

# Appendix M: Safety Analysis

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To: San Diego Association of Governments and Caltrans District 11

From: North County Comprehensive Multimodal Corridor Plan (CMCP) Project Team

Date: October 2022

Subject: North County Comprehensive Multimodal Corridor Plan (CMCP) – Safety Analysis

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## Overview

The North County Comprehensive Multimodal Corridor Plan (CMCP) will identify integrated transportation solutions that enhance the way people travel throughout North County. The purpose of this memo is to provide a summary of the collision analysis performed for the North County CMCP subregion.

## Methodology

The collision analysis utilized two collision datasets between 2009 and 2018 to identify patterns and trends on the local roads and the State Highway System (SHS) within the subregion. The collision datasets are from the Fatality Analysis Reporting System (FARS) and UC Berkeley Transportation Injury Mapping System (TIMS). FARS helped to understand the total number of fatalities and the number of fatalities of pedestrians and bicyclists by year and facility type during a ten-year period. TIMS helped to understand the number of collisions that resulted in a fatality or serious injury as well as the number of fatal victims and victims with a serious injury due to a collision. TIMS also helped to identify areas with a high number of collisions, also known as collision hot spots, within the subregion and understand the movements preceding collision for pedestrian- or bicyclist-involved collisions.

## Findings

This memo documents the information and findings of the collision analysis to help inform discussions with the project development team and the technical working group to identify potential transportation solution strategies that improve safety for all users in the subregion. Key takeaways for the subregion from the collision analysis are listed below.

- The hot spot locations show that key corridors in the subregion that present safety risks for users of the transportation system include:
  - SR 78
  - I-15
  - SR 76
  - San Marcos Blvd
  - Broadway
  - Vista Way
  - Carlsbad Blvd
  - Oceanside Blvd
  - Mission Ave
  - Mission Rd
  - Mulberry Dr
  - Harmony Grove Rd
  - Questhaven Rd
  - Benet Rd
  - Old Grove Rd
  - Canyon Dr

- There is a higher distribution of injury-related collisions that have occurred on the SHS.
- There are more intersection collision hot spots on the non-SHS.
- Upward trend of collisions resulting in a fatality:
  - There was a jump in fatal collisions between 2013 and 2014 that stayed consistent until 2017 for both the state highway system and non-state highway system
  - More than 390 fatalities occurred over the last 10 years, which is about more than 30 fatalities annually
- Larger distribution of fatal collisions being seen on the non-state highway system versus state highway system:
  - 116 fatal crashes on the state highway system occurred with 31 involving pedestrians and one involving bicyclists<sup>1</sup>
  - 255 fatal collisions on the non-state highway system occurred with 95 involving pedestrians and 13 involving bicyclists<sup>1</sup>
- Vulnerable users, pedestrians and bicyclists, are at risk with the existing transportation system:
  - About 38% of fatal collisions in the study area involved a pedestrian or bicyclist
  - Reducing the rate and severity of collisions as well as reducing the collisions involving pedestrians and bicyclists, who are the most vulnerable users of the transportation system, is necessary.

Additional information about the process and findings are can be found in the following sections of this memo:

- Hot Spot Locations
- Fatality Trends
- Pedestrian/Bicyclist-Involved Collisions
- Safety Factsheets for SHS and Non-SHS

## Hot Spot Locations

Hot spot locations are areas where the highest number of collisions are occurring over the ten-year period (2009-2018). Hot spot locations help identify key segments and intersections within the subregion that have a history of collisions and thus, are more likely to result in another collision in the future. Identifying these hot spot locations help identify specific areas in the subregion that need a safety improvement.

To identify these locations, injury-related collisions were first categorized as either intersection or segment collisions. Collision locations in the TIMS dataset are reported by providing the primary and secondary roads of the nearest intersection and the direction and number of feet away from that intersection. Intersection collisions were categorized as collision within 250 feet from an intersection in all directions along the primary or secondary road. Segment collisions were categorized as collision that is more than 250 feet from an intersection along the primary road.

**Table 1** and **Table 2** show the top hot spot locations within the subregion on both the SHS and local roads (non-SHS) by intersection and segment locations. **Figure 1** and **Figure 2** provides heat maps to show the hot spot locations visually on the SHS and non-SHS in the subregion. These locations represent potential risks to users.

<sup>1</sup> Fatality Analysis Reporting System (FARS) (2009-2018)

Table 1. Top Hot Spot Location Assessment along SHS and Non-SHS by Intersection for North County CMCP Subregion

Intersection Location	SHS	Non-SHS	Number of Injury-Related Collisions
Rancho Santa Fe Rd/San Marcos Blvd		✓	7
SR 78/Broadway	✓		6
SR 76/Vista Way	✓		6
Acardia Ave/Vista Wy		✓	6
Mission Rd/Mulberry Dr		✓	6
Harmony Grove Rd/Questhaven Rd		✓	6
Vista Wy/Mote Mar Rd		✓	5
SR 76/Benet Rd	✓		5
SR 76/Old Grove Rd	✓		5
SR 76/Canyon Dr	✓		4

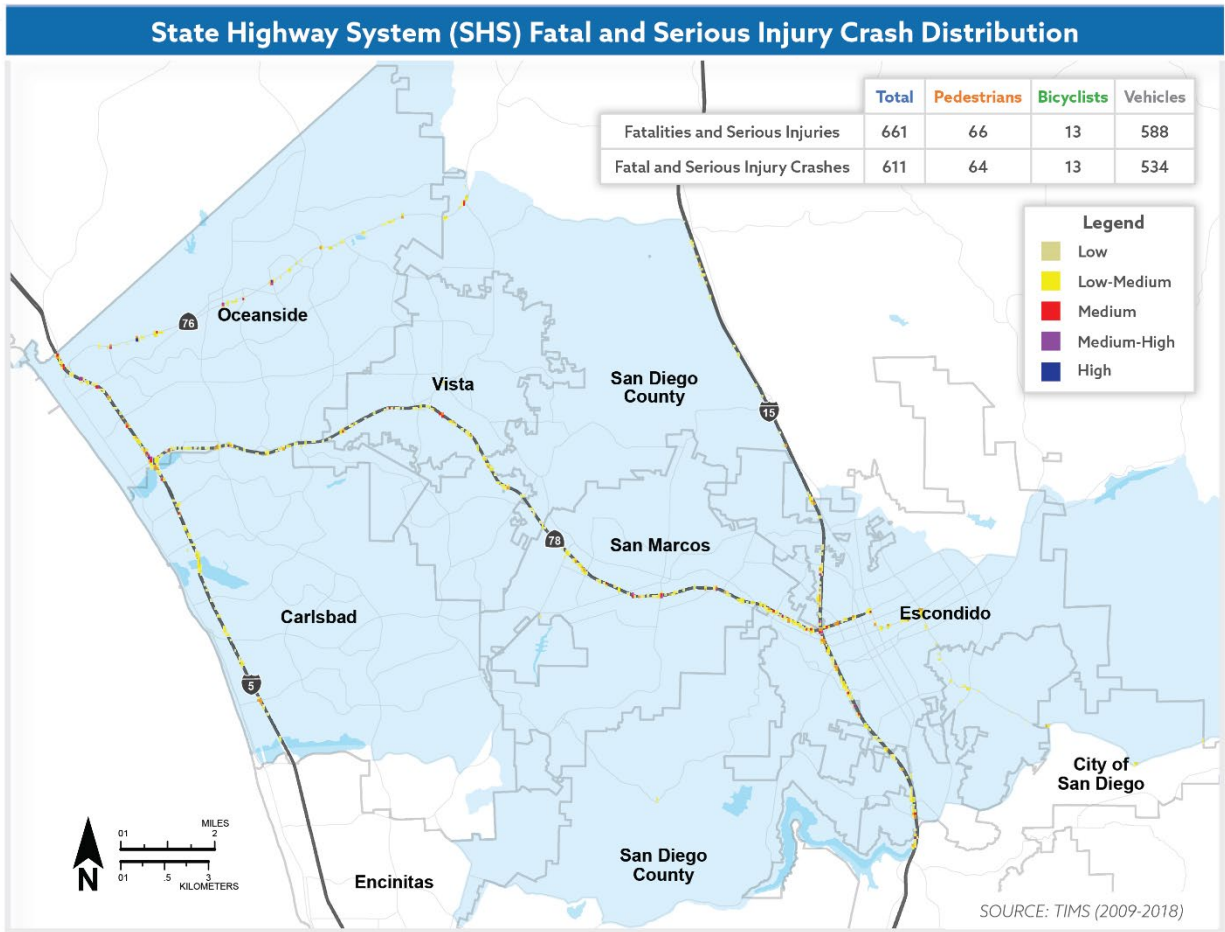
Source: TIMS (2009-2018)

Table 2: Top Hot Spot Assessment along SHS and Non-SHS by Segment for North County CMCP Subregion

Segment Location	SHS	Non-SHS	Number of Injury-Related Collisions
SR 78 (El Camino Real – College Boulevard)	✓		31
SR 78 (Nordahl Rd – I-15)	✓		30
I-15 (Citricado Pkwy – Via Rancho Pkwy)	✓		24
I-15 (El Norte Pkwy – SR 78)	✓		23
SR 78 (Woodland Pkwy – Citricado Pkwy)	✓		22
Carlsbad Blvd (Oceanview Dr – Island Wy)		✓	9
Oceanside Blvd (Corporate Centre Dr – Commerce Center)		✓	7
River Rd (Stallon Dr – Wilshire Rd)		✓	5
Mission Ave (Airport Rd – Roymar Rd)		✓	4
Mission Rd (Bougher Rd – Avenida Chapala)		✓	4

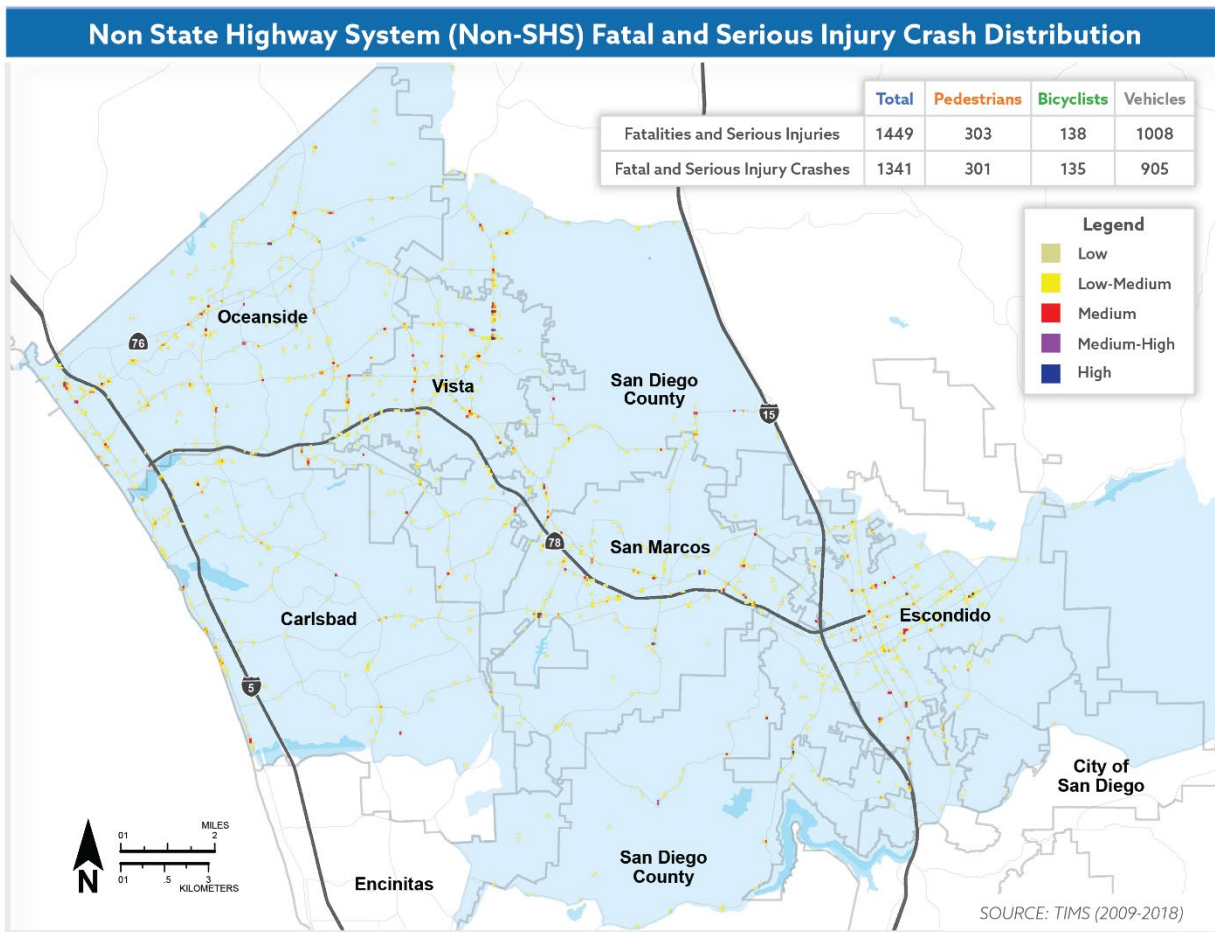
Source: TIMS (2009-2018)

Figure 1: SHS Fatal and Serious Injury Crash Distribution Map



Source: TIMS (2009-2018)

Figure 2: Non-SHS Fatal and Serious Injury Crash Distribution Map



Source: TIMS (2009-2018)

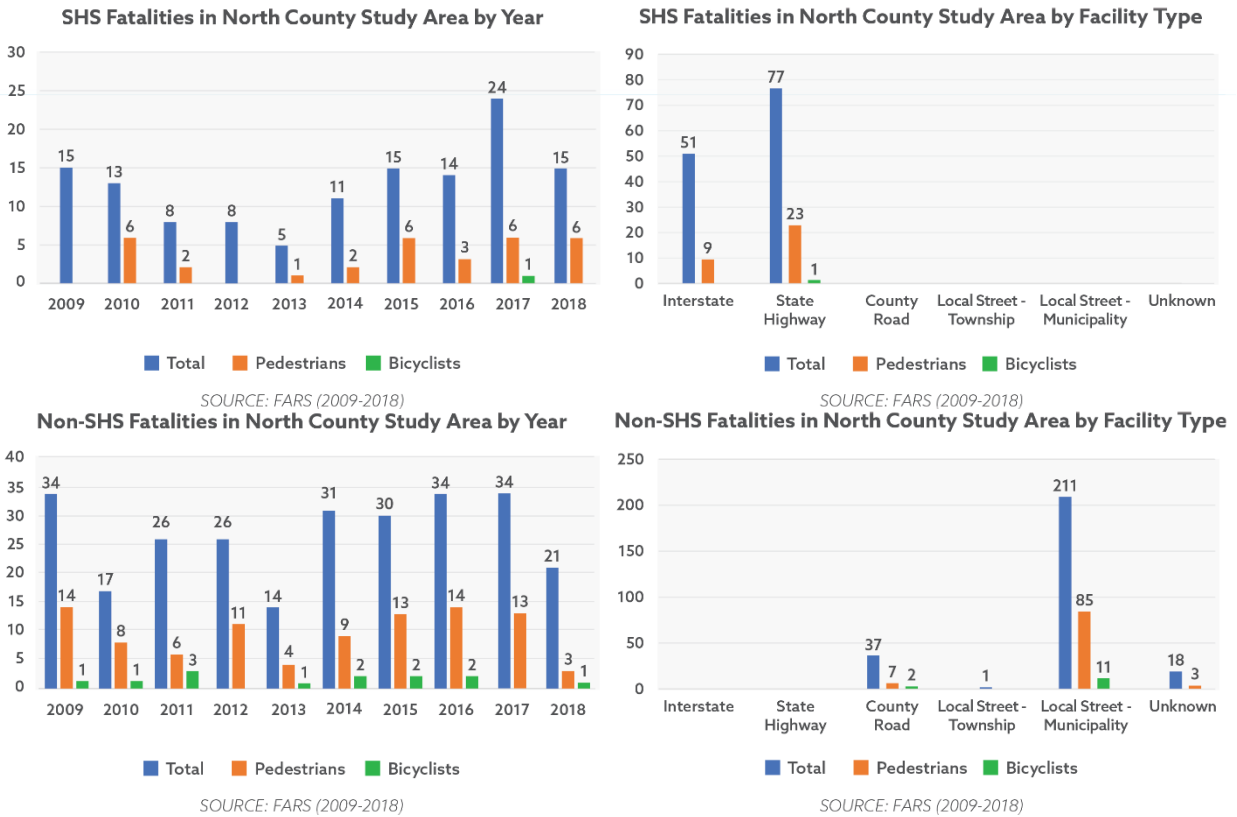
## Fatality Trends

The FARS dataset reports the number of fatalities resulting from a collision on the transportation network. The dataset includes information such as year, pedestrian fatality, and bicyclist fatality. The dataset was reviewed and organized to identify fatality trends on the SHS and non-SHS by year between the 10-year period. **Figure 3** shows the total number of fatalities by year and the number of pedestrian and bicyclist fatalities by year.

The analysis of the FARS dataset revealed an upward trend in fatalities between 2013 and 2017 for both the SHS and non-SHS. The review showed that about 54 percent of fatalities (211 fatalities) occurred on local streets and about 32 percent of fatalities (128 fatalities) occurred on state highways or interstate facilities. In the last 10 years, 116 fatal crashes occurred on the state highway system occurred with 31 involving pedestrians and one involving bicyclists.<sup>2</sup> 255 fatal collisions occurred on local roads with 95 involving pedestrians and 13 involving bicyclists.<sup>1</sup> Reducing the rate and severity of collisions as well as reducing the collisions involving pedestrians and bicyclists on freeway facilities and local roads is necessary.

<sup>2</sup> Fatality Analysis Reporting System (FARS) (2009-2018)

Figure 3: SHS and Non-SHS Fatalities in North County Study Area by Year and by Facility Type

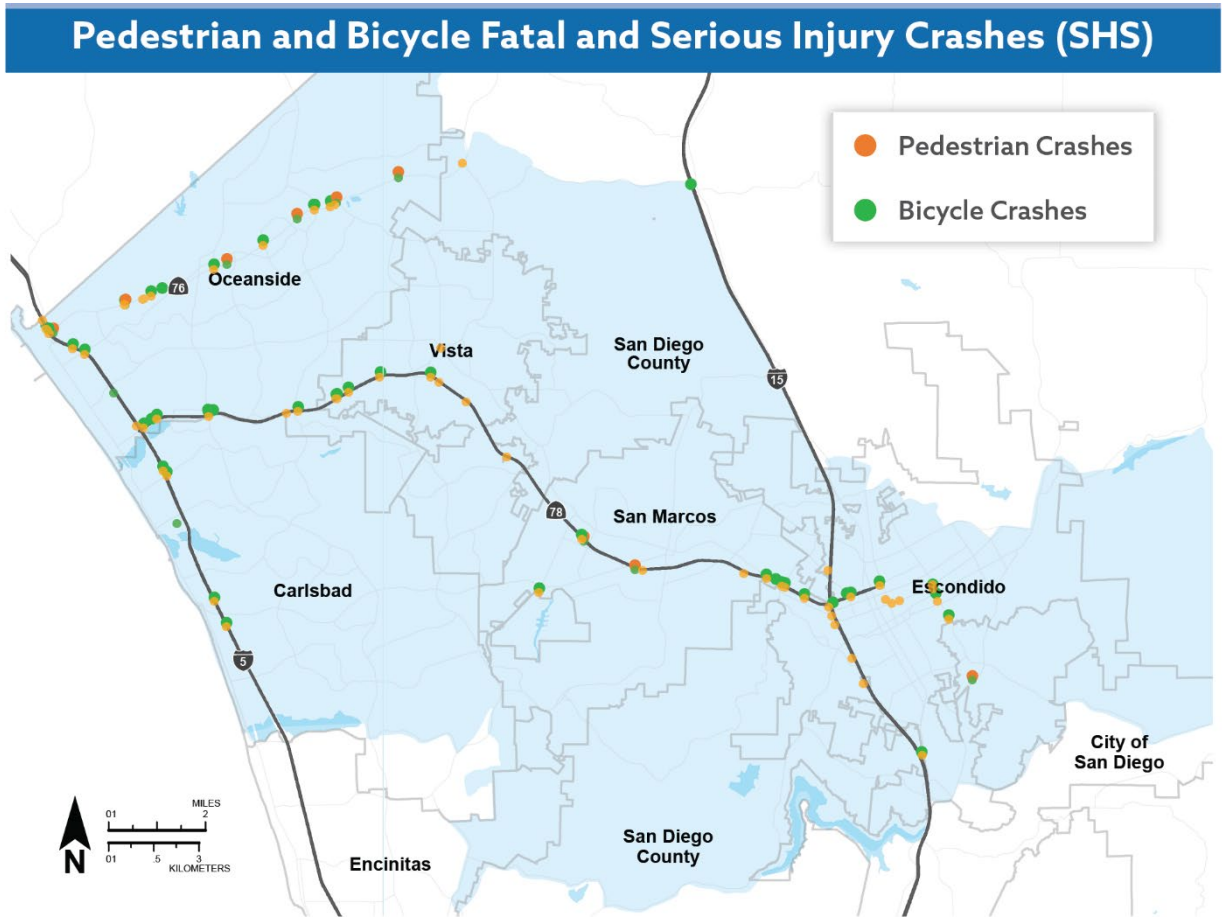


## Pedestrian-and Bicyclist-Involved Collisions

### LOCATIONS OF CONCERN

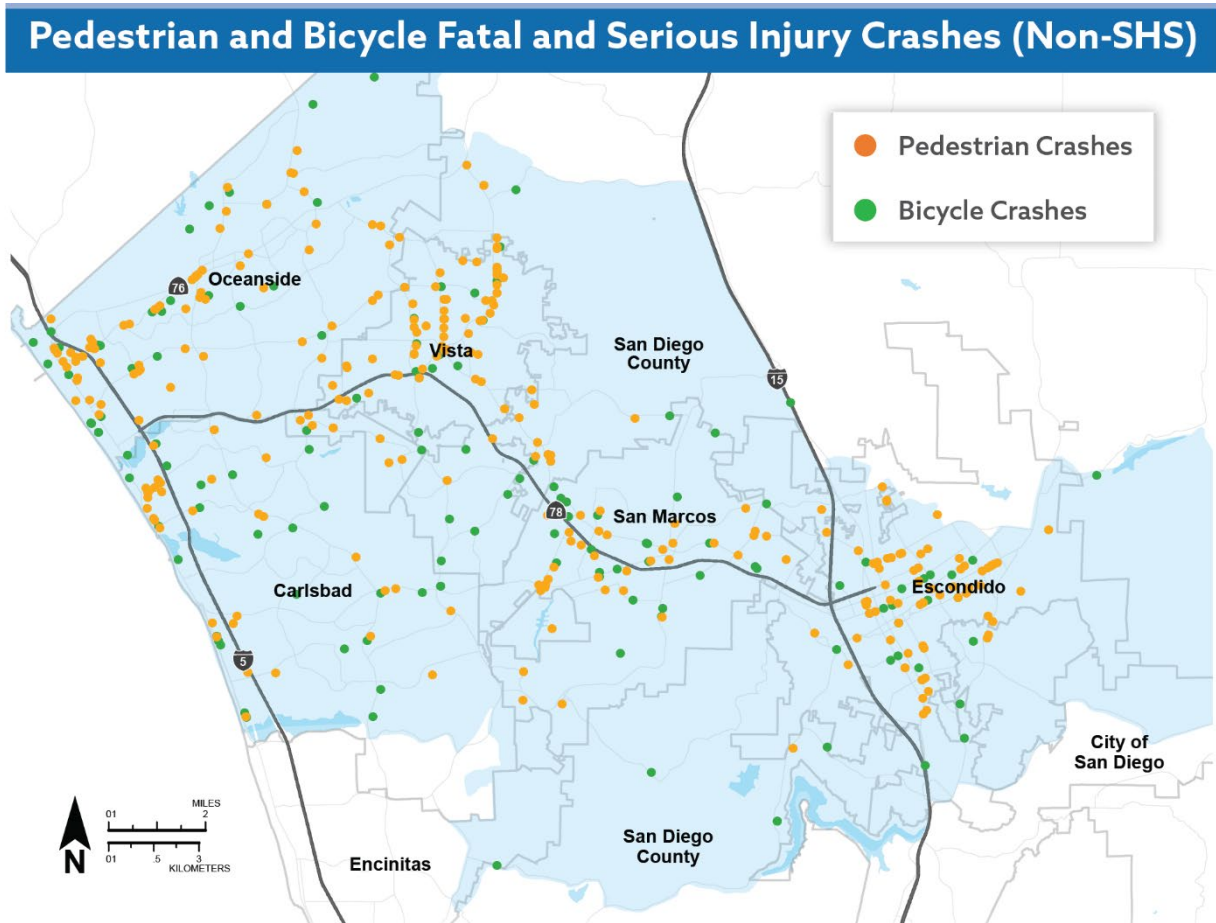
Pedestrians and bicyclists are some of the most vulnerable users on the roadway as their injuries from a collision are more likely to result in a serious injury or fatality, especially when a vehicle is involved. TIMS collision data provides not only location for a collision but also identifies whether a pedestrian or bicyclist was involved in the collision. **Figure 4** shows the pedestrian/bicyclist-involved collisions related to the SHS, particularly, at locations of on- and off-ramps. **Figure 5** shows the pedestrian/bicyclist-involved collisions on the non-SHS roadway network. These help visualize specific locations where there are clusters of pedestrian/bicyclist-involved collisions.

Figure 4: Pedestrian- and Bicyclist-Involved Collision Locations on SHS



Source: TIMS (2009-2018)

Figure 5: Pedestrian- and Bicyclist-Involved Collision Locations on Non-SHS



Source: TIMS (2009-2018)

## MOVEMENT PROCEEDING COLLISION

TIMS collision data follows the following hierarchy: Collision, Party, Victim. Collisions represent the actual crash themselves and parties involved; Parties are the key players in traffic collisions including drivers, pedestrians, bicyclists, and parked vehicles. Victims are the persons associated with each party. For example, a driver and their passenger are each a victim, but the driver is the party. For a single collision there is always at least one party and one victim. For this analysis, party-level data was pulled for Party 1 and Party 2.

The movement preceding collision is a characteristic provided in the party-level data that describes the movement the party was making before the collision. **Table 3** shows the movement preceding collision for vehicle-pedestrian and vehicle-bicyclist collisions where Party 1 and Party 2 are Drivers. **Table 4** shows the movement preceding collision for vehicle-pedestrian collisions where Party 1 and Party 2 are pedestrians. **Table 5** shows the movement preceding collision vehicle-bicyclist collisions where Party 1 and Party 2 are bicyclists.



Table 3. Driver Party Movements Preceding Collision for Vehicle-Pedestrian and Vehicle-Bicyclist Collisions (North County CMCP Subregion)

Movement Preceding Collision	Vehicle-Pedestrian Collisions	Vehicle-Pedestrian Collisions	Vehicle-Bicyclist Collisions	Vehicle-Bicyclist Collisions
	Party 1	Party 2	Party 1	Party 2
Backing	21	1	3	1
Changing Lanes	3	3	4	2
Crossed Into Opposing Lane	0	1	1	0
Entering Traffic	17	4	9	17
Making Left Turn	132	18	65	21
Making Right Turn	169	24	79	69
Making U-Turn	3	1	7	0
Merging	1	1	2	0
Not Stated	6	9	8	19
Other	13	2	3	0
Other Unsafe Turning	4	0	6	0
Parked	0	2	5	6
Parking Maneuver	1	0	2	2
Passing Other Vehicle	1	0	3	1
Proceeding Straight	186	288	87	148
Ran Off Road	8	0	3	0
Slowing/Stopping	4	4	4	5
Stopped	8	12	5	26
Traveling Wrong Way	0	0	0	1
<b>Subtotal Total</b>	<b>577</b>	<b>370</b>	<b>296</b>	<b>318</b>
<b>Total</b>	<b>Both Vehicle and Ped Parties:</b>	<b>947</b>	<b>Both Vehicle and Bike Parties:</b>	<b>614</b>

Table 4. Pedestrian Party Movements Preceding Collision for Vehicle-Pedestrian Collisions (North County CMCP Subregion)

Movement Preceding Collision	Vehicle-Pedestrian Collisions	Vehicle-Pedestrian Collisions
	Party 1	Party 2
Backing	1	1
Changing Lanes	0	0
Crossed Into Opposing Lane	1	0
Entering Traffic	42	15
Making Left Turn	4	3
Making Right Turn	2	0
Making U-Turn	0	0
Merging	0	0
Not Stated	162	297
Other	37	50
Other Unsafe Turning	1	0
Parked	0	0
Parking Maneuver	0	0
Passing Other Vehicle	0	0
Proceeding Straight	101	179
Ran Off Road	0	0
Slowing/Stopping	0	2
Stopped	7	22
Traveling Wrong Way	4	0
<b>Subtotal Total</b>	<b>362</b>	<b>569</b>
<b>Total</b>	<b>Both Vehicle and Ped Parties:</b>	<b>931</b>

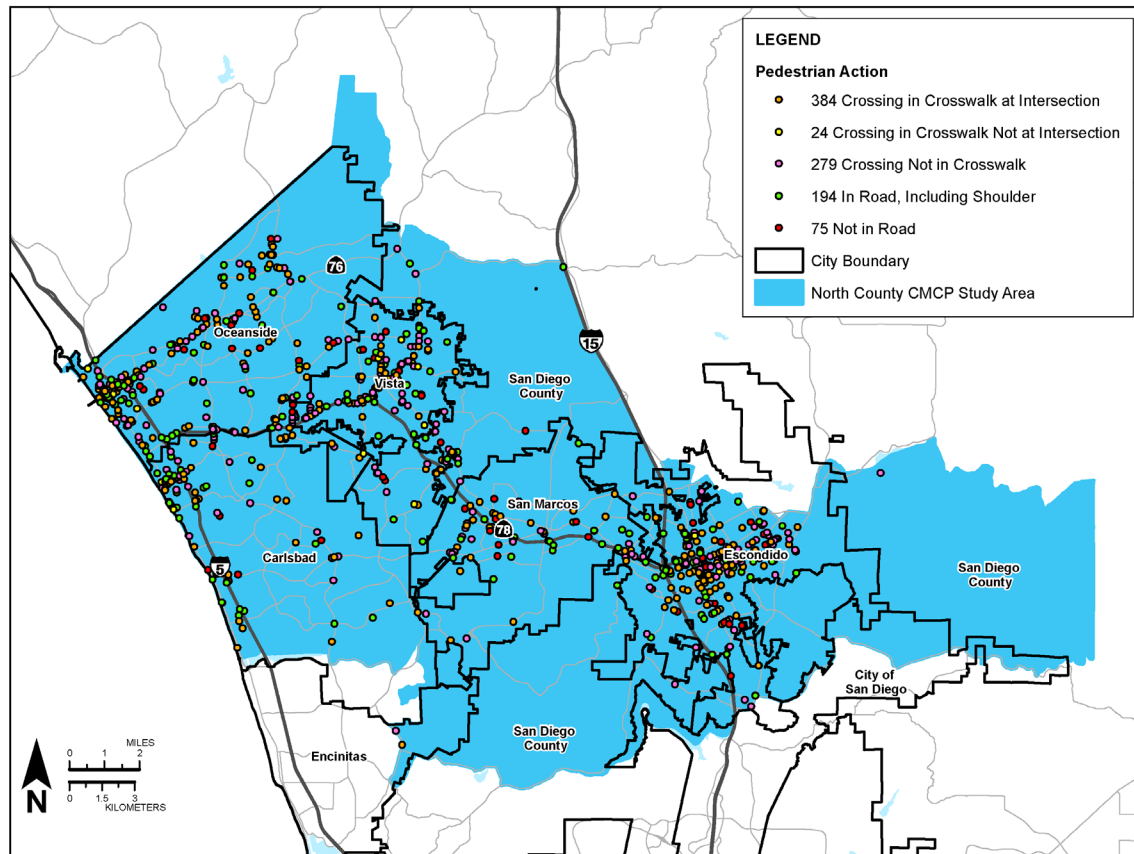
Table 5. Bicyclist Party Movements Preceding Collision for Vehicle-Bicyclist Collisions (North County CMCP Subregion)

Movement Preceding Collision	Vehicle-Bicyclist Collisions	Vehicle-Bicyclist Collisions
	Party 1	Party 2
Backing	0	0
Changing Lanes	8	2
Crossed Into Opposing Lane	1	0
Entering Traffic	17	3
Making Left Turn	20	13
Making Right Turn	7	5
Making U-Turn	0	0
Merging	1	0
Not Stated	3	4
Other	4	3
Other Unsafe Turning	12	4
Parked	0	0
Parking Maneuver	0	0
Passing Other Vehicle	3	1
Proceeding Straight	217	257
Ran Off Road	0	0
Slowing/Stopping	2	2
Stopped	1	2
Traveling Wrong Way	33	11
<b>Subtotal Total</b>	<b>329</b>	<b>307</b>
<b>Total</b>	<b>Both Vehicle and Bike Parties:</b>	<b>636</b>

## PEDESTRIAN ACTION

TIMS collision data reports the Pedestrian Action during a collision. Error! Reference source not found. **Figure 6** shows a map of pedestrian collisions throughout the SR 78 Study Area categorized by Pedestrian Action.

Figure 6: Pedestrian Action (North County CMCP Subregion)

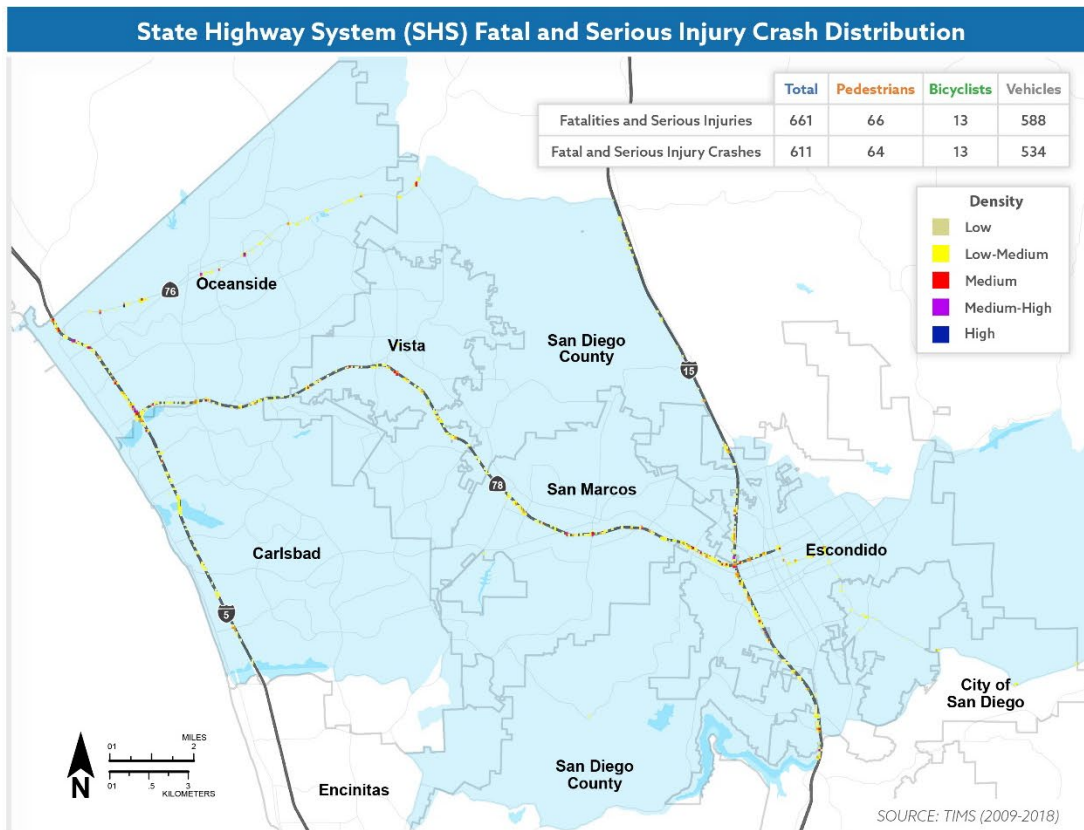


Source: TIMS (2009-2018)

## Safety Fact Sheets

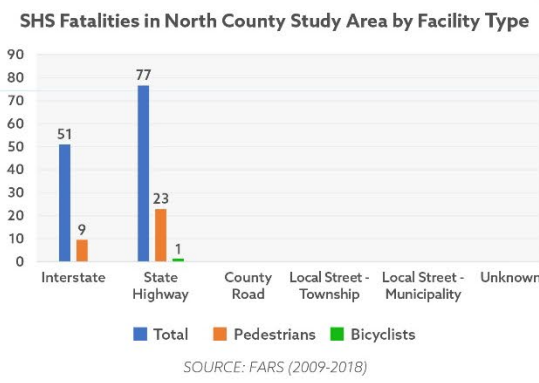
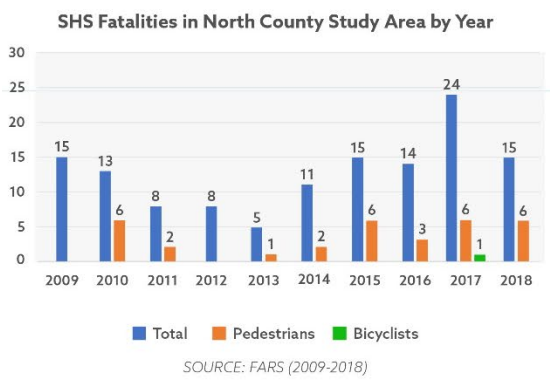
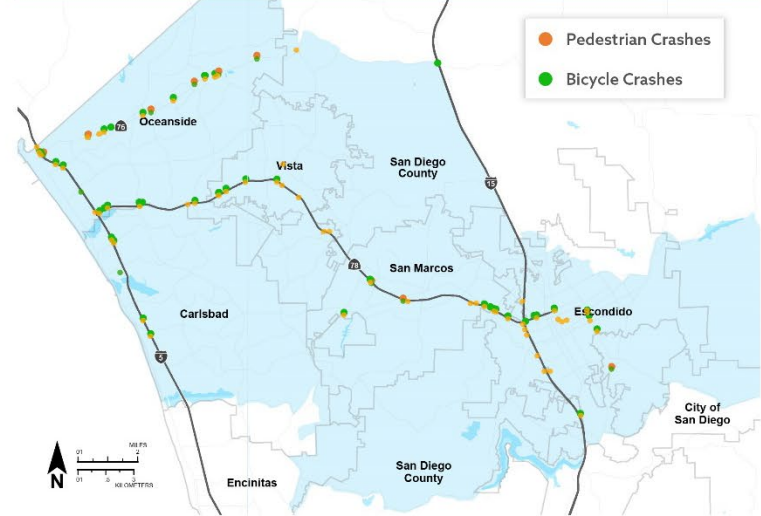
Key findings from the collision analysis were compiled and developed into two safety fact sheets – one for SHS and another for Non-SHS.

Figure 7: State Highway System (SHS) Safety Fact Sheet



### North County CMCP Fatalities Factsheet

#### Pedestrian and Bicycle Fatal and Serious Injury Crashes (SHS)

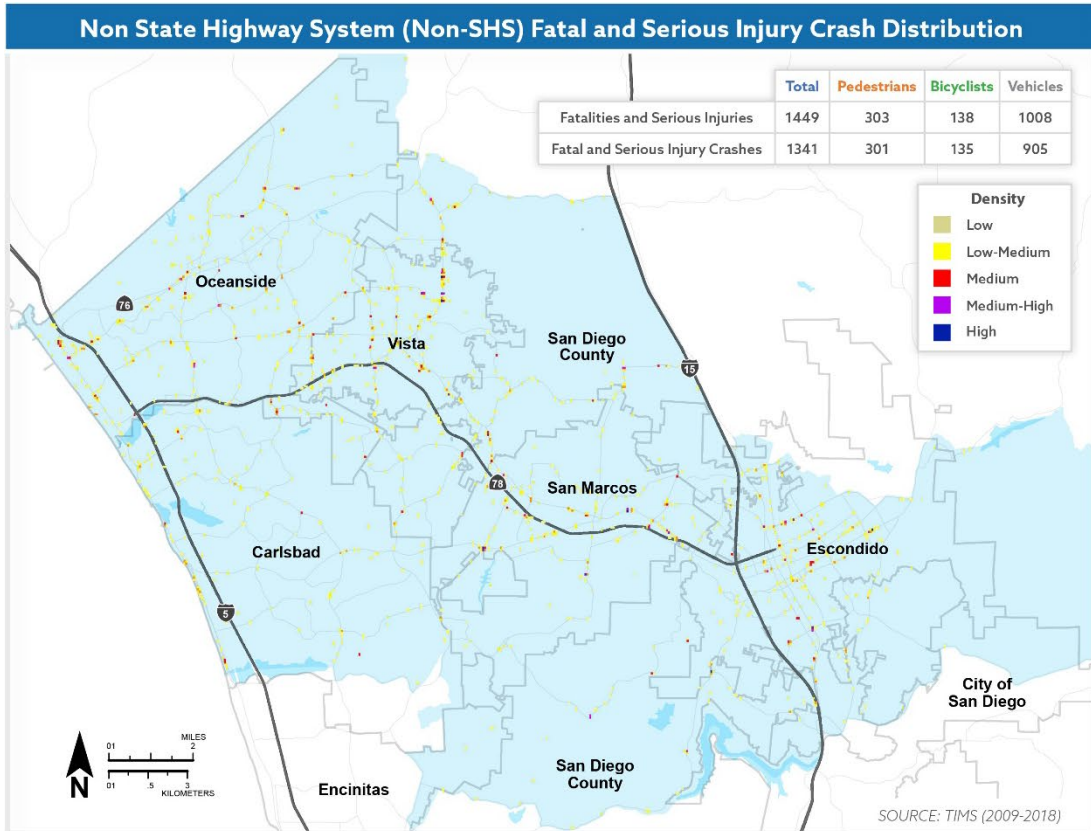


#### SHS Locations (Fatalities & Serious Injuries)

INTERSECTIONS		SEGMENTS	
SR-78 & Broadway	6	SR-78 (El Camino Real - College Blvd)	31
SR-76 & Vista Way	6	SR-78 (Nordahl Rd - I-15)	30
SR-76 & Benet Rd	5	I-15 (Citricado Pkwy - Via Rancho Pkwy)	24
SR-76 & Old Grove Rd	5	I-15 (El Norte Pkwy - SR-78)	23
SR-76 & Canyon Dr	4	SR-78 (Woodland Pkwy - Citricado Pkwy)	22

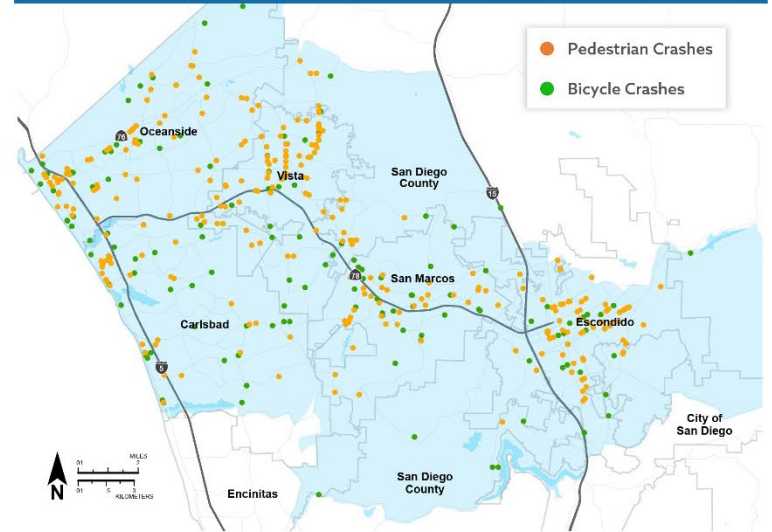
SOURCE: TIMS (2009-2018)

Figure 8: Non State highway System Safety Fact Sheet

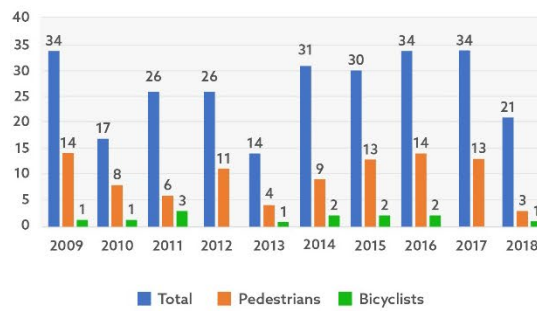


## North County CMCP Fatalities Factsheet

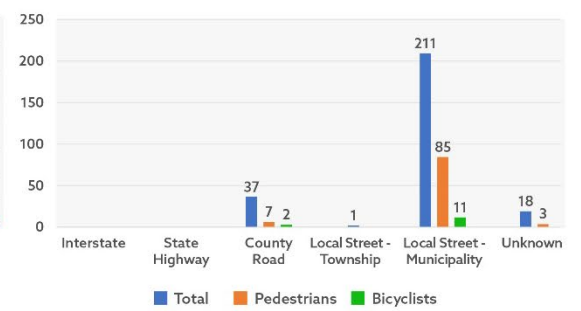
### Pedestrian and Bicycle Fatal and Serious Injury Crashes (Non-SHS)



Non-SHS Fatalities in North County Study Area by Year



Non-SHS Fatalities in North County Study Area by Facility Type



### Non-SHS Locations (Fatalities & Serious Injuries)

INTERSECTIONS		SEGMENTS	
Rancho Santa Fe Rd & San Marcos Blvd	7	Carlsbad Blvd <i>(Oceanview Dr - Island Way)</i>	9
Arcadia Ave & Vista Way	6	Oceanside Blvd <i>(Corporate Centre Dr - Commerce Center)</i>	7
Mission Rd & Mulberry Dr	6	River Rd <i>(Stallon Dr - Wilshire Rd)</i>	5
Harmony Grove Rd & Questhaven Rd	6	Mission Ave <i>(Airport Rd - Roymar Rd)</i>	4
Vista Way & Monte Mar Rd	5	Mission Rd <i>(Bougher Rd - Avenida Chapala)</i>	4

SOURCE: TIMS (2009-2018)