings.

COUNTERMEASURE

Upgrade Curb Ramp



AVAILABILITY OF RESEARCH
LOW MED HIGH

Curb ramps must follow Americans with Disabilities Act (ADA) design guidelines. Tactile warning devices must be detectable to visually impaired pedestrians.

F. OTHER

COUNTERMEASURE

Access Management/Close Driveway



AVAILABILITY OF RESEARCH

LOW MED HIGH

Vehicles entering and exiting driveways may conflict with pedestrians and with vehicles on the main road, especially at driveways within 250 feet of intersections. Closing driveways near intersections with high crash rates related to driveways may reduce potential conflicts.

COUNTERMEASURE

Curbside Management



AVAILABILITY OF RESEARCH

LOW MED HIGH

Curbside management can better prioritize reliable transit and safe bicycling infrastructure, freight deliveries, passenger pick-ups/drop-offs, green stormwater infrastructure, public spaces, and parking management.

COUNTERMEASURE

Far-Side Bus Stop



AVAILABILITY OF RESEARCH

LOW MED HIGH

Far-side bus stops are located immediately after an intersection, allowing the bus to pass through the intersection before stopping for passenger loading and unloading. Far-side stops encourage pedestrians to cross behind the bus for greater visibility, and can improve transit service reliability.

COUNTERMEASURE

LRSM CODE: S01/NS01/R01

Intersection, Street-Scale Lighting



CRF

35%-40%

CRASH TYPE



NIGHT TIME

Street and intersection lighting helps make other road users or hazards more visible to motorists at night, improving driver perception and reaction time and reducing the risk of collision.

COUNTERMEASURE

Keep Roadway Clear of Debris



AVAILABILITY OF RESEARCH

LOW MED HIGH

A smoothly paved surface free of debris enhances safety for vehicles and bicyclists.

COUNTERMEASURE

LRSM CODE: NS11

Remove Obstructions For Sightlines



CRF

20%

CRASH TYPE



Remove objects that may prevent drivers and pedestrians from having a clear sightline. May include installing red curb at intersection approaches to remove parked vehicles (also called "daylighting"), trimming or removing landscaping, or removing or relocating large signs.

G. LOW-COST AND QUICK-BUILD

 LRSM COUNTERMEASURE

COUNTERMEASURE

LRSM CODE: S09

Hardened Centerline

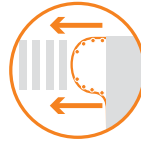


CRF **10%**
CRASH TYPE   

Uses paint to widen left-turn radii and rubber curb with plastic bollards on the receiving roadway's centerline to modify the angle of motorists turning left. Widening the turning radii of left-turning vehicles expands the field of vision for drivers and increases the visibility of pedestrians.

COUNTERMEASURE

Paint and Plastic Curb Extension



AVAILABILITY OF RESEARCH
LOW MED HIGH

Widens the sidewalk at intersections or midblock crossings to shorten the pedestrian crossing distance, to make pedestrians more visible to motorists, and to reduce the speed of turning vehicles.

COUNTERMEASURE

LRSM CODE: S12/NS14/R08

Paint and Plastic Median



CRF **25%**
CRASH TYPE   

A painted median with plastic posts, between the two directions of travel. Reduces vehicular speeding and discourages risky turning movements.

COUNTERMEASURE

Paint and Plastic Mini Circle



AVAILABILITY OF RESEARCH
LOW MED HIGH

Mini circles use paint and soft hit posts to replace stop-controlled intersections with a circular design that calms traffic and eliminates left turns. Installed to reduce vehicular speeds, improve safety at intersections by reducing severe collisions, and help traffic flow more efficiently.

COUNTERMEASURE

LRSM CODE: S12/NS16

Paint and Plastic Pedestrian Refuge Area



CRF **25%-45%**
CRASH TYPE   

Paint and plastic post pedestrian refuge spaces provide a designated area for pedestrians at the center of the roadway. Pedestrian refuge areas constructed from paint and plastic should be implemented in conjunction with additional safety projects, such as an Rectangular Rapid Flashing Beacon (RRFB) or road diet, to reduce pedestrian exposure.

COUNTERMEASURE

LRSM CODE: R33PB

Paint and Plastic Separated Bikeway



CRF **45%**
CRASH TYPE  

A lane on the roadway dedicated to bicycles that is physically separated from vehicles by a raised barrier of plastic posts and painted pavement.

COUNTERMEASURE

Paint and Plastic Turn Radius Reduction



AVAILABILITY OF RESEARCH
LOW MED HIGH

A painted corner with plastic posts to reduce the turning radii at an intersection. Results in reduced speed for turning vehicles, better sight lines, and reduced pedestrian exposure.

COUNTERMEASURE

Traffic Diverter



AVAILABILITY OF RESEARCH
LOW MED HIGH

Traffic diverters use paint, plastic posts, and/or planters to divert auto traffic from a residential street. The diverters do allow bicycles to enter the approach, reducing conflict between bicyclists and vehicles.

D. OUTREACH SUMMARY



City of Sunnyvale Roadway Safety Plan Community Workshop Key Takeaways, April 2019

The City of Sunnyvale hosted the first Roadway Safety Plan Community Workshop on April 22, 2019. The workshop goals were to provide an introduction to the project, describe what a Roadway Safety Plan is, and gather feedback from residents and other stakeholders on preferred countermeasures and treatments to address safety concerns in Sunnyvale. Twenty-three participants provided 115 total comments on a countermeasure toolbox poster as well as posters that highlighted safety treatments which had already been implemented in Sunnyvale. Participants also put stickers on aerial maps where they would like to see transportation improvements for bicycles, pedestrians, or vehicles in Sunnyvale.

PRIORITY LOCATION COUNTERMEASURES

Workshop Overview

Participants provided their input on preferred transportation safety countermeasures in Sunnyvale. Common themes across the locations are summarized in **Figure 1**. Bicycle infrastructure was the most requested countermeasure at the priority project locations, followed by pedestrian infrastructure and vehicular traffic and signals. Separated bike lanes and bicycle detection at traffic signals were the most requested specific countermeasures, followed by widening sidewalks, and traffic calming measures (such as roundabouts). **Figure 2** summarizes the specific countermeasures people indicated they would like to see in Sunnyvale.

Figure 1: Preferred Countermeasures at Priority Locations, by Category (Workshop)

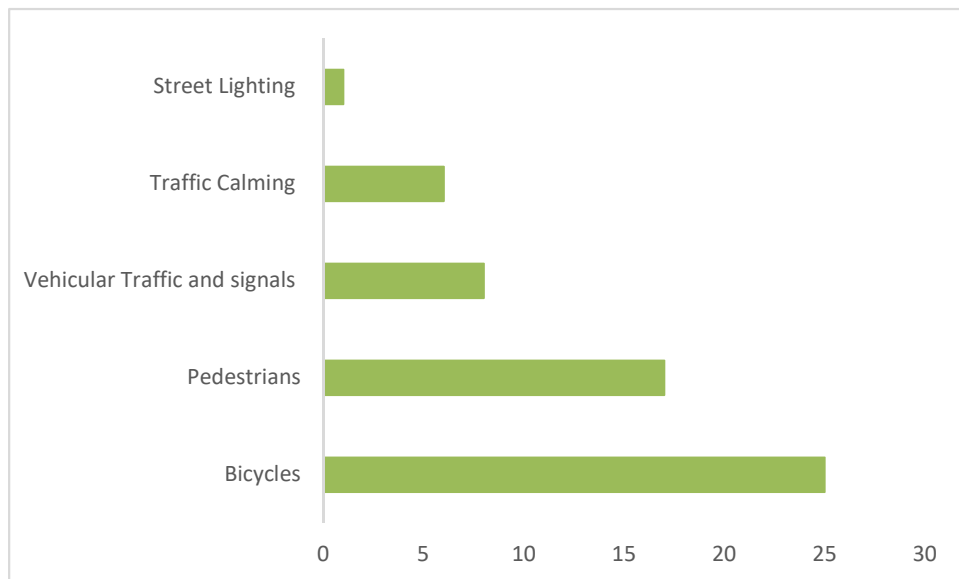
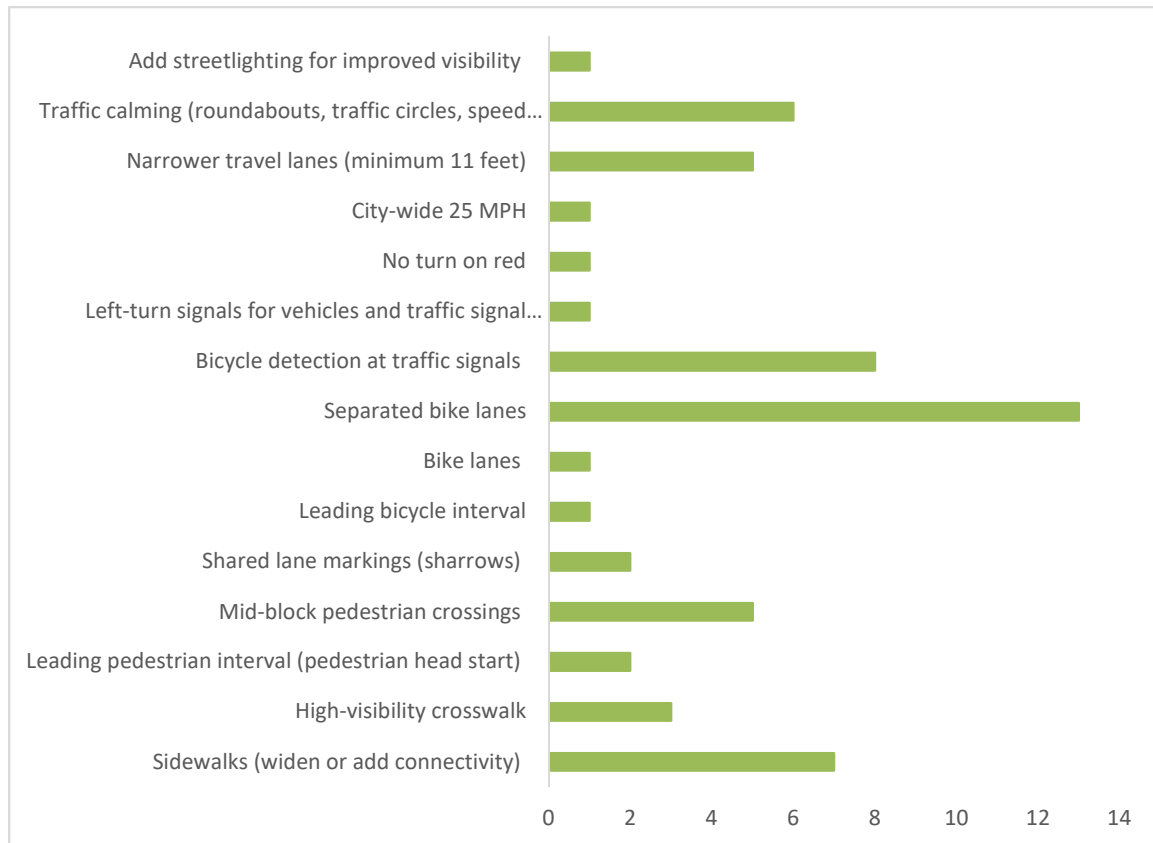




Figure 2: Preferred Countermeasures City-Wide, Detailed (Workshop)



WHAT TREATMENTS WOULD YOU LIKE TO SEE IN SUNNYVALE?

Workshop Overview

Participants were asked to provide their input on what features they liked or had concerns with at two separate locations: S. Mary Avenue at W. Remington Drive- Adjacent to Sunnyvale Middle School, and W. McKinley Avenue West of S. Taaffe Street- Adjacent to Target Downtown.

Location #1: South Mary Avenue at West Remington Drive

Workshop Comments

Responses for Location #1 noted they liked the narrower travel lanes, lower speeds, and the high visibility crosswalk. Respondents noted that the roadway needed a separated bike lane, and pedestrian protection at the intersection (bulbouts). **Figure 3** shows the image that participants were asked to view.



Figure 3: South Mary Avenue Treatment Location

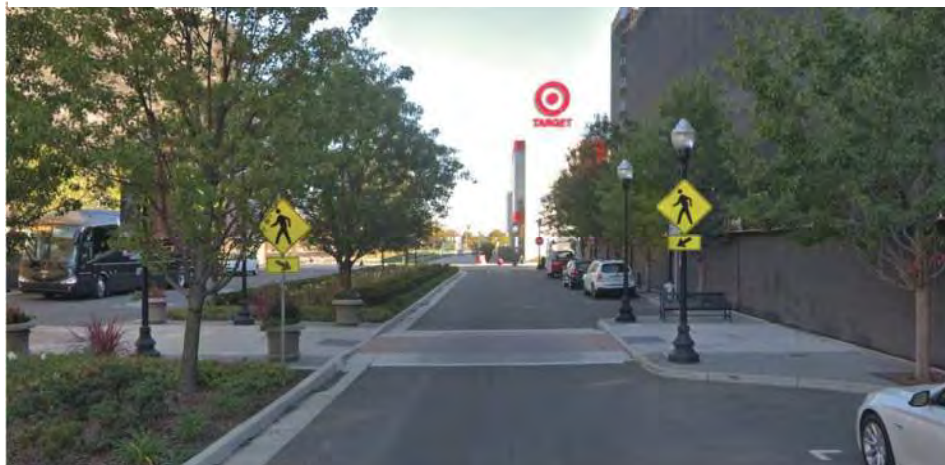


Location #2: West McKinley Avenue West of South Taaffe Street

Workshop Comments

Responses for Location #1 noted they liked the raised crosswalks, wide median, low speeds, curb extensions, trees, and lighting. Respondents noted that they liked all of the design features as a bicyclist. Out of those who responded to the board, 2 drove through the intersection, 5 cycled through the intersection, 1 was a pedestrian, another didn't use the roadway. One respondent did not like the lack of a bike lane. **Figure 4** shows the image that participants were asked to view.

Figure 4: West McKinley Avenue Treatment Location



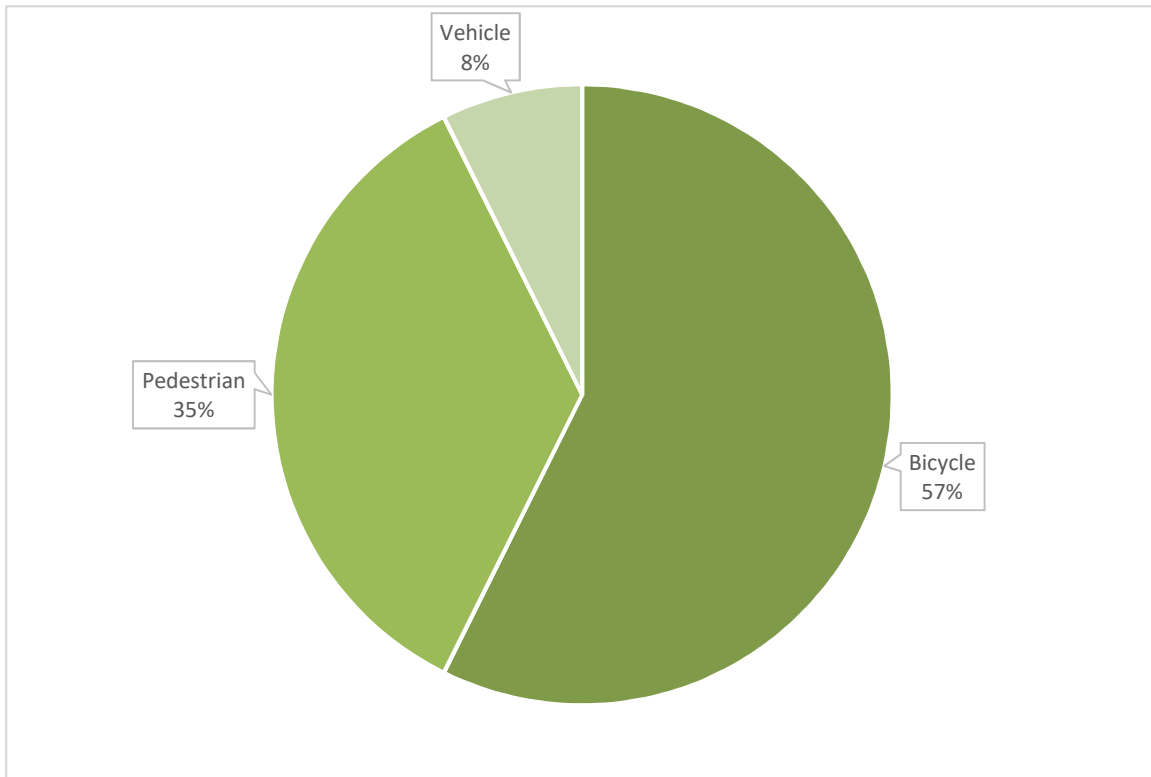


CITYWIDE TREATMENT COMMENTS

Workshop Overview

Participants provided their input on preferred transportation improvements throughout Sunnyvale. Out of 68 responses, 57% were about bicycle improvements, 35% were pedestrian improvements, and 8% were vehicle improvements. Common themes were to add bicycle lanes, add protected intersections, add pedestrian crosswalks, and reduce speeding. **Figure 5** shows the distribution of comments throughout Sunnyvale.

Figure 5: Total Sunnyvale Transportation Improvement Comments



City of Sunnyvale Roadway Safety Plan Community Workshop Key Takeaways, January 2020

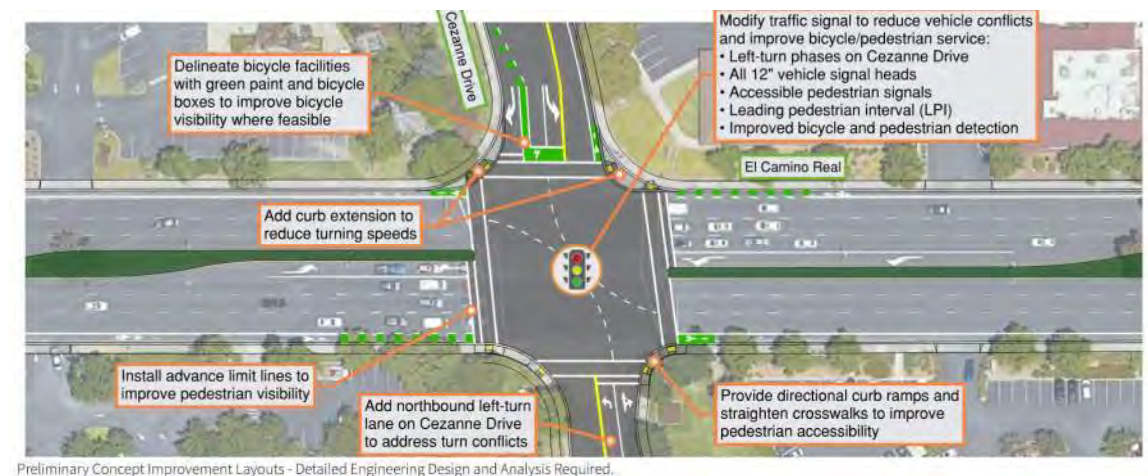
The City of Sunnyvale hosted the second Roadway Safety Plan Community Workshop on January 22, 2020. The workshop goals were to provide an introduction to the project approach, describe what a Roadway Safety Plan and Systemic Analysis is, and solicit feedback from residents and other stakeholders on the safety improvements identified for the 20 representative project locations in Sunnyvale. A total of thirteen participants provided comments on the project boards, comment cards, and through e-mails regarding the identified safety countermeasures for each project location and/or what they would like to see as transportation safety improvements for bicycles, pedestrians, or vehicles at each project location in Sunnyvale.

WORKSHOP OVERVIEW

After a brief presentation about the workshop purpose, participants were asked to provide their feedback and input on the identified safety countermeasures and what features they liked or had concerns with at the 20 separate project locations in Sunnyvale. Outreach materials were subsequently posted to the project website and additional public comment was facilitated through e-mail submissions to City staff.

REPRESENTATIVE PROJECT LOCATION FEEDBACK

Location A: El Camino Real & Cezanne Drive



Feedback Summary

Responses for Location A noted that bike detection does not work at the intersection, and the lack of left-turn signal confuses drivers on Cezanne Drive. Vehicles often turn into oncoming traffic in



the existing condition, which would be addressed by the identified plan. In addition, participants noted lack of curb extension at the southwest corner of the intersection in the identified plan, which is due to the vehicle turning requirements.

The addition of bike box on northbound Cezanne Drive was requested, though this cannot be marked as a bike box without a suitable bike lane from which to enter it. A longer and more explicit mixing zone at the north leg of Cezanne Drive to provide higher level of comfort for cyclists was requested and could be investigated further during future design development of improvements. Finally, implementation of Dutch protected intersection was noted as a desirable improvement requiring more significant geometric modification.

Location B: Fair Oaks Avenue & Maude Avenue

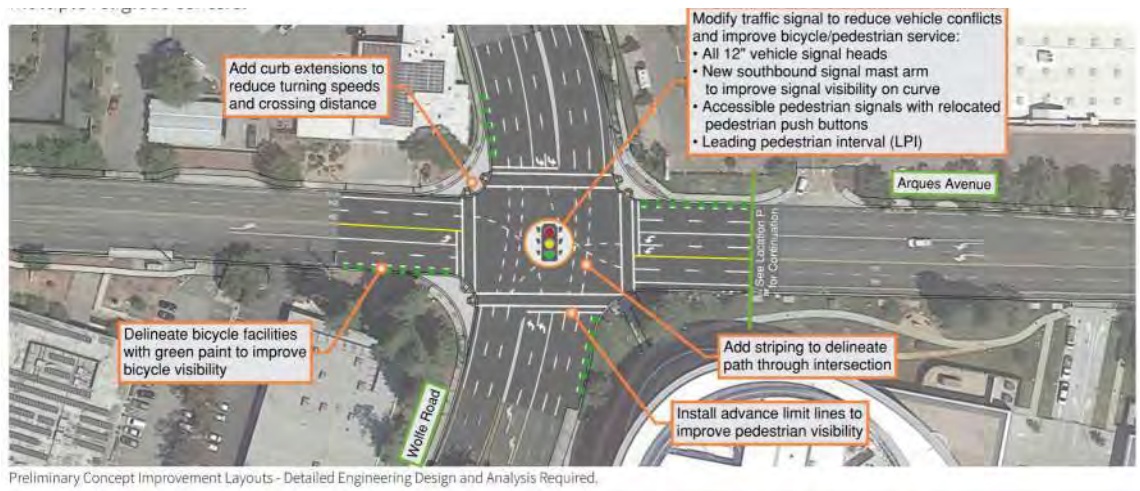


Feedback Summary

One respondent indicated general support for the improvements shown for location B, and further noted that signal timing coordination between intersections of Fair Oaks Avenue/Maude Avenue and Fair Oaks Avenue/Wolfe Road can help to facilitate the traffic flow during peak periods and reduce the number of vehicles stopping between intersections.



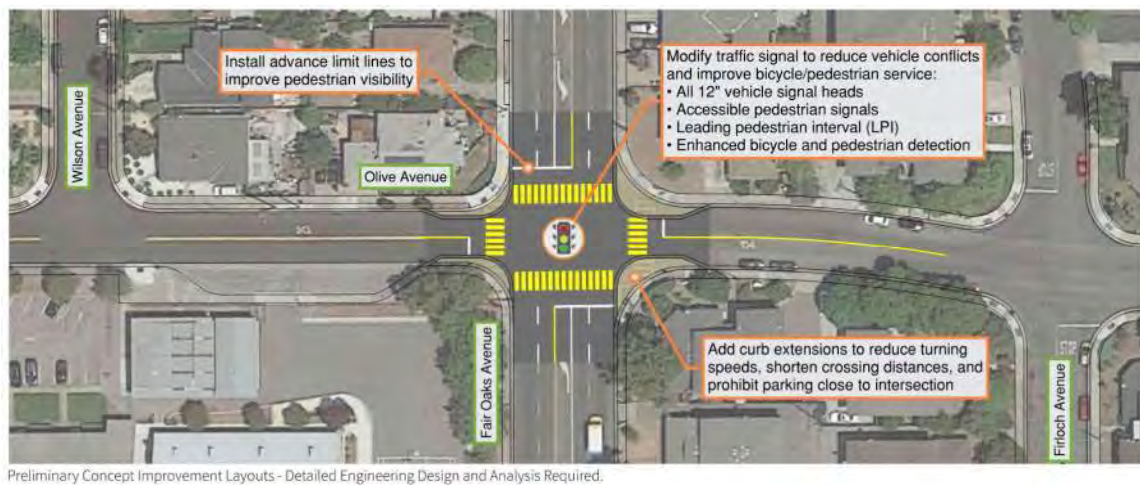
Location C: Wolfe Road & Arques Avenue



Feedback Summary

One respondent noted that pedestrian accessibility could be improved to the west of Location C by addressing sidewalk gaps along Arques Avenue. This improvement may be considered as part of a future project.

Location D: Fair Oaks Avenue & Olive Avenue

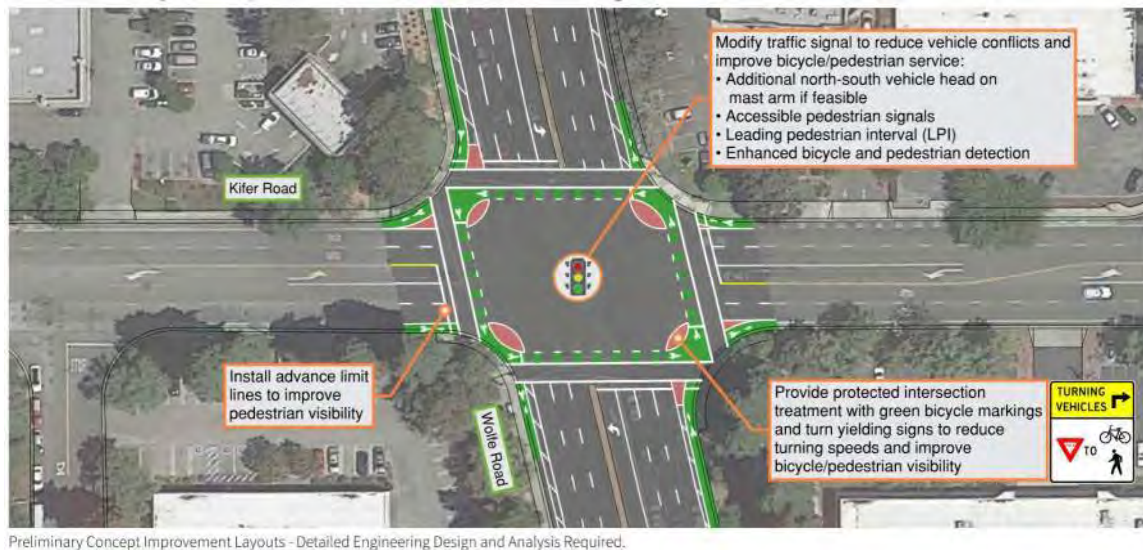


Feedback Summary

No public comments were recorded for this project location.



Location E: Wolfe Road & Kifer Road



Feedback Summary

Responses for Location E inquired as to whether crosswalks would be “painted and visible” and suggested the addition of physical barriers in bike lane buffers. Crosswalks will be marked in accordance with City policy, and the bicycle facilities on Wolfe Road are envisioned to be investigated further as part of a future project.



Location F: Caribbean Drive & Moffett Park Drive

Alternative A



Alternative B



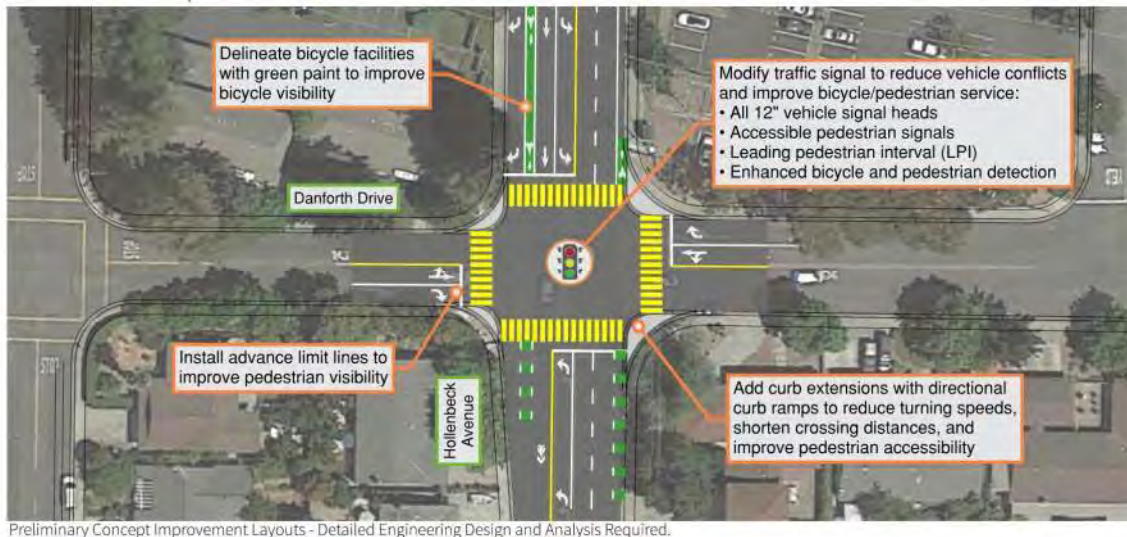
Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

Feedback Summary

No public comments were recorded for this project location.



Location G: Hollenbeck Avenue & Danforth Drive



Feedback Summary

No public comments were recorded for this project location.

Location H: Wolfe Road & WB Central Expressway Ramps



Feedback Summary

No public comments were recorded for this project location.



Location I: Mary Avenue & Olive Avenue



Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

Feedback Summary

One respondent for noted that queuing from the traffic signal at El Camino Real can reach the Olive Avenue intersection. Signal interconnect and traffic signal coordination would be pursued because of this concern.

Location J: Fremont Avenue & Eleanor Way



Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

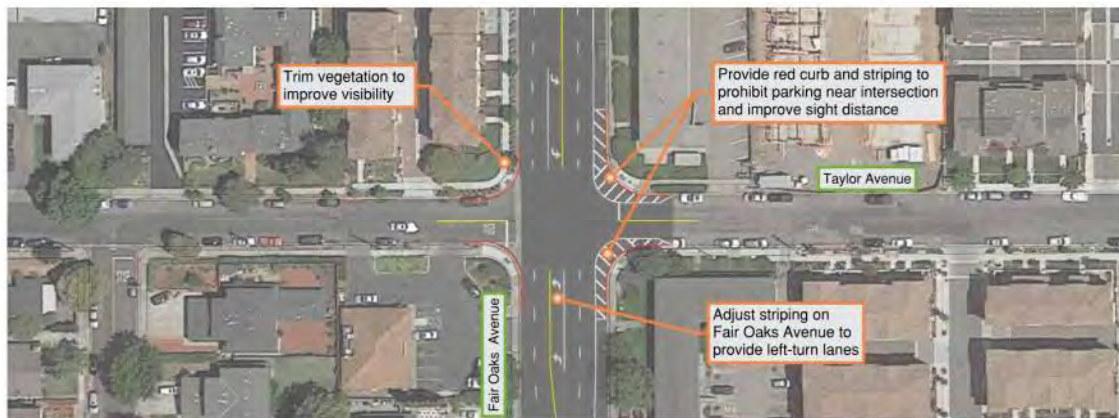


Feedback Summary

Responses for Location J felt that parking restriction near the intersection and pedestrian improvements are good ideas. One response requested addition of a continuous buffered bike lane on eastbound Fremont Avenue to Eleanor Way by narrowing down traffic lanes. Respondents also expressed their concerns about the lack of pedestrians directly at the intersection of Fremont Avenue and Eleanor Way. In addition, respondents requested the addition of a dedicated right-turn lane on westbound Fremont Avenue at Wolfe Road to separated bicyclists and drivers.

Each of the above improvements could be considered in the implementation of long-term solutions at this location, but are not suitable for implementation with the provided quick-build project.

Location K: Fair Oaks Avenue & Taylor Avenue



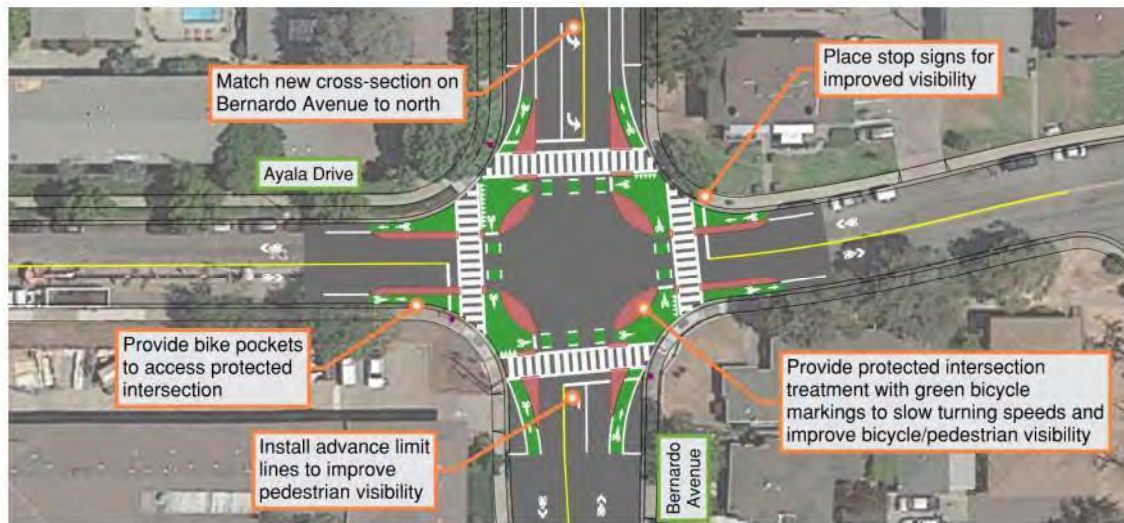
Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

Feedback Summary

One respondent was strongly supportive of the parking reductions and geometric modifications to improve sight distance shown on Fair Oaks Avenue at Location K. The respondent requested that the red curb be extended further on Fair Oaks Avenue if possible, though notes concern with increased parking on Taylor Avenue as a result. The respondent also supported the addition of dedicated left-turn lanes on Fair Oaks Avenue.



Location L: Bernardo Avenue & Ayala Drive

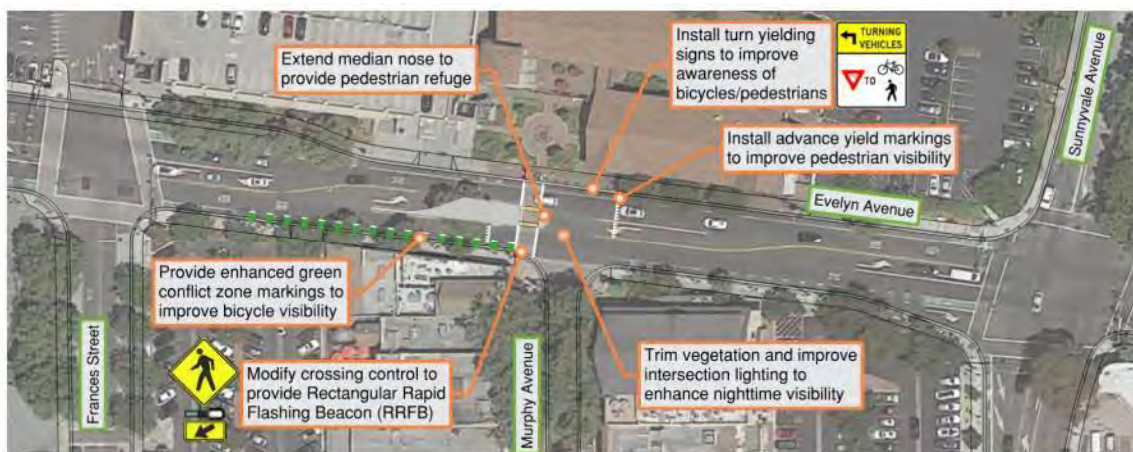


Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

Feedback Summary

A comment received for Location L requested the installation of protected bike lanes flush with the sidewalk along Bernardo Avenue. Potential bicycle facilities along the Bernardo Avenue corridor will be investigated as part of the ongoing 2020 Sunnyvale Active Transportation Plan.

Location M: Evelyn Avenue & Murphy Avenue



Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

Feedback Summary

One commenter for Location M noted that the potential Rectangular Rapid Flashing Beacon (RRFB) is "really important for future transit riders."



Another respondent noted that raised pedestrian crosswalks may help to reduce vehicle speed; this would be subject to City guidelines for traffic calming devices. The respondent also suggested considering closure or modification of access to/from parking facilities on both sides of Evelyn Avenue between Murphy Avenue and Frances Street to address bicycle interactions. Finally, the respondent suggested restricting Murphy Avenue to right-in/right-out access at Evelyn Avenue to reduce pedestrian conflicts, particularly during the evening commute. Changes to access would require further study and evaluation as part of a separate project.

Location N: Evelyn Avenue & Pastoria Avenue



Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.

Feedback Summary

One respondent for Location N suggested addition of a protected bikeway and elimination of the mixing zone shown on Evelyn Avenue, allowing a Dutch protected intersection at Pastoria Avenue. Another respondent indicated the greatest concern for cyclists at this location is being able to identify turning vehicles as early as possible since cyclists are often also traveling at greater speeds along Evelyn Avenue. Additional bicycle facility improvements will be evaluated as part of the 2020 Sunnyvale Active Transportation Plan and potential future bikeway improvement.

Location O: Fremont Avenue – Sunnyvale Saratoga Road to Bobwhite Avenue/Manet Drive



Collision History July 6, 2013 to June 30, 2018

One response for Location O noted lack of safety countermeasures for high school students making left turns into the Fremont high school campus coming from northbound Sunnyvale Saratoga Road or eastbound Fremont Avenue. These improvements would fall beyond the limits of the identified project segment, but could be considered for inclusion in future improvement projects.

Participants also expressed support for the identified protected intersection layout at Fremont Avenue and Sunnyvale Saratoga Road both verbally and in writing.

[illegible]

No public comments were recorded for this project location.

Provide new left-turn lane to consolidate inbound left-turn access

Sunnyvale Saratoga Road

El Camino Real

Install median to restrict left-turn access and reduce vehicle conflict points

Fall River Terrace

Mathilde Avenue

Preliminary Concept Improvement Layouts - Detailed Engineering Design and Analysis Required.



Feedback Summary

Responses for Location Q indicated a desire for wider and potentially buffered bike lanes on both sides of Sunnyvale Saratoga Road if the roadway width allows. The existing bike facilities are relatively narrower and include the gutter pan. One respondent also noted that the shown project could make left turns more difficult, and that the nearby intersection of Sunnyvale Saratoga Road and Mathilda Avenue can be difficult for bicyclists to navigate.

Location R: Reed Avenue – Wolfe Road to Evelyn Avenue



Feedback Summary

Response for Location R requested separated/raised bikeways on Reed Avenue. Additionally, a need to more clearly indicate the correct direction of travel for bicyclists and restrict bicycling on sidewalks along Reed was identified.

Respondents expressed concerns about drainage issues at the southwest corner of Reed Avenue and Sequoia Drive due to flooding during rain events.

Location S: Sandia Avenue – Lawrence Expressway to Wildwood Avenue





Feedback Summary

No public comments were recorded for this project location.

Location T: Hollenbeck Avenue – Bend Drive to The Dalles Avenue



Feedback Summary

Multiple responses for Location T requested marked bike lanes – preferably buffered – on Hollenbeck Avenue.

One respondent noted high traffic volumes on Hollenbeck Avenue near the south end of the project segment related to three nearby schools, resulting in turning issues at The Dalles Avenue and difficulty for residents exiting driveways. The respondent suggested restricting parking on both sides of Hollenbeck Avenue near The Dalles Avenue to allow through vehicles to pass vehicles waiting to turn. Multiple respondents suggested considering additional traffic control such as stop signs or signalization to address school peak traffic, as well as new marked crosswalks.

While parking restrictions to allow illegal passing of vehicles waiting to turn is typically not advisable, future design development could include investigation of turn lanes or traffic control modifications pending evaluation of traffic volumes and delays.



OTHER FEEDBACK

One respondent commented that bicycle volumes are not utilized as part of the collision analysis for this study, resulting in many important routes not being considered for needed bike safety improvements. In other words, a very low bicycle volume due to lack of suitable comfortable facilities results in low collision rates for cyclists.

The Roadway Safety Plan, utilizing a systemic approach, does consider existing facilities as part of the analysis. However, identification of representative project locations is based upon a variety of factors, including suitability for Highway Safety Improvement Program (HSIP) funding applications which rely upon collision history as part of the scoring criteria. Additional evaluation of bicycle facilities is also being performed for the 2020 Sunnyvale Active Transportation Plan.

E. PROJECT LOCATIONS COLLISION DATA

Table D1: Collision Data for Representative Project Locations

Loc	Project Segment / Intersection	Location Type	Crashes	Fatal	Severe Injury	Visible Injury	Complaint of Pain	PDO	Agg-ressive	Bike	Broad-side	Dark	Distracted	Head On	Impaired	Other	Ped	Phone	Rear End	Side-swipe	Wet
A	Cezanne Drive & El Camino Real	Signalized	39	1	2	6	10	20	10	2	5	8	1	1	5	3	8	0	11	5	2
B	Fair Oaks Avenue & Maude Avenue	Signalized	25	1	0	1	8	15	8	0	8	8	0	0	7	6	0	0	8	4	3
C	Wolfe Road & Arques Avenue	Signalized	32	0	2	0	9	21	4	1	10	5	1	2	6	3	1	0	6	8	2
D	Fair Oaks Avenue & Olive Avenue	Signalized	23	0	1	0	8	14	2	0	3	6	0	0	7	13	2	0	8	7	3
E	Wolfe Road & Kifer Road	Signalized	22	0	1	3	6	12	8	4	7	2	0	0	3	2	0	0	9	1	0
F	Caribbean Drive & Moffett Park Drive	Signalized	16	0	1	4	2	9	6	0	1	5	0	1	5	5	0	0	4	4	2
G	Danforth Drive & Hollenbeck Avenue	Signalized	10	0	1	1	4	4	2	0	1	1	0	1	3	3	2	0	2	2	1
H	Wolfe Road and Central WB off-ramp	Signalized	13	0	0	1	2	10	4	0	5	0	0	0	0	0	0	0	5	2	2
I	Mary Avenue & Olive Avenue	Unsignalized	26	0	1	3	7	15	0	2	18	6	0	1	2	0	1	0	0	1	4
J	Fremont Avenue & Eleanor Way	Unsignalized	10	0	0	1	1	8	2	1	0	4	1	0	2	0	2	1	4	2	0
K	Fair Oaks Avenue & Taylor Avenue	Unsignalized	15	0	1	1	0	13	2	1	6	4	0	0	9	5	0	0	4	5	0
L	Bernardo Avenue & Ayala Drive	Unsignalized	17	0	2	2	2	11	3	2	0	5	1	2	8	9	2	0	3	6	2
M	Evelyn Avenue & Murphy Avenue	Unsignalized	14	0	0	3	2	9	4	3	1	5	0	0	2	8	3	0	2	0	1
N	Evelyn Avenue and Pastoria Avenue	Unsignalized	5	1	1	1	1	1	0	1	1	0	0	0	2	3	0	0	0	2	0
O	Fremont Avenue from Sunnyvale Saratoga to Bobwhite / Manet	Class II Arterial	82	1	2	16	14	49	22	10	14	14	3	1	11	5	7	0	30	10	6
	Fremont & Bobwhite / Manet		17	1	1	6	3	6	6	2	4	1	0	0	3	0	3	0	8	0	0
	Fremont & Sunnyvale Saratoga		54	0	0	7	9	38	15	5	7	11	2	1	7	4	3	0	21	8	5
	Fremont between Sunnyvale Saratoga and Bobwhite / Manet, excluding signals		11	0	1	3	2	5	1	3	3	2	1	0	1	1	1	0	1	2	1
P	Arques Avenue from Wolfe to Lawrence Expressway	Class II Arterial	35	0	2	7	7	19	5	3	12	6	0	3	7	5	2	0	6	6	2
	Arques & Commercial/De Guigne		19	0	0	4	2	13	5	0	3	3	0	1	6	4	2	0	5	4	2
	Arques & Santa Trinita		4	0	0	1	0	3	0	1	1	0	0	1	1	0	0	0	1	1	0
	Arques between between Wolfe and Lawrence, excluding signals		12	0	2	2	5	3	0	2	8	3	0	1	0	1	0	0	0	1	0
Q	Sunnyvale Saratoga Road from El Camino Real to Fall River Terrace	Class II Arterial	8	0	0	0	4	4	0	0	6	1	0	1	1	0	0	0	1	1	1
R	Reed Avenue from Wolfe to Evelyn	Residential Collector	56	0	0	6	15	35	18	1	14	7	2	2	9	7	3	1	18	9	5
	Reed & Evelyn		7	0	0	1	3	3	1	0	3	1	0	0	1	1	1	0	1	1	1
	Reed & Sequoia		7	0	0	1	3	3	1	0	3	1	0	0	0	0	2	0	1	1	1
	Reed/Old San Francisco & Wolfe		42	0	0	4	9	29	16	1	8	5	2	2	8	6	0	1	16	7	3
S	Sandia Avenue from Lawrence Expressway to Wildwood	Residential Collector	27	0	0	0	7	20	5	1	9	6	0	2	2	1	0	0	4	9	1
	Sandia & Blazingwood		16	0	0	0	7	9	1	1	9	2	0	1	1	1	0	0	1	5	0
	Sandia east of Blazingwood		11	0	0	0	0	11	4	0	0	4	0	1	1	0	0	0	3	4	1
T	Hollenbeck Drive from Bend to The Dalles	Residential Collector	12	0	1	0	2	9	3	1	1	5	0	0	1	4	1	0	4	6	0
	Hollenbeck & Cascade		5	0	1	0	2	2	3	1	1	1	0	0	1	2	0	0	2	2	0
	Hollenbeck between Bend and The Dalles, excluding intersections		7	0	0	0	0	7	0	0	0	4	0	0	0	2	1	0	2	4	0

Table D2: Representative Project Locations Prioritized by Estimated B/C Ratio

Loc	Project Segment / Intersection	Location Type	B/C Ratio	Crashes	Fatal	Severe Injury	Visible Injury	Complaint of Pain	PDO
K	Fair Oaks Avenue & Taylor Avenue	Unsignalized	234.98	15	0	1	1	0	13
N	Evelyn Avenue and Pastoria Avenue	Unsignalized	53.94	5	1	1	1	1	1
L	Bernardo Avenue & Ayala Drive	Unsignalized	42.37	17	0	2	2	2	11
A	Cezanne Drive & El Camino Real	Signalized	39.39	39	1	2	6	10	20
T	Hollenbeck Drive from Bend to The Dalles	Residential Collector	16.11	12	0	1	0	2	9
O	Fremont Avenue from Sunnyvale Saratoga to Bobwhite / Manet	Class II Arterial	14.69	82	1	2	16	14	49
M	Evelyn Avenue & Murphy Avenue	Unsignalized	8.61	14	0	0	3	2	9
D	Fair Oaks Avenue & Olive Avenue	Signalized	8.37	23	0	1	0	8	14
J	Fremont Avenue & Eleanor Way	Unsignalized	7.21	10	0	0	1	1	8
P	Arques Avenue from Wolfe to Lawrence Expressway	Class II Arterial	6.93	35	0	2	7	7	19
E	Wolfe Road & Kifer Road	Signalized	6.26	22	0	1	3	6	12
C	Wolfe Road & Arques Avenue	Signalized	5.22	32	0	2	0	9	21
B	Fair Oaks Avenue & Maude Avenue	Signalized	5.21	25	1	0	1	8	15
I	Mary Avenue & Olive Avenue	Unsignalized	5.06	26	0	1	3	7	15
S	Sandia Avenue from Lawrence Expressway to Wildwood	Residential Collector	4.30	27	0	0	0	7	20
G	Danforth Drive & Hollenbeck Avenue	Signalized	4.15	10	0	1	1	4	4
Q	Sunnyvale Saratoga Road from El Camino Real to Fall River Terrace	Class II Arterial	2.58	8	0	0	0	4	4
H	Wolfe Road and Central WB off-ramp	Signalized	1.70	13	0	0	1	2	10
R	Reed Avenue from Wolfe to Evelyn	Residential Collector	0.86	56	0	0	6	15	35
F	Caribbean Drive & Moffett Park Drive	Signalized	N/A	16	0	1	4	2	9

Table D3: Representative Project Locations Prioritized by Number of Fatal & Severe Injury Collisions

Loc	Project Segment / Intersection	Location Type	B/C Ratio	Crashes	Fatal	Severe Injury	Total KSI	Visible Injury	Complaint of Pain	PDO
O	Fremont Avenue from Sunnyvale Saratoga to Bobwhite / Manet	Class II Arterial	14.69	82	1	2	3	16	14	49
A	Cezanne Drive & El Camino Real	Signalized	39.39	39	1	2	3	6	10	20
P	Arques Avenue from Wolfe to Lawrence Expressway	Class II Arterial	6.93	35	0	2	2	7	7	19
C	Wolfe Road & Arques Avenue	Signalized	5.22	32	0	2	2	0	9	21
L	Bernardo Avenue & Ayala Drive	Unsignalized	42.37	17	0	2	2	2	2	11
N	Evelyn Avenue and Pastoria Avenue	Unsignalized	53.94	5	1	1	2	1	1	1
I	Mary Avenue & Olive Avenue	Unsignalized	5.06	26	0	1	1	3	7	15
B	Fair Oaks Avenue & Maude Avenue	Signalized	5.21	25	1	0	1	1	8	15
D	Fair Oaks Avenue & Olive Avenue	Signalized	8.37	23	0	1	1	0	8	14
E	Wolfe Road & Kifer Road	Signalized	6.26	22	0	1	1	3	6	12
F	Caribbean Drive & Moffett Park Drive	Signalized	N/A	16	0	1	1	4	2	9
K	Fair Oaks Avenue & Taylor Avenue	Unsignalized	234.98	15	0	1	1	1	0	13
T	Hollenbeck Drive from Bend to The Dalles	Residential Collector	16.11	12	0	1	1	0	2	9
G	Danforth Drive & Hollenbeck Avenue	Signalized	4.15	10	0	1	1	1	4	4
R	Reed Avenue from Wolfe to Evelyn	Residential Collector	0.86	56	0	0	0	6	15	35
S	Sandia Avenue from Lawrence Expressway to Wildwood	Residential Collector	4.30	27	0	0	0	0	7	20
M	Evelyn Avenue & Murphy Avenue	Unsignalized	8.61	14	0	0	0	3	2	9
H	Wolfe Road and Central WB off-ramp	Signalized	1.70	13	0	0	0	1	2	10
J	Fremont Avenue & Eleanor Way	Unsignalized	7.21	10	0	0	0	1	1	8
Q	Sunnyvale Saratoga Road from El Camino Real to Fall River Terrace	Class II Arterial	2.58	8	0	0	0	0	4	4

Table D4: Representative Project Locations Prioritized by Total Number of Collisions

Loc	Project Segment / Intersection	Location Type	B/C Ratio	Crashes	Fatal	Severe Injury	Visible Injury	Complaint of Pain	PDO
O	Fremont Avenue from Sunnyvale Saratoga to Bobwhite / Manet	Class II Arterial	14.69	82	1	2	16	14	49
R	Reed Avenue from Wolfe to Evelyn	Residential Collector	0.86	56	0	0	6	15	35
A	Cezanne Drive & El Camino Real	Signalized	39.39	39	1	2	6	10	20
P	Arques Avenue from Wolfe to Lawrence Expressway	Class II Arterial	6.93	35	0	2	7	7	19
C	Wolfe Road & Arques Avenue	Signalized	5.22	32	0	2	0	9	21
S	Sandia Avenue from Lawrence Expressway to Wildwood	Residential Collector	4.30	27	0	0	0	7	20
I	Mary Avenue & Olive Avenue	Unsignalized	5.06	26	0	1	3	7	15
B	Fair Oaks Avenue & Maude Avenue	Signalized	5.21	25	1	0	1	8	15
D	Fair Oaks Avenue & Olive Avenue	Signalized	8.37	23	0	1	0	8	14
E	Wolfe Road & Kifer Road	Signalized	6.26	22	0	1	3	6	12
L	Bernardo Avenue & Ayala Drive	Unsignalized	42.37	17	0	2	2	2	11
F	Caribbean Drive & Moffett Park Drive	Signalized	N/A	16	0	1	4	2	9
K	Fair Oaks Avenue & Taylor Avenue	Unsignalized	234.98	15	0	1	1	0	13
M	Evelyn Avenue & Murphy Avenue	Unsignalized	8.61	14	0	0	3	2	9
H	Wolfe Road and Central WB off-ramp	Signalized	1.70	13	0	0	1	2	10
T	Hollenbeck Drive from Bend to The Dalles	Residential Collector	16.11	12	0	1	0	2	9
J	Fremont Avenue & Eleanor Way	Unsignalized	7.21	10	0	0	1	1	8
G	Danforth Drive & Hollenbeck Avenue	Signalized	4.15	10	0	1	1	4	4
Q	Sunnyvale Saratoga Road from El Camino Real to Fall River Terrace	Class II Arterial	2.58	8	0	0	0	4	4
N	Evelyn Avenue and Pastoria Avenue	Unsignalized	53.94	5	1	1	1	1	1

F. HSIP BENEFIT/ COST WORKSHEETS

Note: Benefit/Cost analysis is not included for
Location F - Caribbean Drive & Moffett Park Drive as
the project is beyond the scope of HSIP grant funding.

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location A

Project Location:
(limited to 250 characters)

Cezanne Drive/El Camino Real, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Modify traffic signal. Delineate bicycle facilities with green paint and bicycle boxes. Add curb extension. Add northbound left-turn lane on Cezanne Drive. Provide directional curb ramps.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	S06: Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)
CM No. 2:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
CM No. 3:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3	
1. S06: Install left-turn lane and add turn phase (signal has no left-turn lane or phase before);	HSIP Funding Eligibility: 90%
2. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI);	HSIP Funding Eligibility: 100%
3. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number;	HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S06)	% for CM#1 (S21PB)	% for CM#1 (S02)	% for OS*	% for NS**
+ -	1	Improve Signal	EA	1	250,000	250,000	34 %	33 %	33 %	%	0 %
+ -	2	New Striping	LF	1,636	\$1.00	1,636	50 %	%	%	50 %	0 %
+ -	3	New Pavement Marking	SF	147	\$4.00	588	50 %	%	%	50 %	0 %
+ -	4	New Green Bike Lane	SF	1,327	\$7.00	9,289	%	%	%	100 %	0 %
+ -	5	Remove Existing Striping	LF	865	\$4.00	3,460	100 %	%	%	%	0 %
+ -	6	Remove Existing Pavement Marking	SF	42	\$10.00	420	100 %	%	%	%	0 %
+ -	7	New Concrete Curb and Gutter	LF	194	\$40.00	7,760	%	20 %	%	80 %	0 %
+ -	8	New Concrete Sidewalk	SF	673	\$10.00	6,730	%	20 %	%	80 %	0 %
+ -	9	New Curb Ramp	EA	8	\$3500.00	28,000	%	20 %	%	80 %	0 %
+ -	10	Remove AC Pavement	SF	433	\$2.00	866	%	20 %	%	80 %	0 %
+ -	11	Remove Concrete Curb Ramp	SF	240	\$2.00	480	%	20 %	%	80 %	0 %
+ -	12	Remove Concrete Curb Ramp	SF	173	\$5.00	865	%	20 %	%	80 %	0 %
		Weighted Average (%)					29%	29%	27%	15%	
		Total (\$)				\$310,094					

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

20 %

\$62,019

(e.g. enter 10 for 10%)

Total Construction Cost (Con Items & Contingencies):

\$372,200

(Rounded up to the nearest hundreds)

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$25,300	90 %	\$22,770	\$2,530
PS&E	\$37,900	90 %	\$34,110	\$3,790
Subtotal - PE	\$63,200	90 %	\$56,880	\$6,320
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$25,300	90 %	\$22,770	\$2,530
Construction Items	\$372,200 (Read only - from Section I)	90 %	\$334,980	\$37,220
Subtotal - Construction	\$397,500	90 %	\$357,750	\$39,750
PROJECT TOTAL	\$460,700	90 %	\$414,630	\$46,070

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	S (Signalized Intersections)
		1	Cezanne Drive/El Camino Real	

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S06: Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)	S	0.55	20	All	90%
<input checked="" type="checkbox"/>	2	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	3	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Cezanne Drive/El Camino Real	1	2	6	10	20	39
	Total	1	2	6	10	20	39

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Cezanne Drive/El Camino Real	1	2	2	5	0	10
	Total	1	2	2	5	0	10

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S06 S21PB S02) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 1,2,6,10,20 Ped & Bike: 1,2,2,5,0	\$13,868,909	\$2,505,727	\$1,772,790	\$18,147,426
Sum	\$13,868,909	\$2,505,727	\$1,772,790	\$18,147,426

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S06: Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)
- S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
- S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

Cost, FRR, Benefit and BCR:

Total Project Cost

\$460,700

HSIP Funds Requested

\$414,630

Max. FRR

90%

Total Expected Benefit

18,147,426

Benefit Cost Ratio (BCR)

39.39

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location B

Project Location:
(limited to 250 characters)

Fair Oaks Avenue/Maude Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Modify traffic signal. Additional SB signal heads. APS & LPI. Add curb extension on SE corner. Signal pole relocation on Fair Oaks Ave. Install advance limit line.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	S20PB: Install advance stop bar before crosswalk (Bicycle Box)
CM No. 2:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
CM No. 3:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S20PB: Install advance stop bar before crosswalk (Bicycle Box); HSIP Funding Eligibility: 100%
2. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%
3. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S20PB)	% for CM#1 (S21PB)	% for CM#1 (S02)	% for OS*	% for NS**
+ -	1	Improve Signal	EA	1	\$75000.00	75,000	10 %	45 %	45 %	%	0 %
+ -	2	New Striping	LF	675	\$1.00	675	100 %	%	%	%	0 %
+ -	3	Remove Existing Striping	LF	40	\$4.00	160	100 %	%	%	%	0 %
+ -	4	New Concrete Curb and Gutter	LF	81	\$40.00	3,240	30 %	%	%	70 %	0 %
+ -	5	New Concrete Sidewalk	SF	424	\$10.00	4,240	30 %	%	%	70 %	0 %
+ -	6	New Curb Ramps	EA	2	\$3500.00	7,000	30 %	%	%	70 %	0 %
+ -	7	Remove AC Pavement	SF	364	\$2.00	728	30 %	%	%	70 %	0 %
+ -	8	Remove Concrete Curb and Gutter	LF	71	\$5.00	355	30 %	%	%	70 %	0 %
+ -	9	Remove Concrete Curb Ramp	SF	60	\$2.00	120	30 %	%	%	70 %	0 %
		Weighted Average (%)					14%	37%	37%	12%	
		Total (\$)				\$91,518					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$18,304

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$109,900

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$11,000	100 %	\$11,000	\$0
PS&E	\$16,500	100 %	\$16,500	\$0
Subtotal - PE	\$27,500	100 %	\$27,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$11,000	100 %	\$11,000	\$0
Construction Items	\$109,900 (Read only - from Section I)	100 %	\$109,900	\$0
Subtotal - Construction	\$120,900	100 %	\$120,900	\$0
PROJECT TOTAL	\$148,400	100 %	\$148,400	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Fair Oaks Avenue/Maude Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S20PB: Install advance stop bar before crosswalk (Bicycle Box)	S	0.15	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	2	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	3	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Fair Oaks Avenue/Maude Avenue	1	0	1	8	15	25
	Total	1	0	1	8	15	25

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Fair Oaks Avenue/Maude Avenue	0	0	0	0	0	0
	Total	0	0	0	0	0	0

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S20PB S21PB S02) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 1,0,1,8,15 Ped & Bike: 0,0,0,0,0	\$0	\$0	\$773,701	\$773,701
Sum	\$0	\$0	\$773,701	\$773,701

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S20PB: Install advance stop bar before crosswalk (Bicycle Box)
 - S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
 - S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$148,400	\$148,400	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$773,701	5.21	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location C

Project Location:
(limited to 250 characters)

Wolfe Road/Arques Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Modify traffic signal. New southbound signal mast arm. APS & LPI. Add curb extension on northwest and southwest corners. Delineate bicycle facilities. Install advance limit lines.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 2:	S09: Install raised pavement markers and striping (through intersection)
CM No. 3:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%

2. S09: Install raised pavement markers and striping (through intersection); HSIP Funding Eligibility: 100%

3. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S02)	% for CM#1 (S09)	% for CM#1 (S21PB)	% for OS*	% for NS**
+ -	1	Modify Traffic Signal	EA	1	175,000	175,000	70 %	%	30 %	%	0 %
+ -	2	New Striping	LF	1,578	\$1.00	1,578	%	%	%	%	100 %
+ -	3	Remove Existing Striping	LF	587	\$3.50	2,055	%	%	%	%	100 %
+ -	4	New Concrete Curb and Gutter	LF	390	\$40.00	15,600	30 %	%	%	70 %	0 %
+ -	5	New Concrete Sidewalk	SF	1,995	\$10.00	19,950	30 %	%	%	70 %	0 %
+ -	6	New Curb Ramp	EA	6	\$3500.00	21,000	30 %	%	%	70 %	0 %
+ -	7	New Concrete Curb	LF	37	\$25.00	925	30 %	%	%	70 %	0 %
+ -	8	Remove AC Pavement	SF	1,815	\$2.00	3,630	30 %	%	%	70 %	0 %
+ -	9	Remove Concrete Curb and Gutter	LF	310	\$5.00	1,550	30 %	%	%	70 %	0 %
+ -	10	Remove Concrete Curb Ramp	SF	180	\$2.00	360	30 %	%	%	70 %	0 %
+ -	11						30 %	%	%	70 %	0 %
		Weighted Average (%)					59%		22%	18%	2%
		Total (\$)				\$241,648					

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$48,330

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$290,000

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$29,000	100 %	\$29,000	\$0
PS&E	\$43,500	100 %	\$43,500	\$0
Subtotal - PE	\$72,500	100 %	\$72,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$29,000	100 %	\$29,000	\$0
Construction Items	\$290,000 (Read only - from Section I)	100 %	\$290,000	\$0
Subtotal - Construction	\$319,000	100 %	\$319,000	\$0
PROJECT TOTAL	\$391,500	100 %	\$391,500	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Wolfe Road/Arques Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	2	S09: Install raised pavement markers and striping (through intersection)	S	0.1	10	All	100%
<input checked="" type="checkbox"/>	3	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Wolfe Road/Arques Avenue	0	2	0	9	21	32
	Total	0	2	0	9	21	32

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Wolfe Road/Arques Avenue	0	0	0	1	0	1
	Total	0	0	0	1	0	1

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S02 S09 S21PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,2,0,9,21 Ped & Bike: 0,0,0,1,0	\$1,180,847	\$787,232	\$74,267	\$2,042,346
Sum	\$1,180,847	\$787,232	\$74,267	\$2,042,346

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
 - S09: Install raised pavement markers and striping (through intersection)
 - S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$391,500</div>	<div>\$391,500</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$2,042,346</div>	<div>5.22</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location D

Project Location:
(limited to 250 characters)

Fair Oaks Avenue/Olive Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Modify traffic signal. APS & LPI. Enhanced bike and pedestrian detection. Add curb extension to shorten crossing distance. Install advance limit lines.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
CM No. 2:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 3:	S20PB: Install advance stop bar before crosswalk (Bicycle Box)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%
2. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%
3. S20PB: Install advance stop bar before crosswalk (Bicycle Box); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S21PB)	% for CM#1 (S02)	% for CM#1 (S20PB)	% for OS*	% for NS**
+	1	Modify Traffic Signal	EA	1	125,000	125,000	45 %	45 %	10 %	%	0 %
-	2	New Striping	LF	791	\$1.00	791	%	%	100 %	%	0 %
+	3	Remove Existing Striping	LF	777	\$3.50	2,720	%	%	100 %	%	0 %
-	4	New Concrete Curb and Gutter	LF	368	\$40.00	14,720	25 %	%	25 %	50 %	0 %
+	5	New Concrete Sidewalk	SF	1,550	\$10.00	15,500	25 %	%	25 %	50 %	0 %
-	6	New Curb Ramp	EA	8	\$3500.00	28,000	25 %	%	25 %	50 %	0 %
+	7	Remove AC Pavement	SF	1,550	\$2.00	3,100	25 %	%	25 %	50 %	0 %
-	8	Remove Concrete Curb and Gutter	LF	296	\$5.00	1,480	25 %	%	25 %	50 %	0 %
+	9	Remove Concrete Curb Ramp	SF	240	\$2.00	480	25 %	%	25 %	50 %	0 %
-	10						25 %	%	25 %	50 %	0 %
		Weighted Average (%)					38%	29%	17%	16%	
		Total (\$)				\$191,791					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:
(e.g. enter 10 for 10%)

20 %

\$38,358

Total Construction Cost (Con Items & Contingencies):
(Rounded up to the nearest hundreds)

\$230,200

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$23,000	100 %	\$23,000	\$0
PS&E	\$34,600	100 %	\$34,600	\$0
Subtotal - PE	\$57,600	100 %	\$57,600	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$23,000	100 %	\$23,000	\$0
Construction Items	\$230,200 (Read only - from Section I)	100 %	\$230,200	\$0
Subtotal - Construction	\$253,200	100 %	\$253,200	\$0
PROJECT TOTAL	\$310,800	100 %	\$310,800	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Fair Oaks Avenue/Olive Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	2	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	3	S20PB: Install advance stop bar before crosswalk (Bicycle Box)	S	0.15	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Fair Oaks Avenue/Olive Avenue	0	1	0	8	14	23
	Total	0	1	0	8	14	23

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Fair Oaks Avenue/Olive Avenue	0	1	0	1	0	2
	Total	0	1	0	1	0	2

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S21PB S02 S20PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,1,0,8,14 Ped & Bike: 0,1,0,1,0	\$1,499,800	\$727,021	\$374,950	\$2,601,771
Sum	\$1,499,800	\$727,021	\$374,950	\$2,601,771

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
- S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
- S20PB: Install advance stop bar before crosswalk (Bicycle Box)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$310,800</div>	<div>\$310,800</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$2,601,771</div>	<div>8.37</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location E

Project Location:
(limited to 250 characters)

Wolfe Road/Kifer Road, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Install quick-build protected intersection with modifications to traffic signals to improve visibility, add LPI, provide bike markings in intersection, add advance limit lines, provide new curb ramps where required.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
CM No. 2:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 3:	S20PB: Install advance stop bar before crosswalk (Bicycle Box)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

2. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%

3. S20PB: Install advance stop bar before crosswalk (Bicycle Box); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S21PB)	% for CM#1 (S02)	% for CM#1 (S20PB)	% for OS*	% for NS**
+ -	1	Modify Traffic Signal	EA	1	200,000	200,000	30 %	70 %	%	%	0 %
+ -	2	New Striping	LF	3,765	\$1.00	3,765	%	%	100 %	%	0 %
+ -	3	New Pavement Marking	SF	140	\$4.00	560	%	%	100 %	%	0 %
+ -	4	New Paint Pavement Marking	SF	11,026	\$3.00	33,078	%	%	100 %	%	0 %
+ -	5	New Green Bike Lane	SF	5,074	\$7.00	35,518	%	%	100 %	%	0 %
+ -	6	Remove Existing Striping	LF	1,207	\$3.50	4,225	%	%	100 %	%	0 %
+ -	7	Remove Existing Pavement Marking	SF	192	\$10.00	1,920	%	%	100 %	%	0 %
+ -	8	New Post Sign	EA	4	\$270.00	1,080	%	%	100 %	%	0 %
+ -	9	New Concrete Curb	LF	8	\$25.00	200	20 %	%	%	80 %	0 %
+ -	10	New Roadway Pavement	SF	65	\$8.00	520	20 %	%	%	80 %	0 %
+ -	11	New Curb Ramp	EA	2	\$3500.00	7,000	20 %	%	%	80 %	0 %
+ -	12	Remove Concrete Sidewalk	SF	65	\$2.00	130	20 %	%	%	80 %	0 %
+ -	13	Remove Concrete Curb and Gutter	LF	25	\$5.00	125	20 %	%	%	80 %	0 %
		Weighted Average (%)					21%	49%	28%	2%	
		Total (\$)				\$288,121					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

20 %

\$57,624

(e.g. enter 10 for 10%)

Total Construction Cost (Con Items & Contingencies):

\$345,800

(Rounded up to the nearest hundreds)

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$34,600	100 %	\$34,600	\$0
PS&E	\$51,900	100 %	\$51,900	\$0
Subtotal - PE	\$86,500	100 %	\$86,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$34,600	100 %	\$34,600	\$0
Construction Items	\$345,800 (Read only - from Section I)	100 %	\$345,800	\$0
Subtotal - Construction	\$380,400	100 %	\$380,400	\$0
PROJECT TOTAL	\$466,900	100 %	\$466,900	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	S (Signalized Intersections)
<div><div>+</div><div>-</div></div>		1	Wolfe Road/Kifer Road	

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	2	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	3	S20PB: Install advance stop bar before crosswalk (Bicycle Box)	S	0.15	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Wolfe Road/Kifer Road	0	1	3	6	12	22
	Total	0	1	3	6	12	22

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Wolfe Road/Kifer Road	0	1	1	2	0	4
	Total	0	1	1	2	0	4

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S21PB S02 S20PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,1,3,6,12 Ped & Bike: 0,1,1,2,0	\$1,700,145	\$798,571	\$425,037	\$2,923,753
Sum	\$1,700,145	\$798,571	\$425,037	\$2,923,753

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
- S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
- S20PB: Install advance stop bar before crosswalk (Bicycle Box)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$466,900</div>	<div>\$466,900</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$2,923,753</div>	<div>6.26</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location G

Project Location:
(limited to 250 characters)

Hollenbeck Avenue/Danforth Drive, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Modify traffic signal to improve visibility of signal heads, add LPI, and enhance multimodal detection.
Delineate bicycle facilities at intersection, add advance limit lines, and provide curb extensions to reduce crossing distance and turning speed

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

2

CM No. 1: S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

CM No. 2: S20PB: Install advance stop bar before crosswalk (Bicycle Box)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%
2. S20PB: Install advance stop bar before crosswalk (Bicycle Box); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S02)	% for CM#1 (S20PB)	(Not Used)	% for OS*	% for NS**
+	1	Modify Traffic Signal	EA	1	100,000	100,000	80 %	20 %	%	%	0 %
-	2	New Striping	LF	976	\$1.00	976	%	100 %	%	%	0 %
+	3	New Pavement Marking	SF	155	\$4.00	620	%	100 %	%	%	0 %
-	4	New Green Bike Lane	SF	915	\$7.00	6,405	%	100 %	%	%	0 %
+	5	Remove Existing Striping	LF	671	\$3.00	2,013	%	100 %	%	%	0 %
-	6	New Concrete Curb and Gutter	LF	268	\$40.00	10,720	%	%	%	100 %	0 %
+	7	New Concrete Sidewalk	SF	842	\$10.00	8,420	%	%	%	100 %	0 %
-	8	New Curb Ramp	EA	8	\$3500.00	28,000	%	%	%	100 %	0 %
+	9	Remove AC Pavement	SF	602	\$2.00	1,204	%	%	%	100 %	0 %
-	10	Remove Concrete Curb and Gutter	LF	224	\$5.00	1,120	%	%	%	100 %	0 %
+	11	Remove Concrete Curb Ramp	SF	240	\$2.00	480	%	%	%	100 %	0 %
-											
		Weighted Average (%)					50%	19%		31%	
		Total (\$)				\$159,958					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$31,992

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$192,000

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$19,200	100 %	\$19,200	\$0
PS&E	\$28,800	100 %	\$28,800	\$0
Subtotal - PE	\$48,000	100 %	\$48,000	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$19,200	100 %	\$19,200	\$0
Construction Items	\$192,000 (Read only - from Section I)	100 %	\$192,000	\$0
Subtotal - Construction	\$211,200	100 %	\$211,200	\$0
PROJECT TOTAL	\$259,200	100 %	\$259,200	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Hollenbeck Avenue/Danforth Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	2	S20PB: Install advance stop bar before crosswalk (Bicycle Box)	S	0.15	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Hollenbeck Avenue/ Danforth Avenue	0	1	1	4	4	10
	Total	0	1	1	4	4	10

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Hollenbeck Avenue/ Danforth Avenue	0	1	1	0	0	2
	Total	0	1	1	0	0	2

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (S02 S20PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,1,1,4,4 Ped & Bike: 0,1,1,0,0	\$632,731	\$441,737	\$0	\$1,074,468
Sum	\$632,731	\$441,737	\$0	\$1,074,468

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 2
S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
S20PB: Install advance stop bar before crosswalk (Bicycle Box)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$259,200</div>	<div>\$259,200</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$1,074,468</div>	<div>4.15</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location H

Project Location:
(limited to 250 characters)

Wolfe Road/WB Central Expressway Ramps, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Modification to traffic signals to improve signal head visibility and placement. Install enhanced bicycle and crosswalk markings to improve visibility of active moves at intersection.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	S20PB: Install advance stop bar before crosswalk (Bicycle Box)
CM No. 2:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 3:	S03: Improve signal timing (coordination, phases, red, yellow, or operation)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S20PB: Install advance stop bar before crosswalk (Bicycle Box); HSIP Funding Eligibility: 100%
2. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%
3. S03: Improve signal timing (coordination, phases, red, yellow, or operation); HSIP Funding Eligibility: 50%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S20PB)	% for CM#1 (S02)	% for CM#1 (S03)	% for OS*	% for NS**
+	1	Modify Traffic Signal	EA	1	\$75000.00	75,000	15 %	65 %	20 %	%	0 %
-	2	New Striping	LF	1,446	\$1.00	1,446	60 %	%	%	40 %	0 %
+	3	New Pavement Marking	SF	69	\$4.00	276	50 %	%	%	50 %	0 %
-	4	New Paint Pavement Marking	SF	1,070	\$3.00	3,210	50 %	%	%	50 %	0 %
+	5	New Green Bike Lane	SF	1,169	\$7.00	8,183	%	%	%	100 %	0 %
-	6	Remove Existing Striping	LF	101	\$3.00	303	60 %	%	%	40 %	0 %
		Weighted Average (%)					16%	55%	17%	12%	
		Total (\$)				\$88,418					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$17,684

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$106,200

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 50.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

50 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$10,700	50 %	\$5,350	\$5,350
PS&E	\$16,000	50 %	\$8,000	\$8,000
Subtotal - PE	\$26,700	50 %	\$13,350	\$13,350
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	50 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	50 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$10,700	50 %	\$5,350	\$5,350
Construction Items	\$106,200 (Read only - from Section I)	50 %	\$53,100	\$53,100
Subtotal - Construction	\$116,900	50 %	\$58,450	\$58,450
PROJECT TOTAL	\$143,600	50 %	\$71,800	\$71,800

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Wolfe Road/WB Central Expressway

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S20PB: Install advance stop bar before crosswalk (Bicycle Box)	S	0.15	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	2	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	3	S03: Improve signal timing (coordination, phases, red, yellow, or operation)	S	0.15	10	All	50%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Wolfe Road/WB Central Expressway	0	0	1	2	10	13
	Total	0	0	1	2	10	13

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Wolfe Road/WB Central Expressway	0	0	0	0	0	0
	Total	0	0	0	0	0	0

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S20PB S02 S03) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,1,2,10 Ped & Bike: 0,0,0,0,0	\$0	\$121,296	\$121,296	\$242,592
Sum	\$0	\$121,296	\$121,296	\$242,592

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S20PB: Install advance stop bar before crosswalk (Bicycle Box)
 - S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
 - S03: Improve signal timing (coordination, phases, red, yellow, or operation)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$143,600	\$71,800	50%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$242,592	1.70	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location I

Project Location:
(limited to 250 characters)

Mary Avenue/Olive Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Install new traffic signal . Provide green bicycle markings, bicycle boxes, new marked crosswalks and directional curb ramps.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

NS03: Install signals

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

SSARP

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

Spot location(s)

If it is systemic, the primary type of the "systemic" improvements is:

Other

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Motorized users

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. NS03: Install signals; HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS03)	(Not Used)	(Not Used)	% for OS*	% for NS**
+ -	1	Install Traffic Signal	EA	1	500,000	500,000	100 %	%	%	%	0 %
+ -	2	New Striping	LF	1,641	\$1.00	1,641	%	%	%	%	100 %
+ -	3	New Green Bike Lane	SF	1,503	\$7.00	10,521	%	%	%	%	100 %
+ -	4	New Pavement Marking	SF	100	\$4.00	400	%	%	%	%	100 %
+ -	5	Remove Existing Striping	LF	776	\$3.50	2,716	%	%	%	%	100 %
+ -	6	Remove Existing Pavement Marking	SF	144	\$10.00	1,440	%	%	%	%	100 %
+ -	7	New Curb ramps	EA	8	\$3500.00	28,000	%	%	%	%	100 %
		Weighted Average (%)					92%				8%
		Total (\$)				\$544,718					

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:
(e.g. enter 10 for 10%)

20 %

\$108,944

Total Construction Cost (Con Items & Contingencies):
(Rounded up to the nearest hundreds)

\$653,700

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$65,400	100 %	\$65,400	\$0
PS&E	\$98,100	100 %	\$98,100	\$0
Subtotal - PE	\$163,500	100 %	\$163,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$65,400	100 %	\$65,400	\$0
Construction Items	\$653,700 (Read only - from Section I)	100 %	\$653,700	\$0
Subtotal - Construction	\$719,100	100 %	\$719,100	\$0
PROJECT TOTAL	\$882,600	100 %	\$882,600	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.


- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	NS (Non-signalized Intersections)
<div><div>+</div><div>-</div></div>		1	Mary/Olive	

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	NS03: Install signals	NS	0.3	20	All	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Mary/Olive	0	1	3	7	15	26
	Total	0	1	3	7	15	26

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS03) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,1,3,7,15	\$4,467,240	\$0	\$0	\$4,467,240
Sum	\$4,467,240	\$0	\$0	\$4,467,240

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1
NS03: Install signals

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$882,600</div>	<div>\$882,600</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$4,467,240</div>	<div>5.06</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location J (1 of 2)

Project Location:
(limited to 250 characters)

Fremont Avenue Btw Wolfe & ECR (Fremont & Eleanor), Sunnyvale, CA

Project Description:
(limited to 250 characters)

Enhanced pedestrian crossings, filling of sidewalk gap, additional delineation of traveled way, parking restrictions. Nonsignalized improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

2

CM No. 1: NS07: Upgrade intersection pavement markings (NS.I.)

CM No. 2: NS11: Improve sight distance to intersection (Clear Sight Triangles)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. NS07: Upgrade intersection pavement markings (NS.I.); HSIP Funding Eligibility: 100%
2. NS11: Improve sight distance to intersection (Clear Sight Triangles); HSIP Funding Eligibility: 90%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS07)	% for CM#1 (NS11)	(Not Used)	% for OS*	% for NS**
+ -	1	New Striping	LF	3,408	\$1.00	3,408	60 %	40 %	%	%	0 %
+ -	2	New Pavement Marking	SF	1,100	\$4.00	4,400	80 %	20 %	%	%	0 %
+ -	3	Remove Existing Striping	LF	500	\$3.00	1,500	60 %	40 %	%	%	0 %
+ -	4	Remove Existing Pavement Marking	SF	125	\$10.00	1,250	60 %	40 %	%	%	0 %
		Weighted Average (%) Total (\$)				\$10,558	68%	32%			

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$2,112

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$12,700

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$1,300	90 %	\$1,170	\$130
PS&E	\$1,900	90 %	\$1,710	\$190
Subtotal - PE	\$3,200	90 %	\$2,880	\$320
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$1,300	90 %	\$1,170	\$130
Construction Items	\$12,700 (Read only - from Section I)	90 %	\$11,430	\$1,270
Subtotal - Construction	\$14,000	90 %	\$12,600	\$1,400
PROJECT TOTAL	\$17,200	90 %	\$15,480	\$1,720

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: NS (Non-signalized Intersections)
		1	Fremont Avenue/ECR

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS07: Upgrade intersection pavement markings (NS.I.)	NS	0.25	10	All	100%
<input checked="" type="checkbox"/>	2	NS11: Improve sight distance to intersection (Clear Sight Triangles)	NS	0.2	10	All	90%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Fremont Avenue/ECR	0	0	1	1	8	10
	Total	0	0	1	1	8	10

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (NS07 NS11) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,1,1,8	\$146,489	\$117,192	\$0	\$263,681
Sum	\$146,489	\$117,192	\$0	\$263,681

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 2

NS07: Upgrade intersection pavement markings (NS.I.)

NS11: Improve sight distance to intersection (Clear Sight Triangles)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$17,200	\$15,480	90%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$263,681	15.33	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location J (2 of 2)

Project Location:
(limited to 250 characters)

Fremont Avenue Btw Wolfe & ECR (Fremont & Eleanor), Sunnyvale, CA

Project Description:
(limited to 250 characters)

Enhanced pedestrian crossings, filling of sidewalk gap, additional delineation of traveled way, parking restrictions. Roadway improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

R (Roadways)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

R34PB: Install sidewalk/pathway (to avoid walking along roadway)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. R34PB: Install sidewalk/pathway (to avoid walking along roadway); HSIP Funding Eligibility: 90%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (R34PB)	(Not Used)	(Not Used)	% for OS*	% for NS**
<div><div>+</div><div>-</div></div>	1	New Concrete Sidewalk	SF	3,914	\$10.00	39,140	100 %	0 %	0 %	0 %	0 %
<div><div>+</div><div>-</div></div>	2	New Concrete Curb and Gutter	LF	477	\$40.00	19,080	100 %	%	%	%	0 %
		Weighted Average (%)					100%				
		Total (\$)				\$58,220					

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:
(e.g. enter 10 for 10%)

20 %

\$11,644

Total Construction Cost (Con Items & Contingencies):
(Rounded up to the nearest hundreds)

\$69,900

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$7,000	90 %	\$6,300	\$700
PS&E	\$10,500	90 %	\$9,450	\$1,050
Subtotal - PE	\$17,500	90 %	\$15,750	\$1,750
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$7,000	90 %	\$6,300	\$700
Construction Items	\$69,900 (Read only - from Section I)	90 %	\$62,910	\$6,990
Subtotal - Construction	\$76,900	90 %	\$69,210	\$7,690
PROJECT TOTAL	\$94,400	90 %	\$84,960	\$9,440

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike", "Emergency Vehicle", and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.


- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: R (Roadways)
		1	Fremont Avenue Btw Wolfe Road and ECR

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	R3+PB: Install sidewalk/pathway (to avoid walking along roadway)	R	0.8	20	Ped & Bike	90%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) Ped & Bike

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Fremont Avenue Btw Wolfe Road and ECR	0	0	1	0	2	3
	Total	0	0	1	0	2	3

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: R (Roadways) Number of location(s): 1 Number of selected countermeasure(s): 1 (R34PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: Ped & Bike: 0,0,1,0,2	\$540,480	\$0	\$0	\$540,480
Sum	\$540,480	\$0	\$0	\$540,480

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1

R34PB: Install sidewalk/pathway (to avoid walking along roadway)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$94,400	\$84,960	90%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$540,480	5.73	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location K

Project Location:
(limited to 250 characters)

Fair Oaks Avenue/Taylor Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Improve intersection distance by restricting parking and trimming vegetation. Adjust striping on Fair Oaks Avenue to provide left-turn lanes in both directions.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

2

CM No. 1: NS11: Improve sight distance to intersection (Clear Sight Triangles)

CM No. 2: NS18: Install left-turn lane (where no left-turn lane exists)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. NS11: Improve sight distance to intersection (Clear Sight Triangles); HSIP Funding Eligibility: 90%

2. NS18: Install left-turn lane (where no left-turn lane exists); HSIP Funding Eligibility: 90%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS11)		% for CM#1 (NS18)		(Not Used)	% for OS*		% for NS**	
<div>+ -</div>	1	New Striping	LF	3,000	\$1.00	3,000	35	%	30	%	%	35	%	0	%
<div>+ -</div>	2	New Pavement Marking	SF	200	\$4.00	800	50	%	50	%	%	0	%	0	%
<div>+ -</div>	3	New Paint Curb	LF	400	\$2.50	1,000	30	%	70	%	%	0	%	0	%
<div>+ -</div>	4	Remove Existing Striping	LF	1,000	\$3.50	3,500	35	%	30	%	%	35	%	0	%
<div>+ -</div>	5	Install New Signs	EA	4	\$1000.00	4,000	30	%	30	%	%	40	%	0	%
		Weighted Average (%)					34%		35%			32%			
		Total (\$)				\$12,300									

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:
(e.g. enter 10 for 10%)

20 %

\$2,460

Total Construction Cost (Con Items & Contingencies):
(Rounded up to the nearest hundreds)

\$14,800

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$1,500	90 %	\$1,350	\$150
PS&E	\$2,300	90 %	\$2,070	\$230
Subtotal - PE	\$3,800	90 %	\$3,420	\$380
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$1,500	90 %	\$1,350	\$150
Construction Items	\$14,800 (Read only - from Section I)	90 %	\$13,320	\$1,480
Subtotal - Construction	\$16,300	90 %	\$14,670	\$1,630
PROJECT TOTAL	\$20,100	90 %	\$18,090	\$2,010

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: NS (Non-signalized Intersections)
		1	Fair Oaks Avenue/Taylor Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS11: Improve sight distance to intersection (Clear Sight Triangles)	NS	0.2	10	All	90%
<input checked="" type="checkbox"/>	2	NS18: Install left-turn lane (where no left-turn lane exists)	NS	0.35	20	All	90%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Fair Oaks Avenue/Taylor Avenue	0	1	1	0	13	15
	Total	0	1	1	0	13	15

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (NS11 NS18) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,1,1,0,13	\$993,234	\$3,729,799	\$0	\$4,723,033
Sum	\$993,234	\$3,729,799	\$0	\$4,723,033

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 2
- NS11: Improve sight distance to intersection (Clear Sight Triangles)
 - NS18: Install left-turn lane (where no left-turn lane exists)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$20,100</div>	<div>\$18,090</div>	<div>90%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$4,723,033</div>	<div>234.98</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location L

Project Location:
(limited to 250 characters)

Bernardo Avenue/Ayala Drive, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Install all-way stop protected intersection with high-visibility crosswalks, advance limit lines, and in-intersection pavement markings for bicycles.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

NS07: Upgrade intersection pavement markings (NS.I.)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. NS07: Upgrade intersection pavement markings (NS.I.); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS07)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	3,000	\$1.00	3,000	100 %	%	%	%	0 %
-											
+	2	New Pavement Marking	SF	500	\$4.00	2,000	100 %	%	%	%	0 %
-											
+	3	New Green Bike Lane	SF	3,500	\$7.00	24,500	100 %	%	%	%	0 %
-											
+	4	New Pavement Marking	SF	1,500	\$3.00	4,500	100 %	%	%	%	0 %
-											
+	5	Remove Existing Striping	LF	550	\$3.50	1,925	100 %	%	%	%	0 %
-											
+	6	Remove Existing Pavement Marking	SF	110	\$10.00	1,100	100 %	%	%	%	0 %
-											
+	7	New Signs	EA	4	\$1000.00	4,000	100 %	%	%	%	0 %
-											
		Weighted Average (%)					100%				
		Total (\$)				\$41,025					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$8,205

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$49,300

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$5,000	100 %	\$5,000	\$0
PS&E	\$7,400	100 %	\$7,400	\$0
Subtotal - PE	\$12,400	100 %	\$12,400	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$5,000	100 %	\$5,000	\$0
Construction Items	\$49,300 (Read only - from Section I)	100 %	\$49,300	\$0
Subtotal - Construction	\$54,300	100 %	\$54,300	\$0
PROJECT TOTAL	\$66,700	100 %	\$66,700	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	NS (Non-signalized Intersections)
<div><div>+</div><div>-</div></div>	1	Bernardo Avenue/Ayala Drive		

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS07: Upgrade intersection pavement markings (NS.I.)	NS	0.25	10	All	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Bernardo Avenue/Ayala Drive	0	2	2	2	11	17
	Total	0	2	2	2	11	17

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS07) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,2,2,2,11	\$2,826,350	\$0	\$0	\$2,826,350
Sum	\$2,826,350	\$0	\$0	\$2,826,350

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1

NS07: Upgrade intersection pavement markings (NS.I.)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$66,700	\$66,700	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$2,826,350	42.37	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location M

Project Location:
(limited to 250 characters)

Evelyn Avenue/Murphy Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Extend median to provide pedestrian refuge, update crossing control to RRFB, install advance yield markings, trim vegetation and improve intersection lighting for nighttime visibility.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

3

CM No. 1:	NS07: Upgrade intersection pavement markings (NS.I.)
CM No. 2:	NS19PB: Install raised medians / refuge islands (NS.I.)
CM No. 3:	NS22PB: Install Rectangular Rapid Flashing Beacon (RRFB)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. NS07: Upgrade intersection pavement markings (NS.I.); HSIP Funding Eligibility: 100%

2. NS19PB: Install raised medians / refuge islands (NS.I.); HSIP Funding Eligibility: 90%

3. NS22PB: Install Rectangular Rapid Flashing Beacon (RRFB); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS07)	% for CM#1 (NS19PB)	% for CM#1 (NS22PB)	% for OS*	% for NS**
+ -	1	New Green Bike Lane	SF	400	\$7.00	2,800	100 %	%	%	%	0 %
+ -	2	New Striping	LF	100	\$1.00	100	100 %	%	%	%	0 %
+ -	3	New Pavement marking	SF	100	\$4.00	400	100 %	%	%	%	0 %
+ -	4	New Concrete Sidewalk	SF	210	\$10.00	2,100	0 %	100 %	0 %	0 %	0 %
+ -	5	New Concrete Curb	LF	85	\$30.00	2,550	%	100 %	0 %	%	0 %
+ -	6	Remove AC Pavement	SF	185	\$2.00	370	%	100 %	0 %	%	0 %
+ -	7	Install New Tactile Dome Panel	EA	2	\$1000.00	2,000	%	100 %	0 %	%	0 %
+ -	8	Install New RRFB Treatment	EA	1	\$35000.00	35,000	0 %	0 %	100 %	0 %	0 %
+ -	9	Install New R10-15 Signs	EA	2	\$1000.00	2,000	100 %	%	%	%	0 %
+ -	10	Enhance Intersection Lighting	LS	1	\$50000.00	50,000	15 %	15 %	15 %	55 %	0 %
		Weighted Average (%)					13%	15%	44%	28%	
		Total (\$)				\$97,320					

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

20 %

\$19,464

(e.g. enter 10 for 10%)

Total Construction Cost (Con Items & Contingencies):

\$116,800

(Rounded up to the nearest hundreds)

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$11,700	90 %	\$10,530	\$1,170
PS&E	\$17,600	90 %	\$15,840	\$1,760
Subtotal - PE	\$29,300	90 %	\$26,370	\$2,930
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$11,700	90 %	\$10,530	\$1,170
Construction Items	\$116,800 (Read only - from Section I)	90 %	\$105,120	\$11,680
Subtotal - Construction	\$128,500	90 %	\$115,650	\$12,850
PROJECT TOTAL	\$157,800	90 %	\$142,020	\$15,780

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: NS (Non-signalized Intersections)
		1	Evelyn Avenue/Murphy Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS07: Upgrade intersection pavement markings (NS.I.)	NS	0.25	10	All	100%
<input checked="" type="checkbox"/>	2	NS19PB: Install raised medians / refuge islands (NS.I.)	NS	0.45	20	Ped & Bike	90%
<input checked="" type="checkbox"/>	3	NS22PB: Install Rectangular Rapid Flashing Beacon (RRFB)	NS	0.35	20	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Evelyn Avenue/Murphy Avenue	0	0	3	2	9	14
	Total	0	0	3	2	9	14

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Evelyn Avenue/Murphy Avenue	0	0	2	2	0	4
	Total	0	0	2	2	0	4

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (NS07 NS19PB NS22PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,3,2,9 Ped & Bike: 0,0,2,2,0	\$354,200	\$564,662	\$439,181	\$1,358,043
Sum	\$354,200	\$564,662	\$439,181	\$1,358,043

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- NS07: Upgrade intersection pavement markings (NS.I.)
 - NS19PB: Install raised medians / refuge islands (NS.I.)
 - NS22PB: Install Rectangular Rapid Flashing Beacon (RRFB)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$157,800</div>	<div>\$142,020</div>	<div>90%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$1,358,043</div>	<div>8.61</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location N

Project Location:
(limited to 250 characters)

Evelyn Avenue/Pastoria Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Provide buffered bike lane to enhance delineation and spacing, add green conflict zone markings, install curb extensions to reduce pedestrian exposure and turning speeds.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

NS07: Upgrade intersection pavement markings (NS.I.)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. NS07: Upgrade intersection pavement markings (NS.I.); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS07)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	700	\$1.00	700	100 %	%	%	%	0 %
-											
+	2	New Pavement Marking	SF	50	\$4.00	200	100 %	%	%	%	0 %
-											
+	3	New Green Bike Lane	SF	500	\$7.00	3,500	100 %	%	%	%	0 %
-											
+	4	Remove Existing Striping	LF	150	\$3.50	525	100 %	%	%	%	0 %
-											
+	5	Remove Existing Pavement Marking	SF	20	\$10.00	200	100 %	%	%	%	0 %
-											
+	6	New Concrete Sidewalk	SF	700	\$10.00	7,000	%	%	%	100 %	0 %
-											
+	7	New Concrete Curb and Gutter	LF	150	\$40.00	6,000	%	%	%	100 %	0 %
-											
+	8	New Curb Ramps	EA	2	\$3500.00	7,000	%	%	%	100 %	0 %
-											
+	9	Remove AC Pavement	SF	650	\$2.00	1,300	%	%	%	100 %	0 %
-											
+	10	Remove Concrete Curb Ramps	SF	60	\$2.00	120	%	%	%	100 %	0 %
-											
+	11	Remove Concrete Curb and Gutter	LF	110	\$5.00	550	%	%	%	100 %	0 %
-											
+	12	New Signs	EA	3	\$1000.00	3,000	%	%	%	100 %	0 %
-											
		Weighted Average (%)					17%			83%	
		Total (\$)				\$30,095					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$6,019

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$36,200

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$3,700	100 %	\$3,700	\$0
PS&E	\$5,500	100 %	\$5,500	\$0
Subtotal - PE	\$9,200	100 %	\$9,200	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$3,700	100 %	\$3,700	\$0
Construction Items	\$36,200 (Read only - from Section I)	100 %	\$36,200	\$0
Subtotal - Construction	\$39,900	100 %	\$39,900	\$0
PROJECT TOTAL	\$49,100	100 %	\$49,100	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

1. The HSIP amount for PE exceeds 25% of the HSIP amount for Construction Items.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.


- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: NS (Non-signalized Intersections)
		1	Evelyn Avenue/Pastoria Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	NS07: Upgrade intersection pavement markings (NS.I.)	NS	0.25	10	All	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Evelyn Avenue/Pastoria Avenue	1	1	1	1	1	5
	Total	1	1	1	1	1	5

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS07) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 1,1,1,1,1	\$2,648,250	\$0	\$0	\$2,648,250
Sum	\$2,648,250	\$0	\$0	\$2,648,250

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1

NS07: Upgrade intersection pavement markings (NS.I.)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$49,100	\$49,100	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$2,648,250	53.94	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID: **Location O (1 of 2)**

Project Location: Fremont Avenue Btw Sunnyvale Saratoga Road & Bobwhite/Manet, Sunnyvale, CA
(limited to 250 characters) (Fremont & Bobwhite/Manet)

Project Description: Intersection improvement at Bobwhite/Manet, including addition of protected left turns and LPI, striping improvements, and bicycle lane enhancements.
(limited to 250 characters)

2. Application Category (BCR or Set-asides): **Benefit Cost Ratio (BCR)**

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations: **S (Signalized Intersections)**

Number of Intersections/Miles: **1**

Number of countermeasures for the project: **3**

CM No. 1:	S07: Provide protected left turn phase (left turn lane already exists)
CM No. 2:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 3:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S07: Provide protected left turn phase (left turn lane already exists); HSIP Funding Eligibility: 100%

2. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%

3. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S07)	% for CM#1 (S02)	% for CM#1 (S21PB)	% for OS*	% for NS**
+ -	1	New Striping	LF	2,200	\$1.00	2,200	50 %	%	20 %	30 %	0 %
+ -	2	Signal Mod at Manet/Bobwhite	Ea	1	250,000	250,000	60 %	20 %	20 %	%	0 %
+ -	3	New Green Bike Lane	SF	900	\$7.00	6,300	%	%	%	100 %	0 %
+ -	4	New Pavement Marking	SF	120	\$4.00	480	80 %	%	10 %	10 %	0 %
+ -	5	Remove Existing Striping	LF	1,300	\$3.50	4,550	80 %	%	20 %	%	0 %
+ -	6	Remove Existing Pavement marking	SF	105	\$10.00	1,050	80 %	%	20 %	%	0 %
+ -	7	New Post Sign	Ea	4	\$270.00	1,080	%	%	%	100 %	0 %
+ -	8	New Concrete Sidewalk	SF	100	\$10.00	1,000	%	%	30 %	70 %	0 %
+ -	9	New Concrete Curb and Gutter	LF	100	\$40.00	4,000	%	%	30 %	70 %	0 %
+ -	10	New Curb Ramps	Ea	4	\$3500.00	14,000	%	10 %	20 %	70 %	0 %
+ -	11	New Roadway Paving	SF	250	\$8.00	2,000	%	10 %	20 %	70 %	0 %
+ -	12	Remove Existing Curb Ramp/ Sidewalk	SF	350	\$2.00	700	%	10 %	20 %	70 %	0 %
+ -	13	Remove Concrete Curb and Gutter	LF	100	\$5.00	500	%	10 %	20 %	70 %	0 %
+ -	14	Remove AC Pavement	SF	60	\$2.00	120	%	10 %	20 %	70 %	0 %
		Weighted Average (%)					54%	18%	20%	8%	
		Total (\$)				\$287,980					

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

20 %

\$57,596

Total Construction Cost (Con Items & Contingencies):

\$345,600

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$34,600	100 %	\$34,600	\$0
PS&E	\$51,900	100 %	\$51,900	\$0
Subtotal - PE	\$86,500	100 %	\$86,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$34,600	100 %	\$34,600	\$0
Construction Items	\$345,600 (Read only - from Section I)	100 %	\$345,600	\$0
Subtotal - Construction	\$380,200	100 %	\$380,200	\$0
PROJECT TOTAL	\$466,700	100 %	\$466,700	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Fremont at Manet

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S07: Provide protected left turn phase (left turn lane already exists)	S	0.3	20	All	100%
<input checked="" type="checkbox"/>	2	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	3	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Fremont at Manet	1	1	6	3	6	17
	Total	1	1	6	3	6	17

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Fremont at Manet	1	1	3	0	0	5
	Total	1	1	3	0	0	5

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S07 S02 S21PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 1,1,6,3,6 Ped & Bike: 1,1,3,0,0	\$4,966,183	\$1,176,202	\$2,575,327	\$8,717,712
Sum	\$4,966,183	\$1,176,202	\$2,575,327	\$8,717,712

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S07: Provide protected left turn phase (left turn lane already exists)
 - S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
 - S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$466,700	\$466,700	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$8,717,712	18.68	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID: **Location O (2 of 2)**

Project Location: Fremont Avenue Btw Sunnyvale Saratoga Road & Bobwhite/Manet, Sunnyvale, CA
(limited to 250 characters) (Fremont & Sunnyvale Saratoga)

Project Description: Intersection improvement at Bobwhite/Manet, including addition of additional signal heads, LPI, and
(limited to 250 characters) striping improvements for quick-build protected intersection..

2. Application Category (BCR or Set-asides): **Benefit Cost Ratio (BCR)**

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations: **S (Signalized Intersections)**

Number of Intersections/Miles: **1**

Number of countermeasures for the project: **2**

CM No. 1: S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

CM No. 2: S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%
2. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S02)	% for CM#1 (S21PB)	(Not Used)	% for OS*	% for NS**
+ -	1	New Striping	LF	3,251	\$0.75	2,438	%	50 %	%	50 %	0 %
+ -	2	Signal Mod at Sunnyvale Saratoga	EA	1	100,000	100,000	50 %	50 %	%	%	0 %
+ -	3	New Green Bike Lane	SF	2,956	\$7.00	20,692	%	%	%	100 %	0 %
+ -	4	New Pavement Marking	SF	212	\$4.00	848	%	20 %	%	80 %	0 %
+ -	5	New Paint Pavement Marking	SF	520	\$3.00	1,560	%	50 %	%	50 %	0 %
+ -	6	Remove Existing Striping	LF	769	\$3.50	2,692	%	50 %	%	50 %	0 %
+ -	7	Remove Existing Pavement Marking	SF	100	\$10.00	1,000	%	50 %	%	50 %	0 %
+ -	8	New Concrete Sidewalk	SF	60	\$10.00	600	%	30 %	%	70 %	0 %
+ -	9	New Concrete Curb and Gutter	LF	49	\$40.00	1,960	%	30 %	%	70 %	0 %
+ -	10	New Curb Ramps	Ea	2	\$3500.00	7,000	10 %	20 %	%	70 %	0 %
+ -	11	New Roadway Paving	SF	247	\$8.00	1,976	10 %	20 %	%	70 %	0 %
+ -	12	Remove Existing Curb Ramp/ Sidewalk	SF	207	\$2.00	414	10 %	20 %	%	70 %	0 %
+ -	13	Remove Concrete Curb and Gutter	LF	42	\$5.00	210	10 %	20 %	%	70 %	0 %
+ -	14	Remove AC Pavement	SF	40	\$2.00	80	10 %	20 %	%	70 %	0 %
		Weighted Average (%)					36%	40%		24%	
		Total (\$)				\$141,470					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$28,294

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$169,800

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$17,000	100 %	\$17,000	\$0
PS&E	\$25,500	100 %	\$25,500	\$0
Subtotal - PE	\$42,500	100 %	\$42,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$17,000	100 %	\$17,000	\$0
Construction Items	\$169,800 (Read only - from Section I)	100 %	\$169,800	\$0
Subtotal - Construction	\$186,800	100 %	\$186,800	\$0
PROJECT TOTAL	\$229,300	100 %	\$229,300	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Fremont at Sunnyvale Saratoga

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	2	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Fremont at Sunnyvale Saratoga	0	0	7	9	38	54
	Total	0	0	7	9	38	54

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Fremont at Sunnyvale Saratoga	0	0	5	1	2	8
	Total	0	0	5	1	2	8

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (S02 S21PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,7,9,38 Ped & Bike: 0,0,5,1,2	\$668,880	\$835,380	\$0	\$1,504,260
Sum	\$668,880	\$835,380	\$0	\$1,504,260

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 2
S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$229,300</div>	<div>\$229,300</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$1,504,260</div>	<div>6.56</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location P (1 of 2)

Project Location:
(limited to 250 characters)

Arques Avenue btw Wolfe and Lawrence, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Install a raised median with restricted turn openings/access control along corridor. Modify traffic signals to improve visibility of heads and pedestrian accommodations. Signalized Improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

2

Number of countermeasures for the project:

2

CM No. 1: S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

CM No. 2: S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%
2. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S02)	% for CM#1 (S21PB)	(Not Used)	% for OS*	% for NS**
+ -	1	Modify Traffic signal	Ea	2	100,000	200,000	50 %	50 %	%	%	0 %
+ -	2	New Striping	LF	2,000	\$1.00	2,000	%	30 %	%	70 %	0 %
+ -	3	New Green Bike Lane	SF	6,000	\$7.00	42,000	%	%	%	100 %	0 %
+ -	4	New Pavement Marking	SF	300	\$4.00	1,200	%	10 %	%	90 %	0 %
+ -	5	Remove Existing Striping	LF	800	\$3.50	2,800	%	30 %	%	70 %	0 %
+ -	6	Remove Existing Marking	SF	30	\$10.00	300	%	%	%	100 %	0 %
		Weighted Average (%)					40%	41%		19%	
		Total (\$)				\$248,300					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:
(e.g. enter 10 for 10%)

20 %

\$49,660

Total Construction Cost (Con Items & Contingencies):
(Rounded up to the nearest hundreds)

\$298,000

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$29,800	100 %	\$29,800	\$0
PS&E	\$44,700	100 %	\$44,700	\$0
Subtotal - PE	\$74,500	100 %	\$74,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$29,800	100 %	\$29,800	\$0
Construction Items	\$298,000 (Read only - from Section I)	100 %	\$298,000	\$0
Subtotal - Construction	\$327,800	100 %	\$327,800	\$0
PROJECT TOTAL	\$402,300	100 %	\$402,300	\$0

☐ Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	S (Signalized Intersections)
<div><div>+</div><div>-</div></div>	1	Signalized Intersections		

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	2	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Signalized Intersections	0	0	5	2	16	23
	Total	0	0	5	2	16	23

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Signalized Intersections	0	0	4	1	0	5
	Total	0	0	4	1	0	5

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (S02 S21PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,5,2,16 Ped & Bike: 0,0,4,1,0	\$325,831	\$663,102	\$0	\$988,933
Sum	\$325,831	\$663,102	\$0	\$988,933

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 2

S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$402,300	\$402,300	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$988,933	2.46	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location P (2 of 2)

Project Location:
(limited to 250 characters)

Arques Avenue btw Wolfe and Lawrence, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Install a raised median with restricted turn openings/access control along corridor. Modify traffic signals to improve visibility of heads and pedestrian accommodations. Roadway improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

R (Roadways)

Number of Intersections/Miles:

0.9

Number of countermeasures for the project:

1

CM No. 1:

R08: Install raised median

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. R08: Install raised median; HSIP Funding Eligibility: 90%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (R08)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	2,000	\$1.00	2,000	70 %	%	%	30 %	0 %
-											
+	2	New Green Bike Lane	SF	2,000	\$7.00	14,000	%	%	%	100 %	0 %
-											
+	3	New Pavement Marking	SF	400	\$4.00	1,600	50 %	%	%	50 %	0 %
-											
+	4	Remove Existing Striping	LF	2,200	\$3.50	7,700	70 %	%	%	30 %	0 %
-											
+	5	Remove Existing Marking	SF	70	\$10.00	700	50 %	%	%	50 %	0 %
-											
+	6	New Concrete Median	SF	10,000	\$10.00	100,000	100 %	%	%	%	0 %
-											
+	7	New Concrete Curb	LF	6,000	\$25.00	150,000	100 %	%	%	%	0 %
-											
+	8	Remove AC Pavement	SF	9,500	\$2.00	19,000	100 %	%	%	%	0 %
-											
		Weighted Average (%)					94%			6%	
		Total (\$)				\$295,000					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$59,000

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$354,000

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$35,400	90 %	\$31,860	\$3,540
PS&E	\$53,100	90 %	\$47,790	\$5,310
Subtotal - PE	\$88,500	90 %	\$79,650	\$8,850
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$35,400	90 %	\$31,860	\$3,540
Construction Items	\$354,000 (Read only - from Section I)	90 %	\$318,600	\$35,400
Subtotal - Construction	\$389,400	90 %	\$350,460	\$38,940
PROJECT TOTAL	\$477,900	90 %	\$430,110	\$47,790

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.


- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	R (Roadways)
<div><div>+</div><div>-</div></div>	1	Arques Roadway Segment		

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	R08: Install raised median	R	0.25	20	All	90%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Arques Roadway Segment	0	2	2	5	3	12
	Total	0	2	2	5	3	12

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: R (Roadways) Number of location(s): 1 Number of selected countermeasure(s): 1 (R08) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,2,2,5,3	\$5,109,000	\$0	\$0	\$5,109,000
Sum	\$5,109,000	\$0	\$0	\$5,109,000

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1
R08: Install raised median

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$477,900	\$430,110	90%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$5,109,000	10.69	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location Q

Project Location:
(limited to 250 characters)

Sunnyvale-Saratoga Road Between ECR and Mathilda Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Construct new median with left-turn openings to control access, install new midblock crossing.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

R (Roadways)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

R08: Install raised median

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. R08: Install raised median; HSIP Funding Eligibility: 90%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (R08)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	470	\$1.00	470	100 %	%	%	%	0 %
-											
+	2	New Pavement Marking	SF	300	\$4.00	1,200	100 %	%	%	%	0 %
-											
+	3	Remove Existing Striping	LF	420	\$3.50	1,470	100 %	%	%	%	0 %
-											
+	4	New Concrete Median	SF	4,225	\$10.00	42,250	100 %	%	%	%	0 %
-											
+	5	New Concrete Curb	LF	1,505	\$25.00	37,625	100 %	%	%	%	0 %
-											
+	6	New Curb Ramp	EA	2	\$3500.00	7,000	25 %	%	%	75 %	0 %
-											
		Weighted Average (%)					94%			6%	
		Total (\$)				\$90,015					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$18,003

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$108,100

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$10,800	90 %	\$9,720	\$1,080
PS&E	\$16,300	90 %	\$14,670	\$1,630
Subtotal - PE	\$27,100	90 %	\$24,390	\$2,710
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$10,800	90 %	\$9,720	\$1,080
Construction Items	\$108,100 (Read only - from Section I)	90 %	\$97,290	\$10,810
Subtotal - Construction	\$118,900	90 %	\$107,010	\$11,890
PROJECT TOTAL	\$146,000	90 %	\$131,400	\$14,600

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike", "Emergency Vehicle", and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: R (Roadways)
		<div><div>+</div><div>-</div></div>	1Sunnyvale-Saratoga Road Btw ECR and Mathilda Avenue

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	R08: Install raised median	R	0.25	20	All	90%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): 07/01/2013 To (MM/DD/YYYY): 06/30/2018 Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Sunnyvale Saratoga Road Btw ECR and Mathilda Avenue	0	0	0	4	4	8
	Total	0	0	0	4	4	8

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: R (Roadways) Number of location(s): 1 Number of selected countermeasure(s): 1 (R08) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,0,4,4	\$376,800	\$0	\$0	\$376,800
Sum	\$376,800	\$0	\$0	\$376,800

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1
R08: Install raised median

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$146,000	\$131,400	90%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$376,800	2.58	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location R

Project Location:
(limited to 250 characters)

Reed Avenue between Wolfe Road and Evelyn Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Lane reduction on eastbound Reed Avenue, signal modifications to improve visibility and improve pedestrian accommodations, new curb extensions.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

3

Number of countermeasures for the project:

3

CM No. 1:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 2:	S20PB: Install advance stop bar before crosswalk (Bicycle Box)
CM No. 3:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 3

1. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%
2. S20PB: Install advance stop bar before crosswalk (Bicycle Box); HSIP Funding Eligibility: 100%
3. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S02)	% for CM#1 (S20PB)	% for CM#1 (S21PB)	% for OS*	% for NS**
+ -	1	Modify Wolfe Traffic Signal	EA	1	100,000	100,000	80 %	0 %	20 %	0 %	0 %
+ -	2	Modify Sequoia Traffic Signal	EA	1	100,000	100,000	80 %	%	20 %	%	0 %
+ -	3	Modify Evelyn Traffic Signal	EA	1	400,000	400,000	80 %	%	20 %	%	0 %
+ -	4	New Striping	LF	26,500	\$0.75	19,875	%	10 %	%	90 %	0 %
+ -	5	New Green Bike Lane	SF	4,400	\$7.00	30,800	%	10 %	%	90 %	0 %
+ -	6	New Pavement Marking	SF	900	\$4.00	3,600	%	25 %	%	75 %	0 %
+ -	7	Remove Existing Striping	LF	13,500	\$3.50	47,250	%	25 %	%	75 %	0 %
+ -	8	Remove Existing Pavemnet marking	SF	400	\$10.00	4,000	%	25 %	%	75 %	0 %
+ -	9	New Concrete Sidewalk	SF	9,000	\$10.00	90,000	%	25 %	%	75 %	0 %
+ -	10	New Concrete Curb and Gutter	LF	800	\$40.00	32,000	%	25 %	%	75 %	0 %
+ -	11	New Curb Ramp	EA	16	\$3500.00	56,000	%	25 %	%	75 %	0 %
+ -	12	New Paint Pavement Marking	SF	300	\$3.00	900	%	75 %	%	25 %	0 %
+ -	13	Remove AC Pavement	SF	6,855	\$2.00	13,710	%	25 %	%	75 %	0 %
+ -	14	Remove Concrete Curb ramp	SF	450	\$2.00	900	%	25 %	%	75 %	0 %
+ -	15	Remove Concrete Curb and Gutter	LF	400	\$5.00	2,000	%	25 %	%	75 %	0 %
		Weighted Average (%)					53%	8%	13%	26%	
		Total (\$)				\$901,035					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$180,207

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$1,081,300

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$108,200	97 %	\$104,954	\$3,246
PS&E	\$162,200	97 %	\$157,334	\$4,866
Subtotal - PE	\$270,400	97 %	\$262,288	\$8,112
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	97 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	97 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$108,200	97 %	\$104,954	\$3,246
Construction Items	\$1,081,300 (Read only - from Section I)	97 %	\$1,048,861	\$32,439
Subtotal - Construction	\$1,189,500	97 %	\$1,153,815	\$35,685
PROJECT TOTAL	\$1,459,900	97 %	\$1,416,103	\$43,797

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

Crossroads

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	S (Signalized Intersections)
		1	Signalized Intersection at Wolfe, Sequoia, Evelyn	

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	2	S20PB: Install advance stop bar before crosswalk (Bicycle Box)	S	0.15	10	Ped & Bike	100%
<input checked="" type="checkbox"/>	3	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Signalized Intersection at Wolfe, Sequoia, Evelyn	0	0	6	15	35	56
	Total	0	0	6	15	35	56

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Signalized Intersection at Wolfe, Sequoia, Evelyn	0	0	2	2	0	4
	Total	0	0	2	2	0	4

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 3 (S02 S20PB S21PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,6,15,35 Ped & Bike: 0,0,2,2,0	\$759,841	\$100,173	\$400,689	\$1,260,703
Sum	\$759,841	\$100,173	\$400,689	\$1,260,703

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 3
- S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
- S20PB: Install advance stop bar before crosswalk (Bicycle Box)
- S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Cost, FRR, Benefit and BCR:

Total Project Cost

\$1,459,900

HSIP Funds Requested

\$1,416,103

Max. FRR

100%

Total Expected Benefit

\$1,260,703

Benefit Cost Ratio (BCR)

0.86

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location S (1 of 3)

Project Location:
(limited to 250 characters)

Sandia Avenue between Lawrence Expressway and Wildwood Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Addition of median at Blazingwood Drive to restrict left turns, edgelines with reflectors on roadway segments, curb extensions and pedestrian improvements at intersections. Nonsignalized improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

2

CM No. 1: NS15: Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)

CM No. 2: NS07: Upgrade intersection pavement markings (NS.I.)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. NS15: Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.); HSIP Funding Eligibility: 90%
2. NS07: Upgrade intersection pavement markings (NS.I.); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS15)	% for CM#1 (NS07)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	1,000	\$1.00	1,000	30 %	70 %	%	%	0 %
-	2	New Pavement Marking	SF	200	\$4.00	800	%	100 %	%	%	0 %
+	3	New Concrete Curb	LF	600	\$25.00	15,000	100 %	%	%	%	0 %
-	4	New Concrete Median	SF	2,000	\$10.00	20,000	100 %	%	%	%	0 %
+	5	Remove Existing Striping	LF	200	\$4.00	800	%	100 %	%	%	0 %
-	6	Install New Regulatory Sign	EA	6	\$1000.00	6,000	20 %	20 %	%	60 %	0 %
		Weighted Average (%)					84%	8%		8%	
		Total (\$)				\$43,600					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:
(e.g. enter 10 for 10%)

20 %

\$8,720

Total Construction Cost (Con Items & Contingencies):
(Rounded up to the nearest hundreds)

\$52,400

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 90.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

90 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$5,300	90 %	\$4,770	\$530
PS&E	\$7,900	90 %	\$7,110	\$790
Subtotal - PE	\$13,200	90 %	\$11,880	\$1,320
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	90 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	90 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$5,300	90 %	\$4,770	\$530
Construction Items	\$52,400 (Read only - from Section I)	90 %	\$47,160	\$5,240
Subtotal - Construction	\$57,700	90 %	\$51,930	\$5,770
PROJECT TOTAL	\$70,900	90 %	\$63,810	\$7,090

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: NS (Non-signalized Intersections)
		1	Sandia/Blazingwood Intersection

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS15: Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)	NS	0.5	20	All	90%
<input checked="" type="checkbox"/>	2	NS07: Upgrade intersection pavement markings (NS.I.)	NS	0.25	10	All	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Sandia/Blazingwood Intersection	0	0	0	7	9	16
	Total	0	0	0	7	9	16

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (NS15 NS07) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,0,7,9	\$1,257,667	\$285,834	\$0	\$1,543,501
Sum	\$1,257,667	\$285,834	\$0	\$1,543,501

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

- Number of countermeasures: 2
- NS15: Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)
 - NS07: Upgrade intersection pavement markings (NS.I.)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$70,900</div>	<div>\$63,810</div>	<div>90%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$1,543,501</div>	<div>21.77</div>	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location S (2 of 3)

Project Location:
(limited to 250 characters)

Sandia Avenue between Lawrence Expressway and Wildwood Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Addition of median at Blazingwood Drive to restrict left turns, edgelines with reflectors on roadway segments, curb extensions and pedestrian improvements at intersections. Nonsignalized improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

NS (Non-signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

NS07: Upgrade intersection pavement markings (NS.I.)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. NS07: Upgrade intersection pavement markings (NS.I.); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS07)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	2,500	\$1.00	2,500	100 %	%	%	%	0 %
-											
+	2	New Pavement Marking	SF	200	\$4.00	800	100 %	%	%	%	0 %
-											
+	3	New Concrete Curb	LF	1,400	\$25.00	35,000	30 %	%	%	70 %	0 %
-											
+	4	New Concrete Median	SF	7,500	\$10.00	75,000	30 %	%	%	70 %	0 %
-											
+	5	New Curb Ramp	EA	16	\$3500.00	56,000	30 %	%	%	70 %	0 %
-											
+	6	Remove Existing Striping	LF	100	\$4.00	400	100 %	%	%	%	0 %
-											
+	7	Install New Regulatory Sign	EA	14	\$1000.00	14,000	70 %	%	%	30 %	0 %
-											
		Weighted Average (%)					34%			66%	
		Total (\$)				\$183,700					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$36,740

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$220,500

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$22,100	90 %	\$19,890	\$2,210
PS&E	\$33,100	90 %	\$29,790	\$3,310
Subtotal - PE	\$55,200	90 %	\$49,680	\$5,520
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$22,100	90 %	\$19,890	\$2,210
Construction Items	\$220,500 (Read only - from Section I)	90 %	\$198,450	\$22,050
Subtotal - Construction	\$242,600	90 %	\$218,340	\$24,260
PROJECT TOTAL	\$297,800	90 %	\$268,020	\$29,780

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: NS (Non-signalized Intersections)
		1	Other Sandia Intersections

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	NS07: Upgrade intersection pavement markings (NS.I.)	NS	0.25	10	All	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): 07/01/2013 To (MM/DD/YYYY): 06/30/2018 Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Other Sandia Intersections	0	0	0	0	9	9
	Total	0	0	0	0	9	9

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS07) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,0,0,9	\$59,850	\$0	\$0	\$59,850
Sum	\$59,850	\$0	\$0	\$59,850

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1

NS07: Upgrade intersection pavement markings (NS.I.)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$297,800	\$268,020	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$59,850	0.20	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location S (3 of 3)

Project Location:
(limited to 250 characters)

Sandia Avenue between Lawrence Expressway and Wildwood Avenue, Sunnyvale, CA

Project Description:
(limited to 250 characters)

Addition of median at Blazingwood Drive to restrict left turns, edgelines with reflectors on roadway segments, curb extensions and pedestrian improvements at intersections. Roadway improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

R (Roadways)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

1

CM No. 1:

R28: Install edge-lines and centerlines

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. R28: Install edge-lines and centerlines; HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (R28)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	4,500	\$1.00	4,500	100 %	%	%	%	0 %
-											
		Weighted Average (%)					100%				
		Total (\$)				\$4,500					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$900

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$5,400

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$600	100 %	\$600	\$0
PS&E	\$800	100 %	\$800	\$0
Subtotal - PE	\$1,400	100 %	\$1,400	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$600	100 %	\$600	\$0
Construction Items	\$5,400 (Read only - from Section I)	100 %	\$5,400	\$0
Subtotal - Construction	\$6,000	100 %	\$6,000	\$0
PROJECT TOTAL	\$7,400	100 %	\$7,400	\$0

☐ Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.


- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)	
			Location type for this project:	R (Roadways)
		<div><div>+</div><div>-</div></div>	1	Sandia Roadway

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	R28: Install edge-lines and centerlines	R	0.25	10	All	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: [ALL](#)

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Sandia Roadway	0	0	0	0	2	2
	Total	0	0	0	0	2	2

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: R (Roadways) Number of location(s): 1 Number of selected countermeasure(s): 1 (R28) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,0,0,2	\$13,300	\$0	\$0	\$13,300
Sum	\$13,300	\$0	\$0	\$13,300

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1
R28: Install edge-lines and centerlines

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$7,400	\$7,400	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$13,300	1.80	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" +Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location T (1 of 2)

Project Location:
(limited to 250 characters)

Hollenbeck Avenue between Bend Drive and The Dalles Avenue Sunnyvale, CA

Project Description:
(limited to 250 characters)

Addition of edgelines with reflectors on roadway segments, modifications to traffic signal to improve signal head visibility and improve pedestrian accommodations. Signalized improvements at Danforth.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

S (Signalized Intersections)

Number of Intersections/Miles:

1

Number of countermeasures for the project:

2

CM No. 1:	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
CM No. 2:	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

- The purpose of this section is to:
- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
 - o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 2

1. S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number; HSIP Funding Eligibility: 100%

2. S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI); HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. **Do not enter data for gray fields (calculated or not used).**

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (S02)	% for CM#1 (S21PB)	(Not Used)	% for OS*	% for NS**
+ -	1	Modify Traffic Signal	EA	1	\$75000.00	75,000	50 %	50 %	%	%	0 %
+ -	2	Remove Existing Striping	LF	400	\$4.00	1,600	%	30 %	%	70 %	0 %
+ -	3	New Striping	LF	1,500	\$1.00	1,500	%	50 %	%	50 %	0 %
		Weighted Average (%) Total (\$)				\$78,100	48%	50%		2%	

* % for OS: Cost % for Other Safety-Related components;
** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

20 %

\$15,620

(e.g. enter 10 for 10%)

Total Construction Cost (Con Items & Contingencies):

\$93,800

(Rounded up to the nearest hundreds)

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$9,400	100 %	\$9,400	\$0
PS&E	\$14,100	100 %	\$14,100	\$0
Subtotal - PE	\$23,500	100 %	\$23,500	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$9,400	100 %	\$9,400	\$0
Construction Items	\$93,800 (Read only - from Section I)	100 %	\$93,800	\$0
Subtotal - Construction	\$103,200	100 %	\$103,200	\$0
PROJECT TOTAL	\$126,700	100 %	\$126,700	\$0

☐ Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach". Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.

- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

		No.	Location Description (Intersection Name or Road Limit or General Description)
			Location type for this project: S (Signalized Intersections)
		1	Hollenbeck Avenue/Cascade Drive Intersection

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	S	0.15	10	All	100%
<input checked="" type="checkbox"/>	2	S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	S	0.6	10	Ped & Bike	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All (2) Ped & Bike

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Hollenbeck Avenue/Cascade Drive Intersection	0	1	0	2	2	5
	Total	0	1	0	2	2	5

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Hollenbeck Avenue/Cascade Drive Intersection	0	1	0	0	0	1
	Total	0	1	0	0	0	1

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: S (Signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 2 (S02 S21PB) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,1,0,2,2 Ped & Bike: 0,1,0,0,0	\$533,521	\$1,621,800	\$0	\$2,155,321
Sum	\$533,521	\$1,621,800	\$0	\$2,155,321

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 2
S02: Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number
S21PB: Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
\$126,700	\$126,700	100%
Total Expected Benefit	Benefit Cost Ratio (BCR)	
\$2,155,321	17.01	

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (i.e. later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

Save this file using "HA" + Application ID as the file name (e.g. "HA03-Sacramento-01.pdf"). Attach the completed HSIP Analyzer to the last page of the HSIP Application Form.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Location T (2 of 2)

Project Location:
(limited to 250 characters)

Hollenbeck Avenue between Bend Drive and The Dalles Avenue Sunnyvale, CA

Project Description:
(limited to 250 characters)

Addition of edgelines with reflectors on roadway segments, modifications to traffic signal to improve signal head visibility and improve pedestrian accommodations. Roadway improvements.

2. Application Category (BCR or Set-asides):

Benefit Cost Ratio (BCR)

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Type of project locations:

R (Roadways)

Number of Intersections/Miles:

0.5

Number of countermeasures for the project:

1

CM No. 1:

R28: Install edge-lines and centerlines

3. Project information

Functional Classification (FC):

For California Road System (CRS) maps to check the FC, click [here](#).

Urban / Rural Area:

What is the approximate total cost percentage that is HR3 eligible?

Annual Average Daily Traffic (see instructions):

AADT (Major Road)

AADT (Minor Road)

Year of AADT

Posted Speed Limit (mph):

Which of the California's Strategic Highway Safety Plan (SHSP) Challenge Areas does the project address primarily?
(For more information on the SHSP and its Challenge Areas, click [here](#).)

How were the safety needs and potential countermeasures for this project first identified?

California established Systemic Safety Analysis Report Program (SSARP) in 2016 and Local Roadway Safety Plan (LRSP) Program in 2019. Was this project identified through the SSARP or LRSP?

Is the project focused primarily on "spot location(s)" or "systemic" improvements?

If it is systemic, the primary type of the "systemic" improvements is:

What is the primary mode of travel intended to be benefited by this project (enter if not in the list)?

Approximate percentage of project cost going to improvements related to **motorized** travel

4. Project schedule

The local agency is expected to deliver the project per [the HSIP Program Delivery requirements](#). Assuming the HSIP Cycle 10 projects selected for funding will be programmed by January 1, 2021, please enter your best estimated dates for the following implementation milestones. Leave blank if not applicable.

Will this project use HSIP funds for Preliminary Engineering (PE) Phase?

Will an external consultant be hired to do the PE work?

After both of the above two questions are answered, the delivery requirements of this project (if selected for funding) will be displayed here.

PE Authorization Date:

Environmental Clearance Date:

Right of Way Clearance Date:

Final PS&E Date:

CON Authorization Date:

Construction Contract Award Date:

Construction Completion Date:

Project Close-Out Date:

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Determine the project's maximum Funding Reimbursement Ratio (FRR).

I.1 Countermeasures (CMs) applied to all location(s) (from Page No. 1)

Number of countermeasures: 1

1. R28: Install edge-lines and centerlines; HSIP Funding Eligibility: 100%

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated. Do not enter data for gray fields (calculated or not used).

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (R28)	(Not Used)	(Not Used)	% for OS*	% for NS**
+	1	New Striping	LF	3,620	\$1.00	3,620	100 %	%	%	%	0 %
-											
+	2	New Pavement Legend	SF	500	\$4.00	2,000	100 %	%	%	%	0 %
-											
+	3	New Paint Curb	LF	100	\$3.00	300	100 %	%	%	%	0 %
-											
		Weighted Average (%)					100%				
		Total (\$)				\$5,920					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

20 %

\$1,184

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$7,200

I.3 Funding Reimbursement Ratio

Project's Maximum Funding Reimbursement Ratio = 100.0%

The project's Maximum Funding Reimbursement Ratio is calculated as the least of the FEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total(%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

- All project costs, for all phases and by all funding sources, must be accounted for on this form.
- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
 - ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Funding Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
 - iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in narrative question No. 3 in the HSIP Application Form.

Project's maximum Funding Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

100 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HISP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$800	100 %	\$800	\$0
PS&E	\$1,100	100 %	\$1,100	\$0
Subtotal - PE	\$1,900	100 %	\$1,900	\$0
Right of Way (ROW) Phase				
Right of Way Engineering	\$0	100 %	\$0	\$0
Appraisals, Acquisitions & Utilities	\$0	100 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$0	%	\$0	\$0
Construction (CON) Phase				
Construction Engineering (CE)	\$800	100 %	\$800	\$0
Construction Items	\$7,200 (Read only - from Section I)	100 %	\$7,200	\$0
Subtotal - Construction	\$8,000	100 %	\$8,000	\$0
PROJECT TOTAL	\$9,900	100 %	\$9,900	\$0

☐

 Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:
If there are any messages in the below box, please fix OR explain justification for exceptions in narrative question No 3 in the HSIP application form.

Section III. Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the historical crash data at the project sites.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the application, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , "Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

Note: If a Roundabout CM (S16 or NS04 or NS05) is selected, additional information (such as roundabout configuration and ADT) is required.

For more information regarding crash data, please refer to the Manual for HSIP Analyzer and the Local Roadway Safety Manual.

1. Please indicate the sources of the crash data. Typical sources include Statewide Integrated Traffic Records System (SWITRS), UC Berkeley SafeTREC TIMS, your locally preferred mapping software (such as Crossroads) or any other data sources.

2. Please explain how "incremental approach" has been pursued if CM R15, R16, R17 or R18 is proposed. Please skip this question if none of these CMs are being proposed.

Countermeasure R15 (Widen shoulder), R16 (Curve shoulder widening (outside only)), R17 (Improve horizontal alignment (flatten curves)) and R18 (Flatten crest vertical curve) are not eligible unless they are done as the last step of an "incremental approach".

Applicants need to document they have already installed lower cost and lower impact CMs but the crash rate is unacceptably high. What safety improvements have been pursued and installed at the project sites within the last ten years?

III.1 List of Project Locations

List all locations/sites included in this project. Highlighted fields must be filled in.


- 1) Initially there is only one location line. Click "+" "-" to add a new line/delete an existing line;
- 2) Enter location description for each line. The same descriptions will be auto-populated in III.2.

If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc.

	No.	Location Description (Intersection Name or Road Limit or General Description)	
		Location type for this project:	R (Roadways)
<div><div>+</div><div>-</div></div>	1	Hollenbeck Avenue Btw Bend Drive and The Dallas	

III.2: Countermeasures and Crash Data

Step 1: Countermeasure(s) to be applied (from Page 1)

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
	1	R28: Install edge-lines and centerlines	R	0.25	10	All	100%
	*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.						

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: All

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Hollenbeck Avenue Btw Bend Drive and The Dallas	0	0	0	0	7	7
	Total	0	0	0	0	7	7

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Benefit Summary:

Information/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit
Location type: R (Roadways) Number of location(s): 1 Number of selected countermeasure(s): 1 (R28) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,0,0,7	\$46,550	\$0	\$0	\$46,550
Sum	\$46,550	\$0	\$0	\$46,550

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

BCR and other key information:

Transfer the "Total Project Cost" , "HSIP Funds Requested" and the BCR to Page 2 of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1
R28: Install edge-lines and centerlines

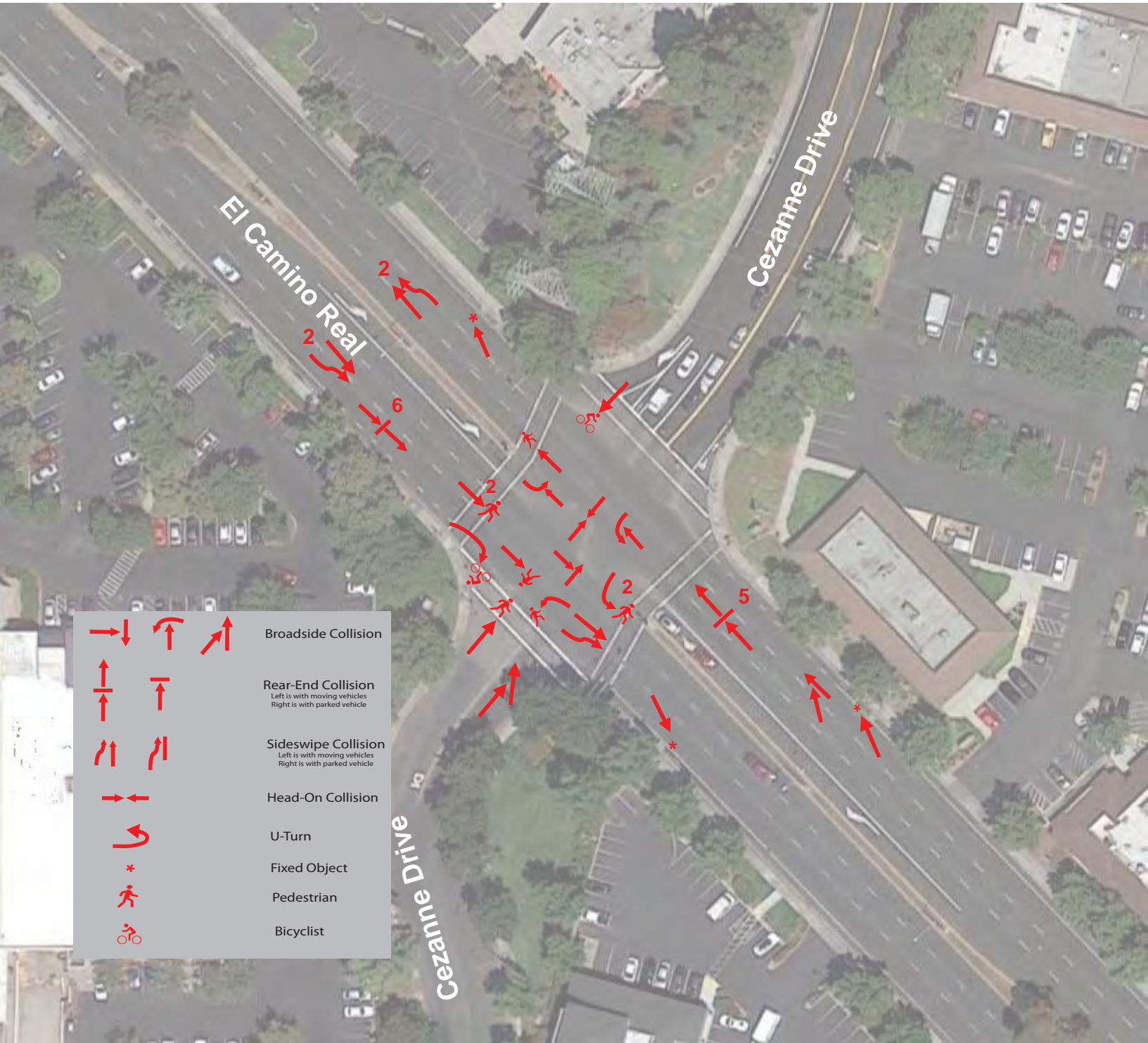
Cost, FRR, Benefit and BCR:

Total Project Cost	HSIP Funds Requested	Max. FRR
<div>\$9,900</div>	<div>\$9,900</div>	<div>100%</div>
Total Expected Benefit	Benefit Cost Ratio (BCR)	
<div>\$46,550</div>	<div>4.61</div>	

G. PROJECT COLLISION STICK DIAGRAMS

Location A
Cezanne Drive & El Camino Real

-39 Total Collisions
-Collision Types: 11 Rear-End, 8 Involving Pedestrian, 5 Broadside, 5 Sideswipe, 3 Hit Object**, 2 Involving Bicyclist, 1 Head-On
-Major Injuries: 1 Fatal, 2 Severe Injury
*4 Collisions not shown due to insufficient information
**Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location B
Fair Oaks Avenue & Maude Avenue

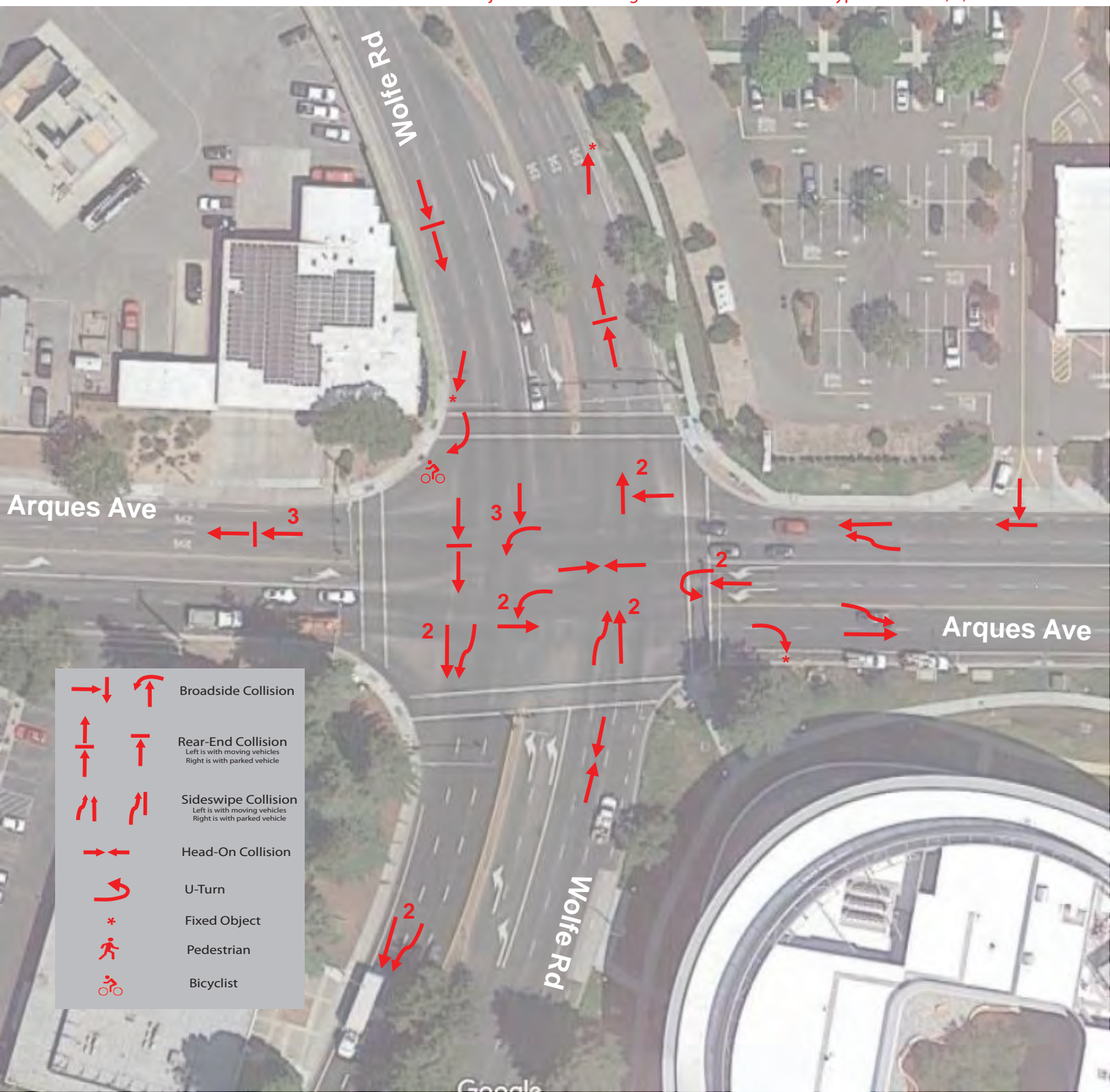
- 25 Total Collisions
- Collision Types: 8 Rear-End, 8 Broadside, 4 Sideswipe, 2 Hit Object**
- Major Injuries: 1 Fatal
- *2 Broadside Collisions not shown due to insufficient/conflicting information
- *3 Collisions not shown due to insufficient information
- **Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location C

Wolfe Road & Arques Avenue

-32 Total Collisions
-Collision Types: 10 Broadside**, 8 Sideswipe, 6 Rear-End, 3 Hit Object**, 2 Head-On, 1 Involving Bicycle
-Major Injuries: 2 Severe Injury
*2 Collisions not shown due to insufficient/conflicting information
**U-Turn movement part of Broadside collisions
**Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location D
Fair Oaks Avenue & Olive Avenue

-23 Total Collisions
-Collision Types: 8 Rear-End, 7 Sideswipe, 3 Broadside, 2 Involving Pedestrian, 1 Hit Object**
-Major Injuries: 1 Severe Injury
*2 Collisions not shown due to insufficient information
**Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location E

Kifer Road & Wolfe Road

-22 Total Collisions

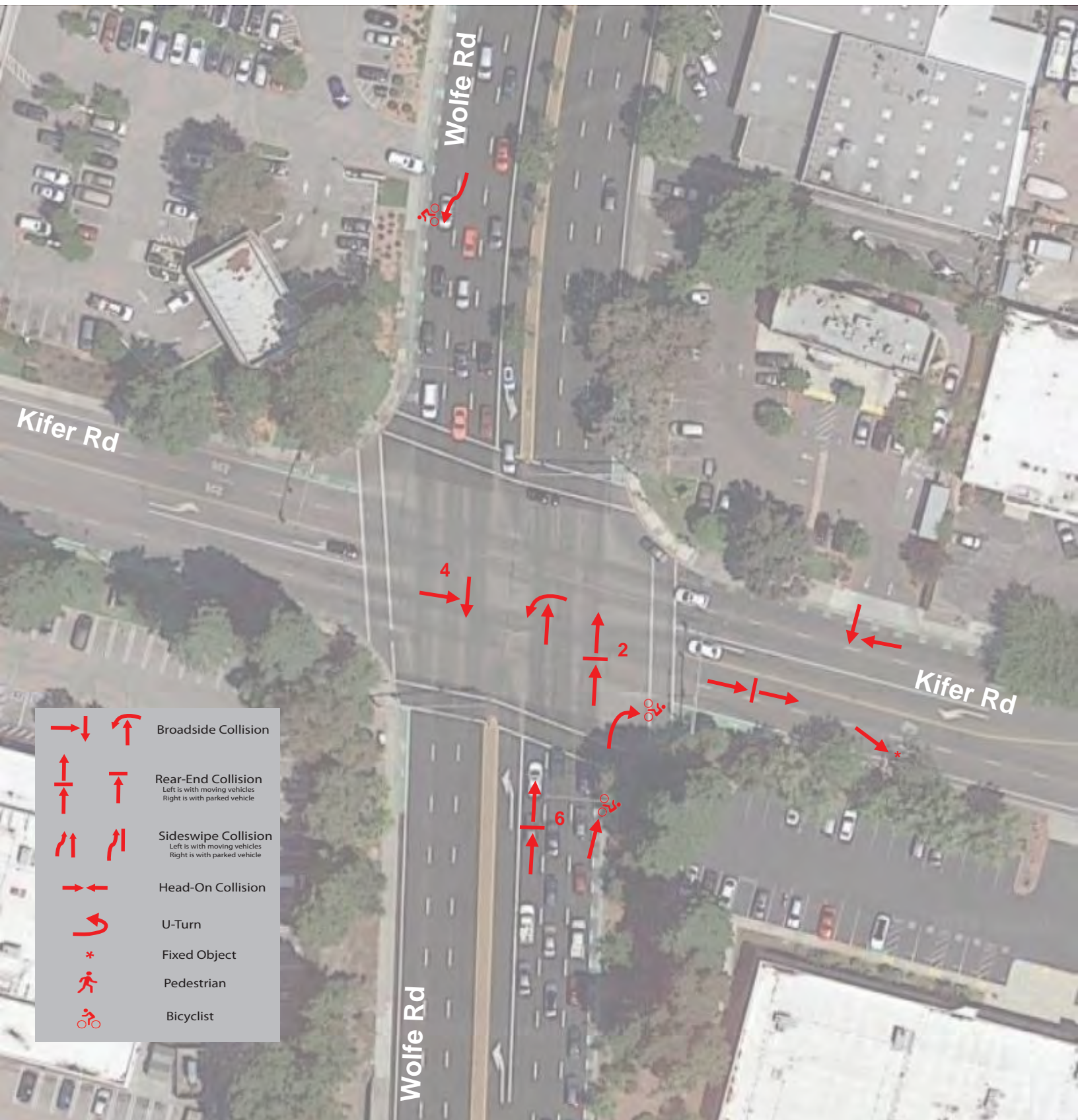
-Collision Types: 9 Rear-End, 6 Broadside, 4 Involving Bicycle, 1 Hit Object**

-Major Injuries: 1 Severe Injury

*1 Collision involving Bicycles not shown due to insufficient information

*2 Collisions not shown due to insufficient/conflicting information

**Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location F

Caribbean Drive & Moffett Park Drive

-16 Total Collisions

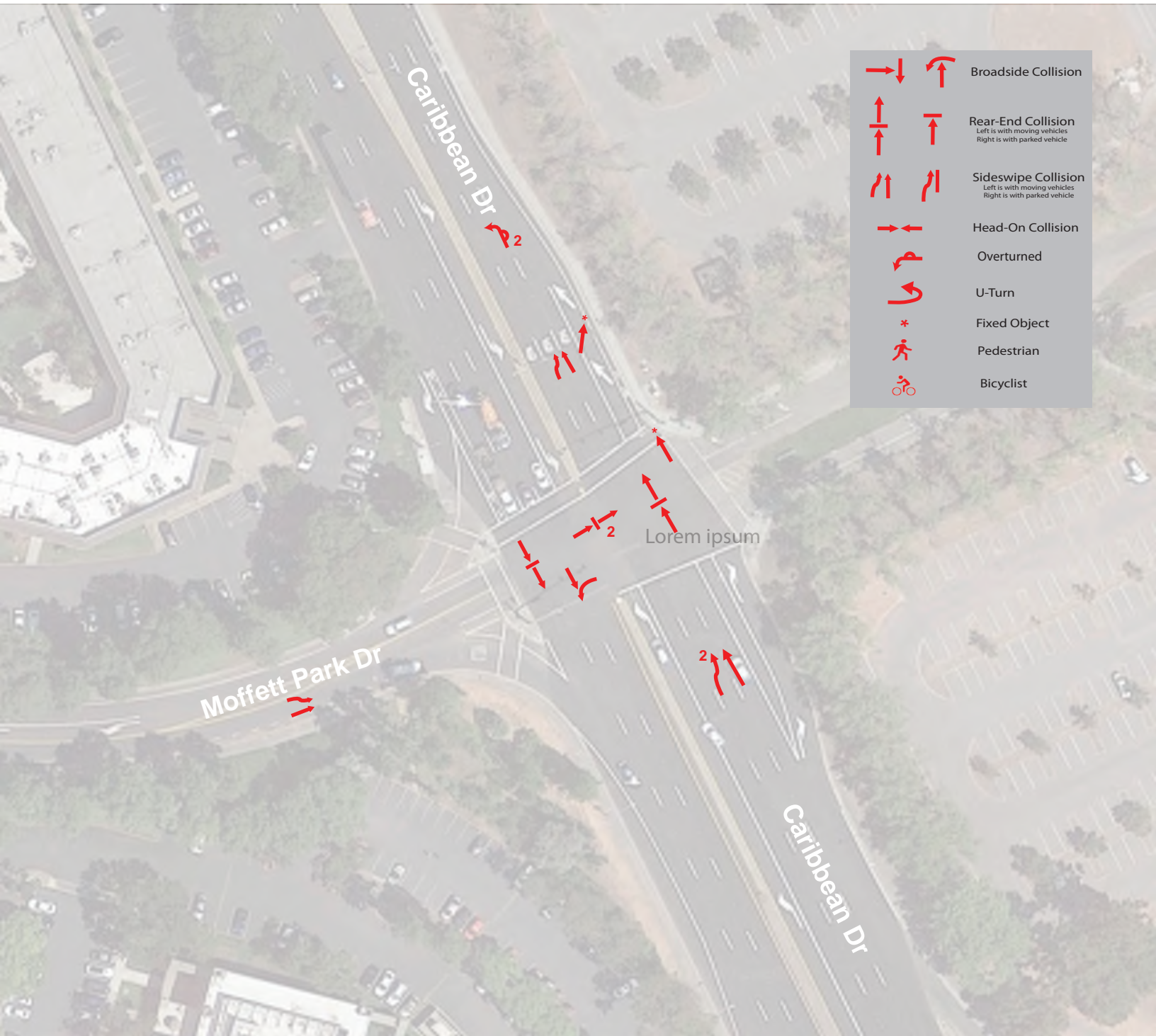
-Collision Types: 4 Rear-End, 4 Sideswipe, 2 Overturned**, 2 Hit Object**, 1 Broadside, 1 Head-On

-Major Injuries: 1 Severe Injury

*1 Head-On Collision not shown due to insufficient information

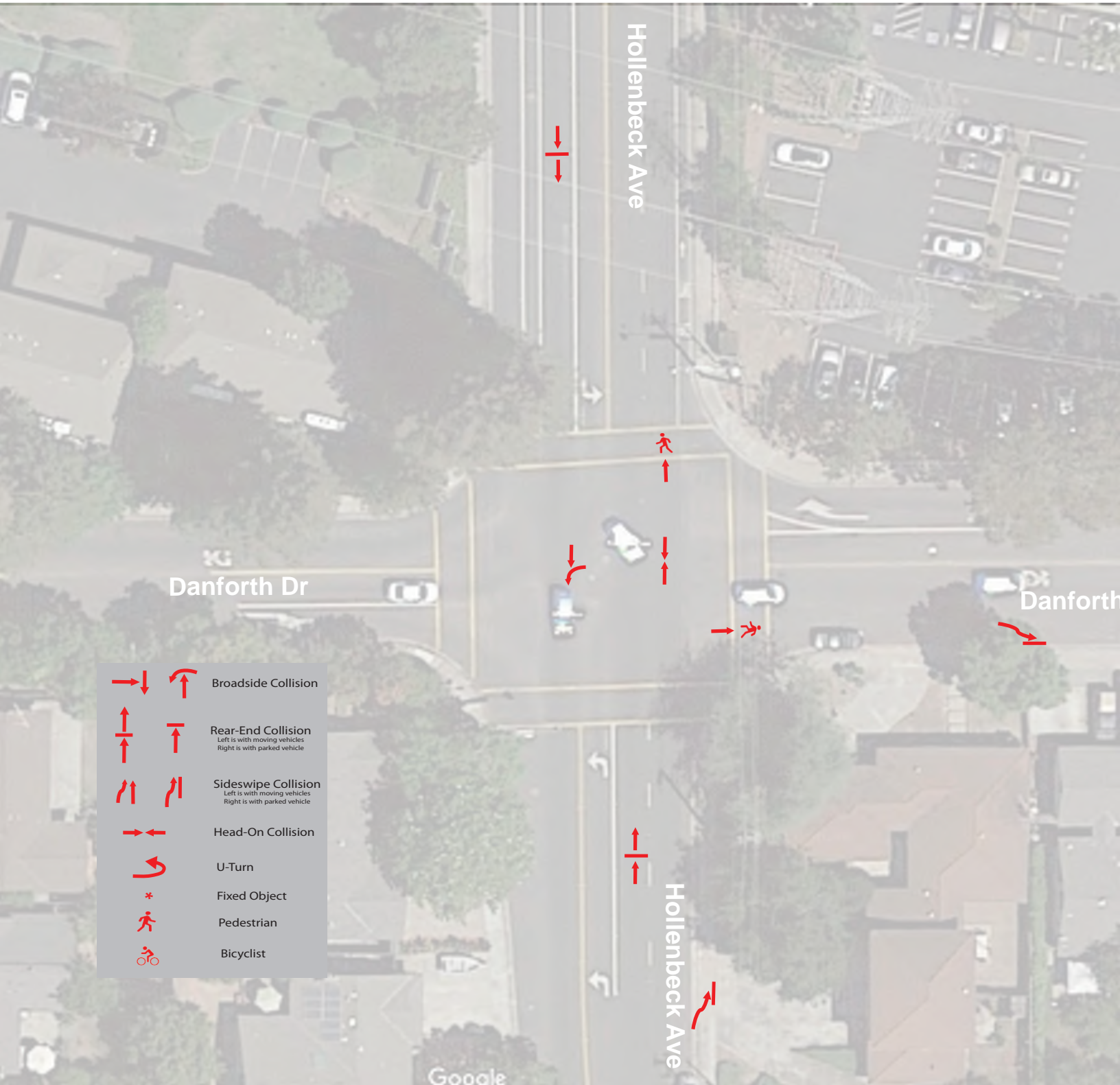
*2 Collisions not shown due to insufficient information

**Hit Object and Overturned Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location G
Danforth Drive & Hollenbeck Avenue

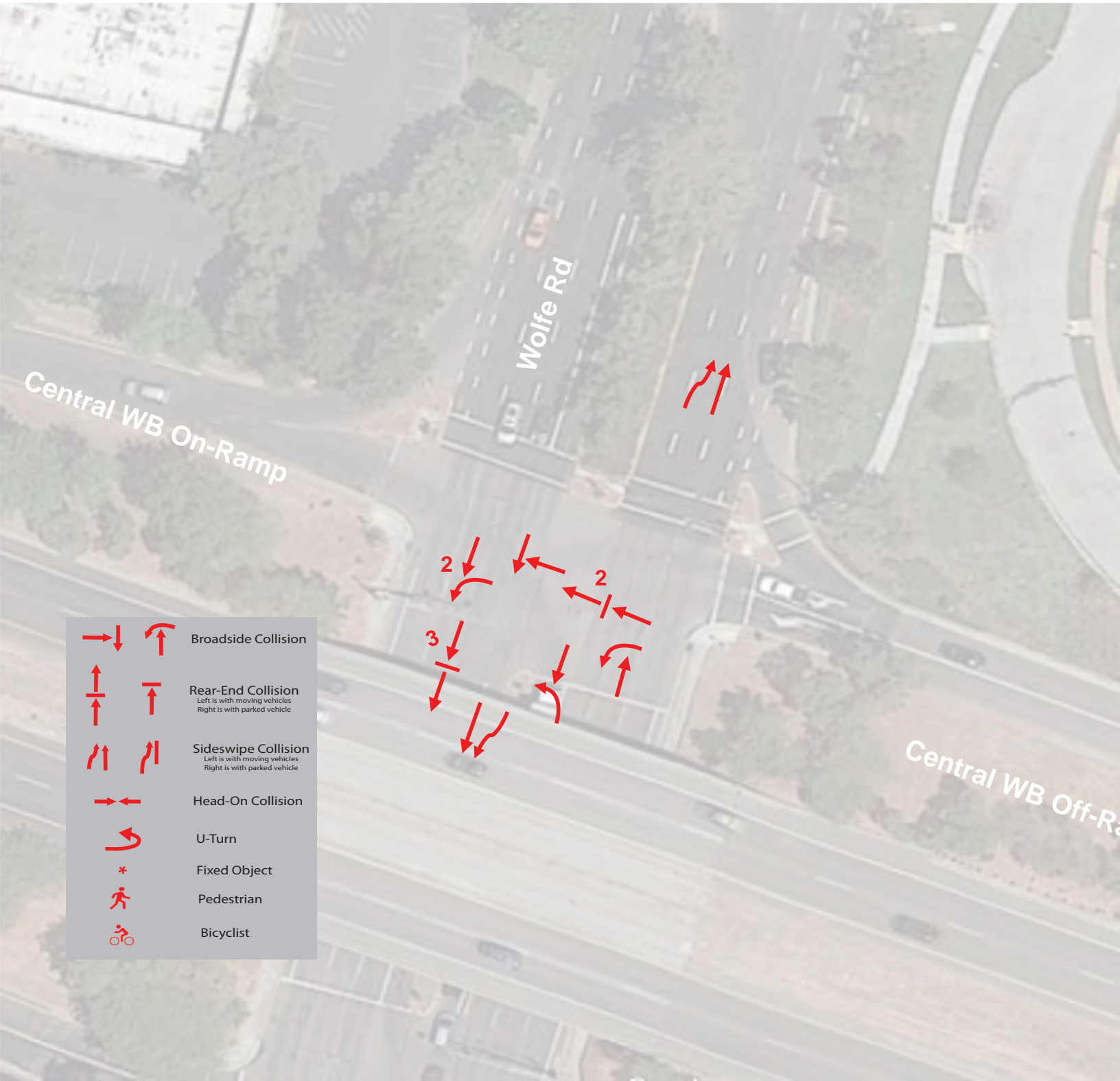
- 10 Total Collisions
- Collision Types: 2 Rear-End, 2 Sideswipe, 1 Broadside, 1 Head-On, 2 Pedestrian
- Major Injuries: 1 Severe Injury
- *2 Collisions not shown due to insufficient information



Location H

Wolfe Road & Central WB Off-Ramp

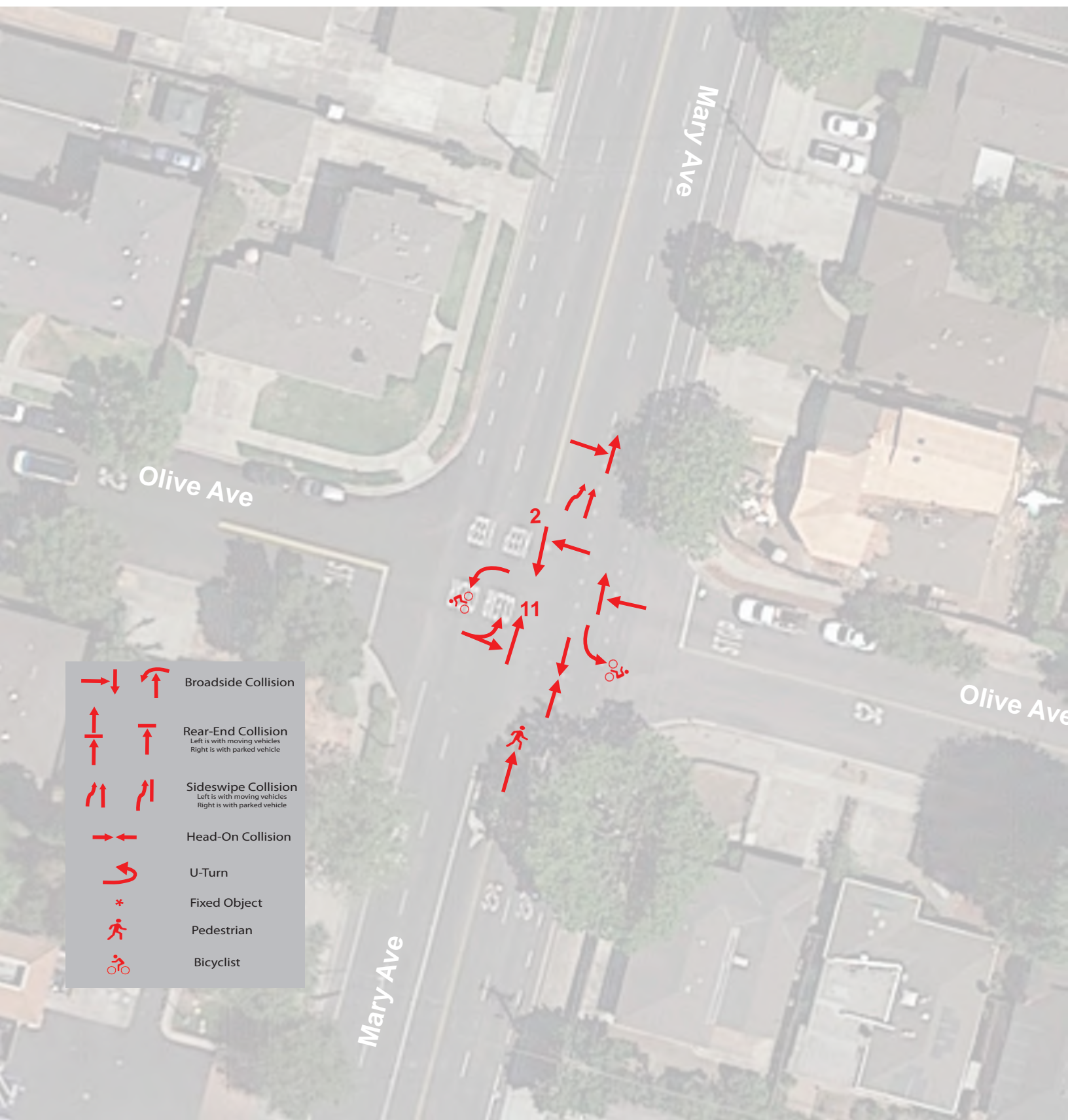
- 13 Total Collisions
- Collision Types: 5 Rear-End, 5 Broadside, 2 Sideswipe
- *1 Collisions not shown due to insufficient/conflicting information



Location I

Mary Avenue & Olive Avenue


- 26 Total Collisions
- Collision Types: 16 Broadside, 1 Head-On, 1 Sideswipe, 2 Involving Bicycle, 1 Pedestrian
- Major Injuries: 1 Severe Injury
- *1 Broadside Collision not shown due to insufficient information
- *5 Collisions not shown due to insufficient information




Location J

Fremont Avenue & Eleanor Way


-10 Total Collisions
Collision Types: 4 Rear-End, 2 Sideswipe, 1 Involving Bicycle, 2 Involving Pedestrian
*1 Collisions not shown due to insufficient information




Broadside Collision




Rear-End Collision
Left is with moving vehicles
Right is with parked vehicle




Sideswipe Collision
Left is with moving vehicles
Right is with parked vehicle




Head-On Collision



U-Turn



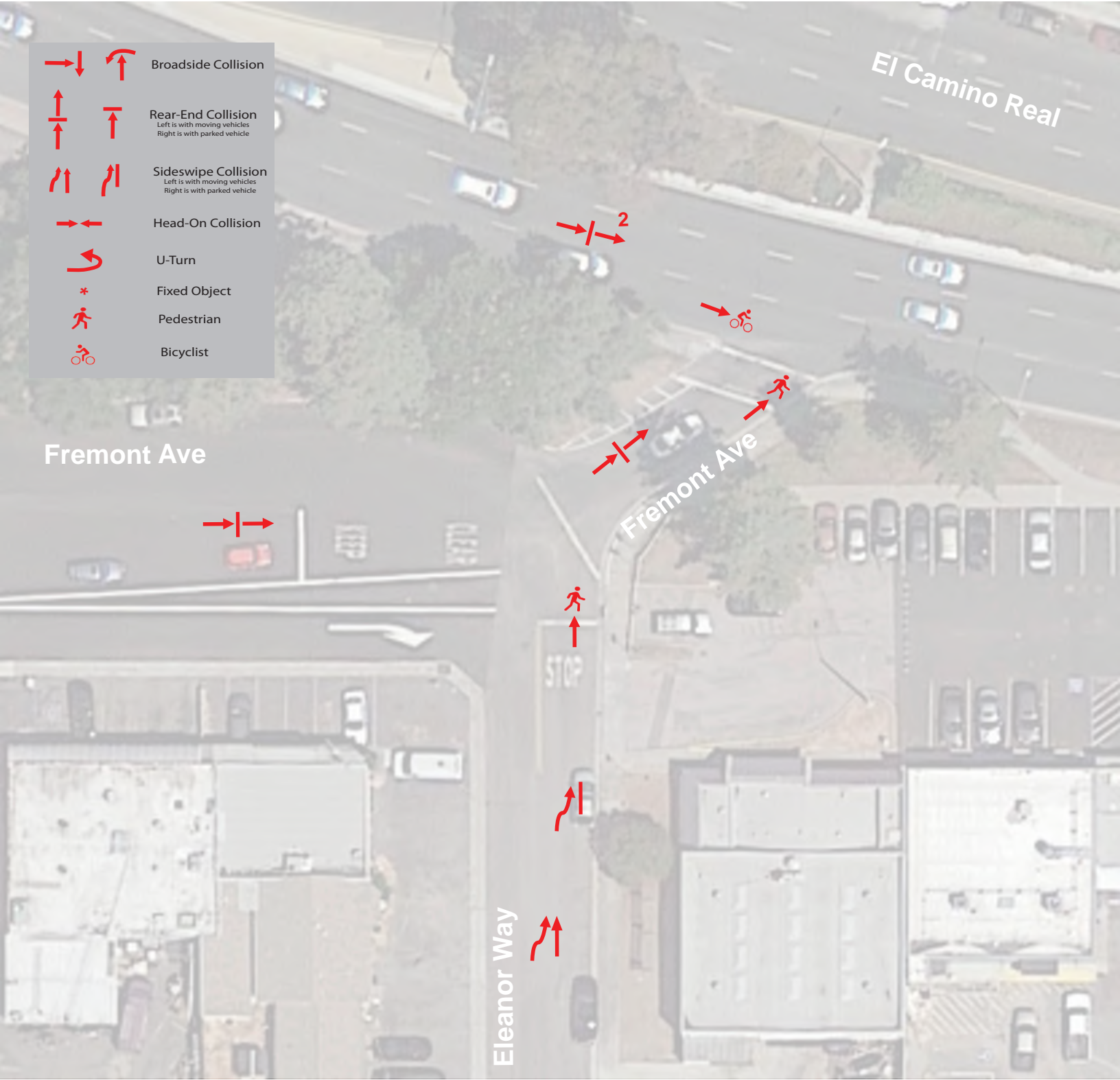
Fixed Object



Pedestrian



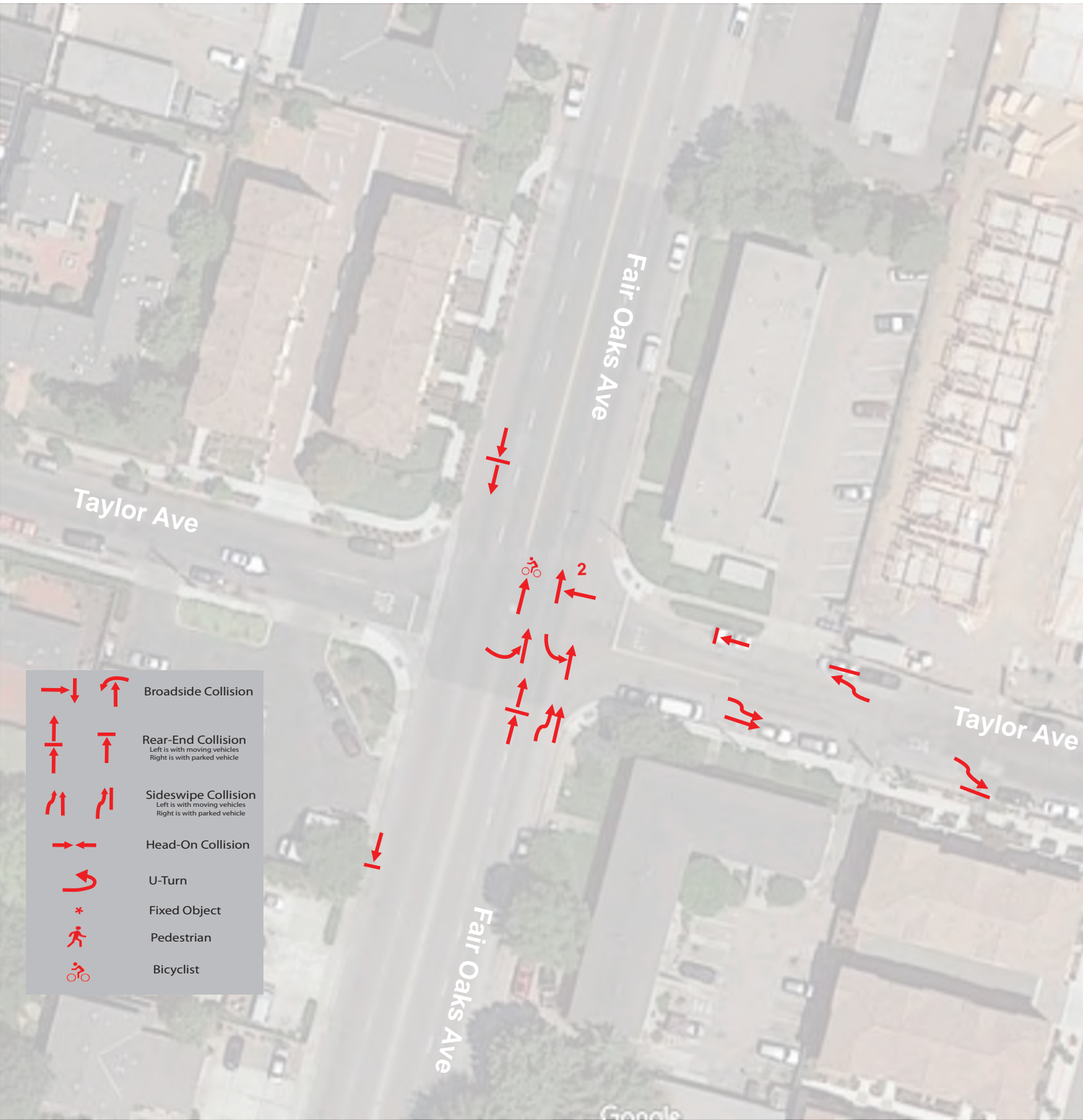
Bicyclist



Location K

Fair Oaks Avenue & Taylor Avenue

- 15 Total Collisions
- Collision Types: 5 Broadside, 5 Sideswipe, 4 Rear-End, 1 Involving Bicycle
- Major Injuries: 1 Severe Injury
- *1 Broadside Collision not shown due to insufficient information
- *1 Sideswipe Collision not shown due to insufficient information



Location L

Bernardo Avenue & Ayala Drive

-17 Total Collisions
-Collision Types: 6 Sideswipe, 2 Head-On, 2 Rear-End, 1 Hit Object**, 2 Involving Bicycle, 1 Involving Pedestrian
-Major Injuries: 2 Severe Injury
*3 Collisions not shown due to insufficient information
**Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



Location M
Evelyn Avenue & Murphy Avenue

-14 Total Collisions
-Collision Types: 5 Hit Object**, 2 Rear-End, 3 Involving Bicycle, 1 Involving Pedestrian
-*3 Collisions not shown due to insufficient information
**Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6

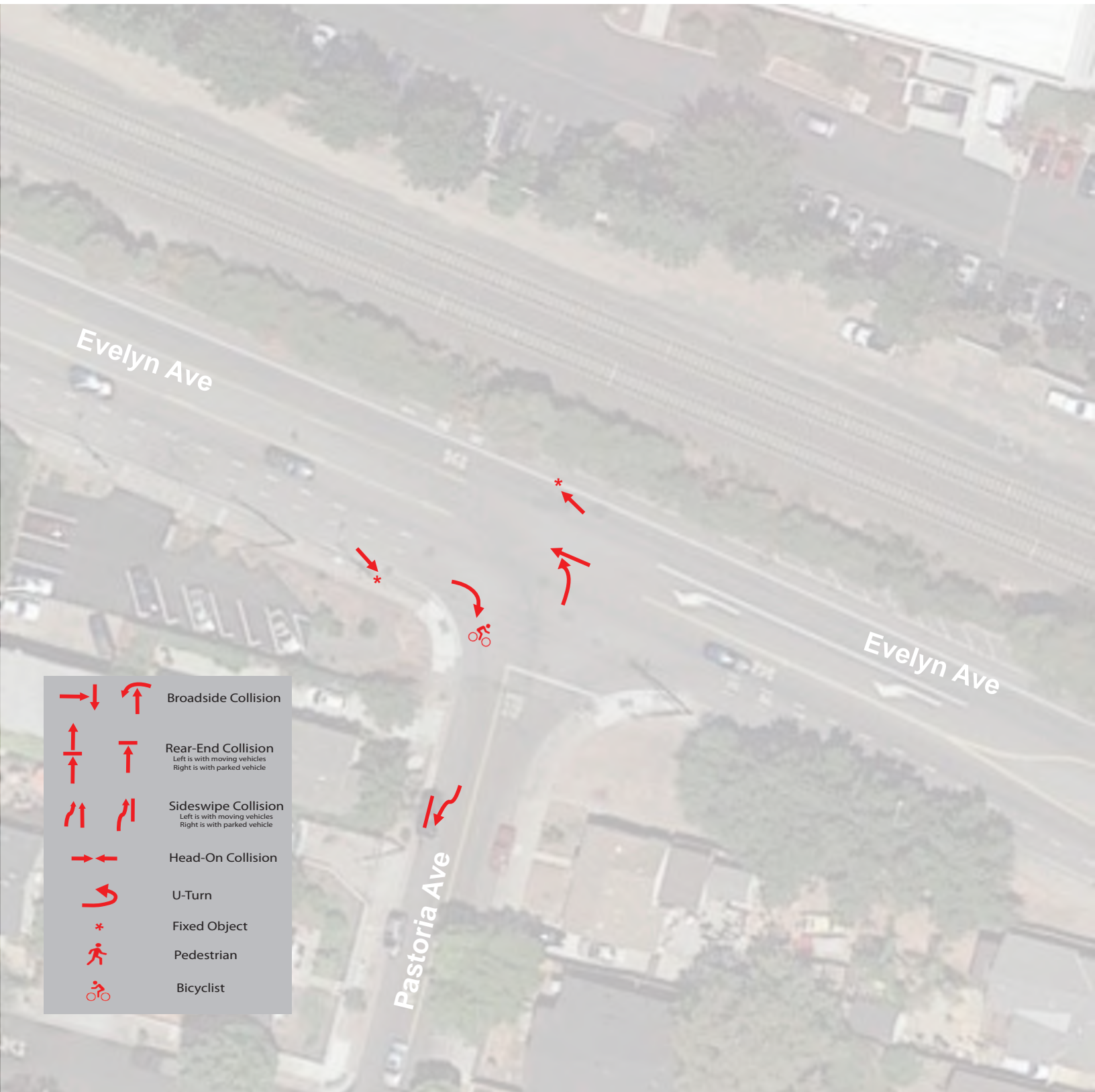


	Broadside Collision
	Rear-End Collision Left is with moving vehicles Right is with parked vehicle
	Sideswipe Collision Left is with moving vehicles Right is with parked vehicle
	Head-On Collision
	U-Turn
	Fixed Object
	Pedestrian
	Bicyclist

Location N

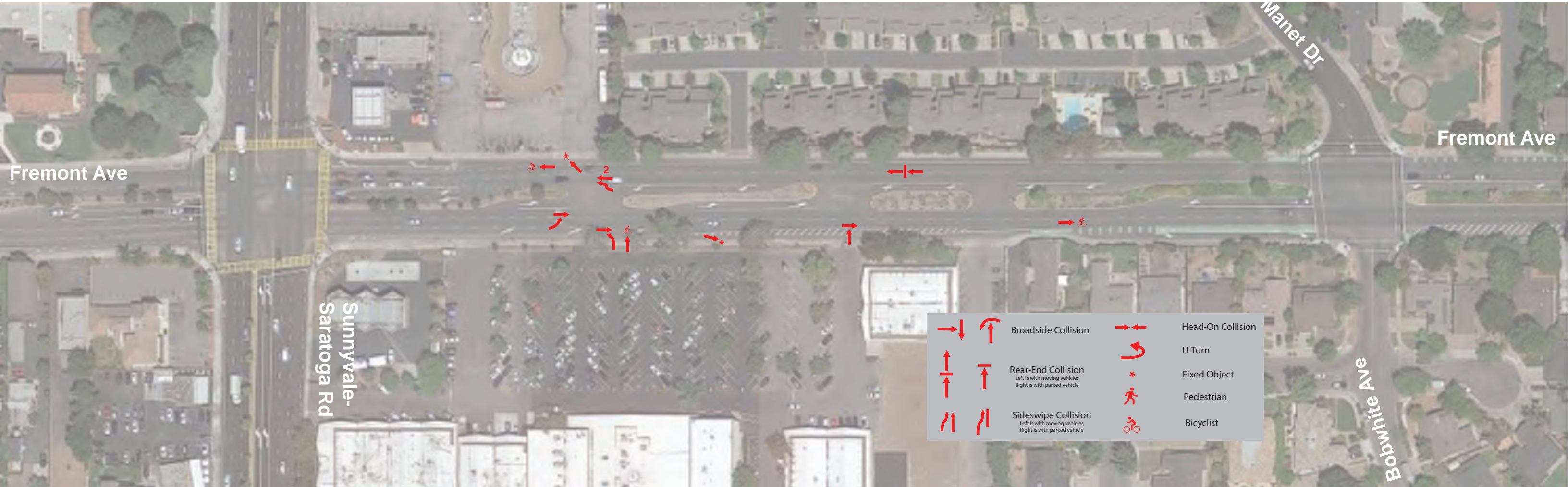
Evelyn Avenue & Pastoria Avenue

- 5 Total Collisions
- Collision Trends: 1 Sideswipe, 1 Broadside, 2 Hit Object**, 1 Involving Bicycle, 1 Severe Injury
- Major Injuries: 1 Fatal
- **Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6



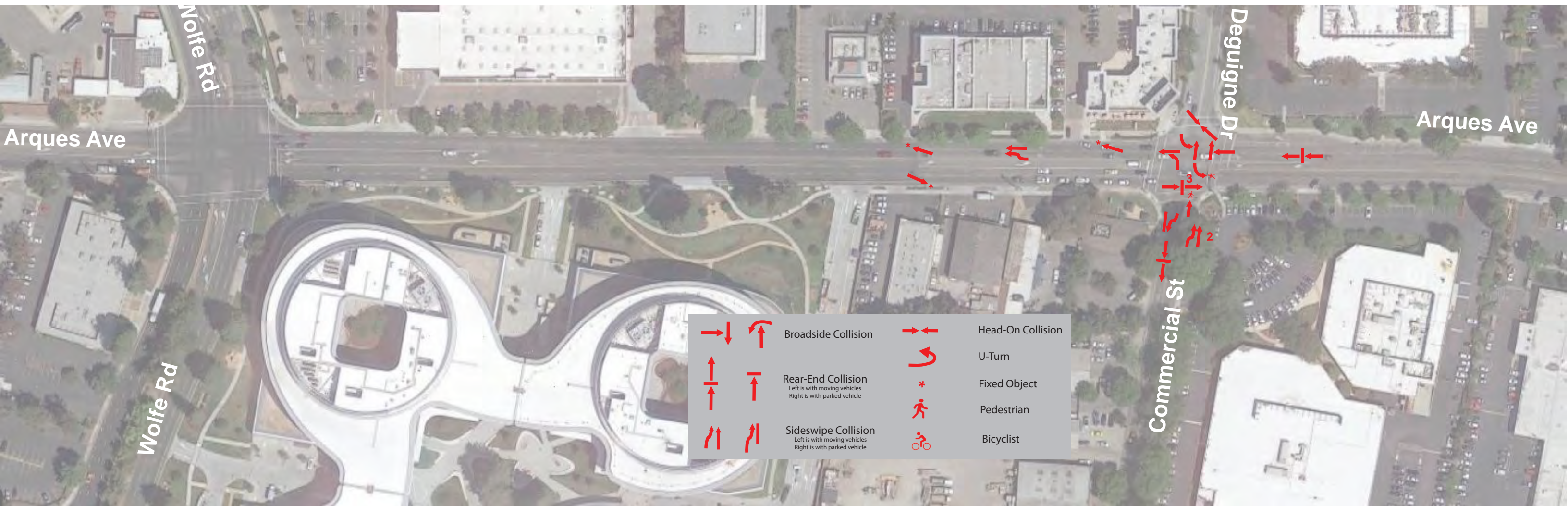
Location O
Fremont Avenue - between Sunnyvale-Saratoga Road and Manet Drive

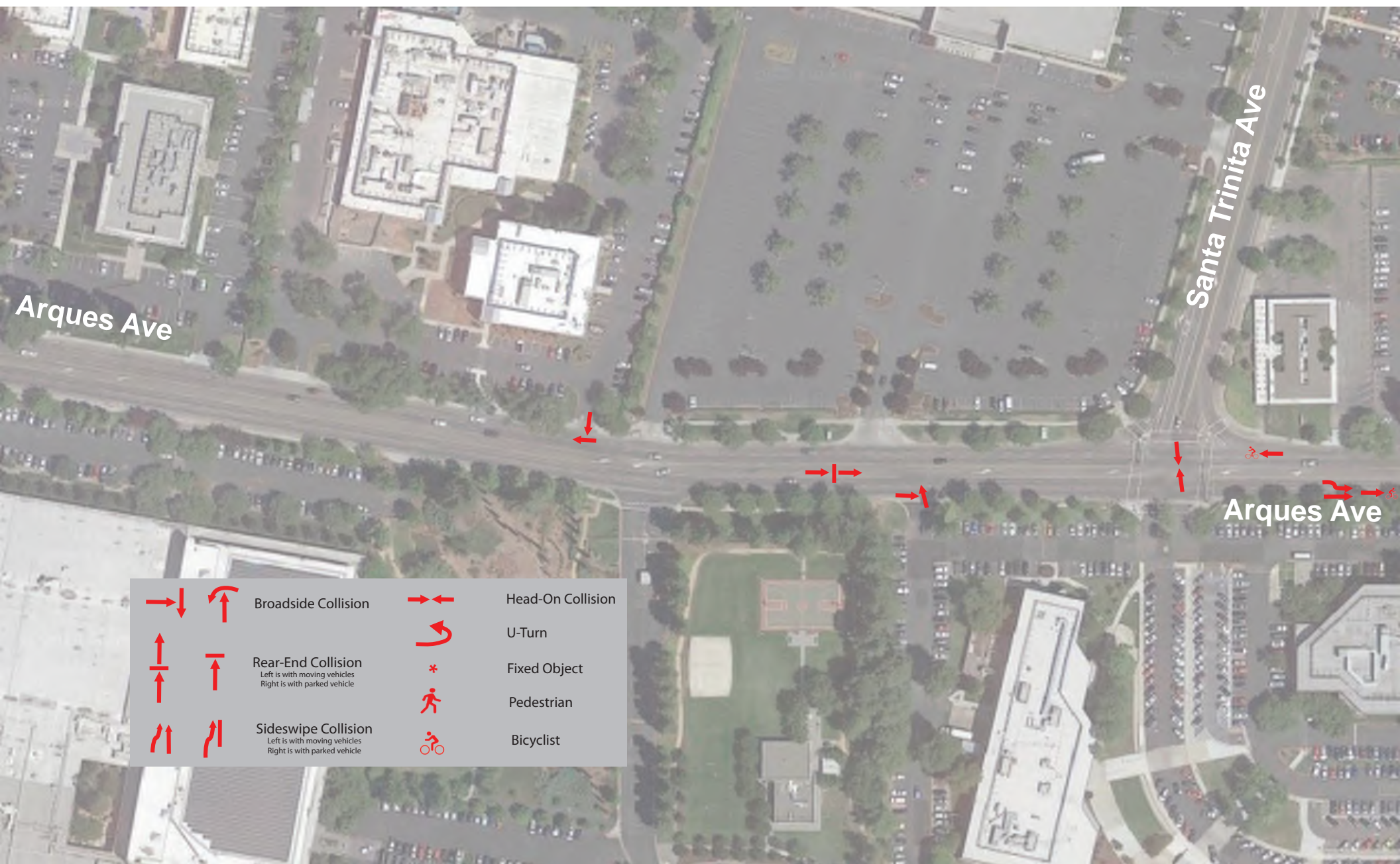
-11 Total Collisions
-Collision Types: 3 Broadside, 2 Sideswipe, 1 Rear-End, 1 Hit Object**, 3 Involving Bicycle, 1 Involving Pedestrian
-Major Injuries: 1 Severe Injury
**Hit Object Collisions categorized as ‘Other’ collision type in Tables 4, 5, and 6



Location P
Arques Avenue - between Wolfe Road and Lawrence Expressway

- 35 Total Collisions
- Collision Types: 11 Broadside, 5 Sideswipe, 6 Rear-End, 4 Hit Object**, 3 Head-On, 3 involving Bicycle, 2 involving Pedestrian
- Major Injuries: 2 Severe Injury
- *1 Collision not shown at Arques & Commercial due to insufficient information
- *1 Broadside Collision not shown at Arques & Apple West Driveway due to insufficient information
- **Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6





Arques Ave

Santa Trinita Ave

Arques Ave

	Broadside Collision		Head-On Collision
	Rear-End Collision Left is with moving vehicles Right is with parked vehicle		U-Turn
	Sideswipe Collision Left is with moving vehicles Right is with parked vehicle		Fixed Object
			Pedestrian
			Bicyclist

Lawrence Expressway

Lawrence Expressway

Arques Ave



Location Q
Sunnyvale-Saratoga Road - between El Camino Real and Mathilda Avenue

- 8 Total Collisions
- Collision Types: 6 Broadside, 1 Rear-End, 1 Sideswipe
- *1 Broadside Collision not shown due to insufficient information



Location R
Reed Avenue - between Wolfe Road and Evelyn Avenue

-7 Total Collisions
-Collision Types: 3 Broadside, 1 Sideswipe, 1 Rear-End, 2 Involving Pedestrian





Location S
Sandia Avenue - between Lawrence Expressway and Wildwood Avenue

- 27 Total Collisions
- Collision Trends: 9 Broadside, 9 Sideswipe, 4 Rear-End, 2 Head-On, 1 Hit Object**, 1 Involving Bicycle
- *1 Broadside Collision not shown at Sandia & Blazingwood due to insufficient information
- *1 Collision not shown at Sandia & Havenwood due to insufficient information
- **Hit Object Collisions categorized as 'Other' collision type in Tables 4, 5, and 6







Oak Creek Way

Sandia Ave

Sandia Ave

		Broadside Collision		Head-On Collision
		Rear-End Collision Left is with moving vehicles Right is with parked vehicle		Overturned
		Sideswipe Collision Left is with moving vehicles Right is with parked vehicle		U-Turn
				Fixed Object
				Pedestrian
				Bicyclist



Sandia Ave

Havenwood Ave

Sandia Ave

		Broadside Collision		Head-On Collision
		Rear-End Collision Left is with moving vehicles Right is with parked vehicle		Overturned
		Sideswipe Collision Left is with moving vehicles Right is with parked vehicle		U-Turn
				Fixed Object
				Pedestrian
				Bicyclist



Sandia Ave

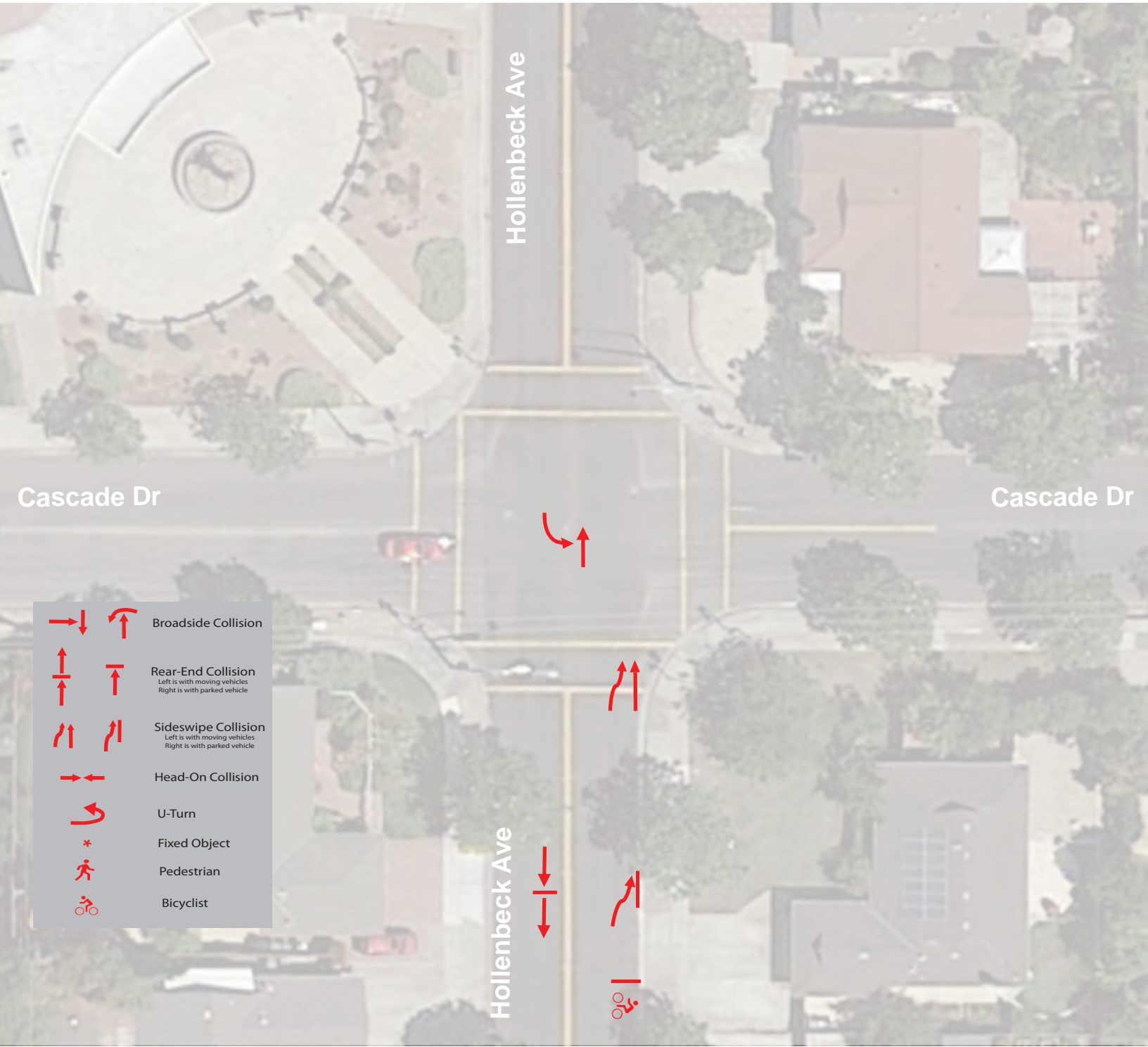
Wildwood Ave

	Broadside Collision		Head-On Collision
	Rear-End Collision Left is with moving vehicles Right is with parked vehicle		Overturned
	Sideswipe Collision Left is with moving vehicles Right is with parked vehicle		U-Turn
			Fixed Object
			Pedestrian
			Bicyclist

Location T

Cascade Drive & Hollenbeck Avenue

- 12 Total Collisions
- Collision Types: 6 Sideswipe, 4 Rear-End, 1 Broadside, 1 Bicycle, 1 Pedestrian
- Major Injuries: 1 Severe Injury





Hollenbeck Ave

Bend Dr

		Broadside Collision
		Rear-End Collision Left is with moving vehicles Right is with parked vehicle
		Sideswipe Collision Left is with moving vehicles Right is with parked vehicle
		Head-On Collision
		U-Turn
		Fixed Object
		Pedestrian
		Bicyclist



Cheyenne Dr

Hollenbeck Ave

Hollenbeck Ave

The Dalles Ave

		Broadside Collision
		Rear-End Collision Left is with moving vehicles Right is with parked vehicle
		Sideswipe Collision Left is with moving vehicles Right is with parked vehicle
		Head-On Collision
		U-Turn
		Fixed Object
		Pedestrian
		Bicyclist