

Appendix E: Collision Assessment





MEMORANDUM

Date: February 10, 2017
To: Brent Pearse, VTA
From: Carrie Modi and Matt Haynes, Fehr & Peers
Subject: Story-Keys Complete Streets Study: Safety Assessment

OK16-0122

This memorandum presents the results of the Story-Keys Corridor Complete Streets Study existing conditions safety assessment. In April 2015, the City of San Jose adopted Vision Zero San Jose which outlines an action plan for reducing the incidence of traffic deaths to zero. This safety assessment is broadened slightly from Vision Zero San Jose in that it focuses on all injury collisions. As a result, the City of San Jose Collision database was used to analyze collision trends and profiles on the corridor, particularly focused on the most vulnerable roadway users: people who walk and people who bicycle. The last five complete and available years (2010-2015) of reported collisions that occurred on the Story-Keys study corridor were analyzed. This includes Willow Street, Graham Avenue, Goodyear Street, Keyes Street, and Story Road between SR 87 and Capitol Expressway.

COLLISIONS ANALYSIS FRAMEWORK

In order to better understand collisions on the corridor, collision profiles were utilized. Collision profiles consist of one or more collision, victim, or infrastructure related variables that, when considered together, help explain the types of collision that are occurring the corridor. They can identify collision trends and be used to identify infrastructure, education, and/or enforcement related countermeasures. Collision profiles are typically specific to travel mode and can help identify factors contributing to collisions such as age, location or roadway characteristics. For example, a safe routes to school profile might consist of all bicycle and pedestrian collisions on the corridor that involved school-aged children 5 to 17 and that occurred within 1/4 mile of a school site.



Additionally, roadway and land use characteristics vary substantially on the Story-Keyes corridor. In particular, the the segment between SR 87 and Senter Road (the “western half of the corridor”) and Senter Road to Capitol Expressway (the “eastern half of the corridor”) vary the most in terms of number of travel lanes and land development patterns. As a result, the corridor was split into two segments to provide a finer-grained understanding of trends on the corridor. The western segment is characterized by shorter block lengths and a grid-based street pattern, generally lower automobile speeds and some dedicated bicycle facilities. The eastern segment generally has higher automobile speeds, a wider cross section, long block lengths and long gaps in bicycle lanes. All collisions on the corridor are mapped in **Figure 1** (Western segment) and **Figure 2** (Eastern Segment).

CORRIDOR OVERVIEW

In total, 886 collisions were reported on the corridor between 2010 and 2015. Of those, auto collisions were the most common on the corridor, accounting for 84 percent of total reported injury collisions. Bicycle collisions account for 11 percent of the collisions on the corridor and pedestrian collisions account for 6 percent. There were 36 fatal or severe injury collisions on the corridor during the study period, and of those 50 percent involved pedestrians (18 collisions) and 25 percent involved bicyclists (9 collisions). **Table 1** breaks down the total reported collisions by mode.

• **TABLE 1: REPORTED COLLISIONS-ON THE CORRIDOR BY MODE**

Mode	Number of Collisions	Fatal or Injury Collisions	Percentage of Total Collisions
Automobile-Automobile	740	9 severe, 0 fatal	84%
Bicycle-Automobile	94	8 severe, 0 fatal	11%
Pedestrian-Automobile	52	15 severe, 3 fatal	6%
Total	886	32 severe, 3 fatal	100%

Source: City of San Jose, Collision Database, 2010-2015.

Fatal Collisions and Vision Zero

The portion of Story Road between McLaughlin Avenue and Capitol Expressway is identified in Vision Zero San Jose as being part of its ‘safety priority streets’. That is to say, that it has one of the



highest incidences of fatal collisions citywide.¹ The portion identified in Vision Zero San Jose had one fatal collision during the reporting period. The entire corridor had three fatal collisions during the same period, all of which were pedestrian-automobile collisions.

BICYCLE-INVOLVED COLLISIONS

82 bicycle-involved injury collisions occurred on the corridor between 2010 and 2015, accounting for approximately eleven percent of all reported collisions. Eight of the bicycle collisions on the corridor were categorized as a severe injury collision, three of which occurred at or near the intersection of First and Goodyear streets. Two major bicycle collisions also occurred at the US-101 Interchange. All bicycle injury collisions are mapped on **Figures 1 and 2**. The following bicycle-related collisions profiles were observed on the corridor:

- **Lack of Dedicated Bicycle Facilities:** The most prominent collision trend on the corridor consists of collisions that occurred at locations that lack dedicated bicycle facilities, such as bicycle lanes or separated bikeways. As shown in **Figures 1 and 2**, approximately 48 percent of bicycle collisions on the corridor occurred in areas in which dedicated bicycle facilities do not exist. Approximately 40 percent of the corridor has dedicated bicycle facilities. The majority of the western half of the corridor has bicycle facilities and has a lower number of bicycle collisions (20) in comparison to the eastern half, which largely does not have bicycle facilities and had 74 collisions.
- **Child-Involved Collisions near Schools:** Another collision profile found on the corridor is collisions involving children near schools. Many public and private schools are within 1/4 mile of the corridor. During the study period, four percent of all bicycle collisions involved a school-age child (age 5-17) and occurred within 1/4 mile of a school.
- **Right-Turn Hook Collisions:** Right-turn hook collisions accounted for 36 percent (34 collisions) of all bicycle injury collisions. These occur when a vehicle made a right turn and collided with a cyclist.

Table 2 identifies these collision profiles and countermeasures that seek to decrease the occurrence of these types of collisions.

¹ City of San Jose Vision Zero Action Plan <https://www.sanjoseca.gov/DocumentCenter/View/42849>



TABLE 2: COLLISION PROFILES-BICYCLES

Collision Profile	Number of Collisions		Potential Countermeasure
	West Segment	East Segment	
Lack of Dedicated Bicycle Facility	4	41	<ul style="list-style-type: none"> • Sign and stripe dedicated bicycle facilities, such as a bicycle lanes or separated bikeways, where not present
Vehicle Making Right Turn	9	25	<ul style="list-style-type: none"> • Signalize uncontrolled locations • Conflict zone striping • Protect right turns at existing signals
Children Near Schools on Bikes	1	2	<ul style="list-style-type: none"> • Safe Routes to School Education • Walk and Roll Map • Sign and stripe dedicated bicycle facilities, such as a bicycle lanes or separated bikeways, where not present • Provide safe bicycle crossings for students traveling north-south across the corridor

Source: Fehr & Peers, City of San Jose, Collision Database, 2010-2015.

PEDESTRIAN INJURY COLLISIONS

52 pedestrian-auto injury collisions were reported on the corridor between 2010 and 2015. Pedestrian collisions on the study corridor occurred less frequently but were more severe than bicycle collisions, as 35 percent (18 collisions) of recorded injuries were reported as severe or fatal and all collisions resulted in some type of injury. Three fatal pedestrian collisions occurred between 2010 and 2015. About three-fourths of all pedestrian collisions occurred at an intersection. Pedestrian injury collisions are mapped on **Figures 1** and **2**. The following pedestrian related collision profiles were observed on the corridor:

- **Lack of crossing infrastructure:** This collision profile is one of the most prominent on the corridor as seen in **Table 3** below. This type of collision, which occurs when a pedestrian is not crossing at a legal crosswalk (either marked or unmarked), may be attributed to unmet pedestrian desire lines and infrequent crossing infrastructure. Collisions where a vehicle collides with a pedestrian in the roadway may also occur during midblock crossings or at crossings which are uncontrolled and unmarked. 39 percent (7



collisions) of severe or fatal collisions on the corridor occurred when a pedestrian was crossing outside of a crosswalk.

- **Left Turn Hook Collisions:** Similar to the prevalent bicycle collision profile, this collision occurs when a left turning vehicle collides with a pedestrian. 23 percent of pedestrian injury collisions are left turn hook collisions.
- **Child Involved Collisions Near Schools:** Another collision profile found on the corridor is collisions involving children near schools. Many public and private schools are within 1/4 mile of the corridor. During the study period, eight percent of all pedestrian collisions involved a school-age child (age 5-17) and occurred within 1/4 mile of a school.

Table 3 below identifies the frequency of the collisions summarized above and potential countermeasures to reduce their occurrence.

TABLE 3: COLLISION PROFILES-PEDESTRIANS

Collision Profile	Number of Collisions		Countermeasure
	Western Segment	Eastern Segment	
Lack of Crossing Infrastructure	3	12	<ul style="list-style-type: none"> • Sign and stripe crossing infrastructure at unmarked locations
Vehicle Making Left Turn	2	10	<ul style="list-style-type: none"> • Signalize uncontrolled locations • Protect left turns at existing signals
Children Near Schools	1	3	<ul style="list-style-type: none"> • Safe Routes to School Education • Walk and Roll Map

Source: Fehr & Peers, City of San Jose, Collision Database, 2010-2015.

Automobile Injury Collisions

Automobile injury collisions account for 271 reported collisions on the corridor. A large portion of reported automobile injury incidents were caused by rear end collisions. Drivers involved in injury automobile collisions were also more often reported turning left in comparison to right or U-turn movements. Other collision profiles observed on the corridor included collisions due to unsafe speeds or lack of adherence to traffic signs and signals. The remaining collisions occurred due to a



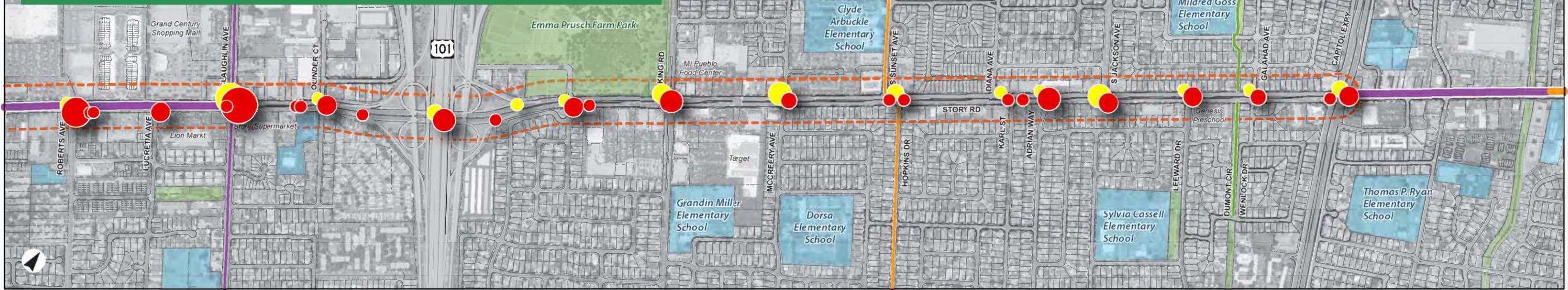
variety of different violations, ranging from unsafe lane changes to following too closely. A substantial number of collisions did not state a violation category.

TABLE 4: COLLISION PROFILES-AUTOMOBILES

Collision Profile	Number of Collisions
Rear End	116 (43%)
Left Turning Vehicles	51 (19%)

Key Profiles for Pedestrian and Bicycle Injury Collisions

Eastern Corridor, from Senter Road to Capitol Expressway



Reported Pedestrian Injury Collisions

43



23% of these injury collisions occurred as the vehicle was approaching a left turn signal.



72% of these injury collisions occurred while pedestrians were crossing at a crosswalk. 28% occurred where pedestrians were crossing at a location without a crosswalk.



7% of these injury collisions occurred within 1/4 mile of schools, and affected pedestrians ages 5-17.



Reported Bicycle Injury Collisions

64



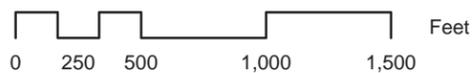
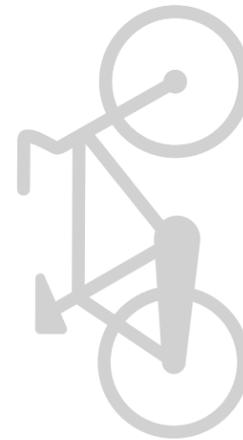
41% of these injury collisions occurred on roads without dedicated bicycling facilities. Bicycle paths, lanes, and routes often create an exclusive space for bicyclists to ride at their preferred speed without interference.



34% of bicycle collisions were right-hook collisions, occurring when a vehicle made a right turn and collided with a cyclist.



3% of these collisions occurred within 1/4 mile of schools and affected bicyclists ages 5-17.



January 2017

Source: CITY OF SAN JOSE COLLISION DATABASE 2010-15 SANTA CLARA COUNTYWIDE BICYCLE MASTER PLAN, FEHR AND PEERS, 2017

Story-Keys Complete Streets Study

--- Story-Keys Study Corridor

● Pedestrian Collision
● Bicycle Collision

Number of Collisions



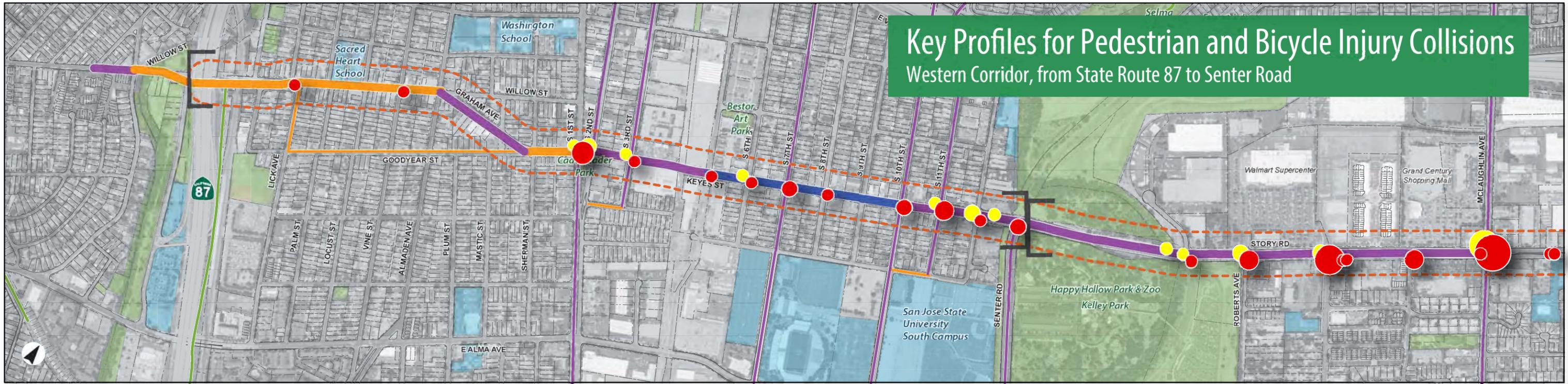
Bicycle Facilities

— Class 1: Bicycle Path
— Class 2: Bicycle Lane
— Class 2B: Buffered Bicycle Lane
— Class 3: Bicycle Route



Key Profiles for Pedestrian and Bicycle Injury Collisions

Western Corridor, from State Route 87 to Senter Road



Reported Pedestrian Injury Collisions **9**



22% of these injury collisions occurred as the vehicle was approaching a left turn signal.



67% of these injury collisions occurred while pedestrians were crossing at a crosswalk. 33% occurred where pedestrians were crossing at a location without a crosswalk.



11% of these injury collisions occurred within 1/4 mile of schools, and affected pedestrians ages 5-17.



Reported Bicycle Injury Collisions **18**



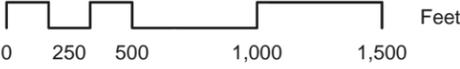
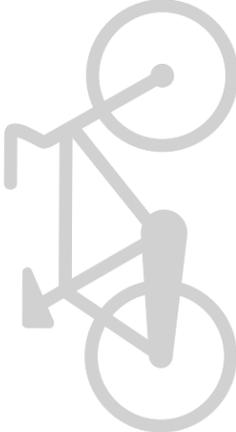
20% of these injury collisions occurred on roads without dedicated bicycling facilities. Bicycle paths, lanes, and routes often create an exclusive space for bicyclists to ride at their preferred speed without interference.



45% of bicycle collisions were right-hook collisions, occurring when a vehicle made a right turn and collided with a cyclist.



6% of these collisions occurred within 1/4 mile of schools and affected bicyclists ages 5-17.



January 2017

Source: CITY OF SAN JOSE COLLISION DATABASE 2010-15 SANTA CLARA COUNTYWIDE BICYCLE MASTER PLAN, FEHR AND PEERS, 2017

Story-Keyes Complete Streets Study

<ul style="list-style-type: none"> --- Story-Keyes Study Corridor ● Pedestrian Collision ● Bicycle Collision 	<p>Number of Collisions</p> <table border="0"> <tr> <td>○ 1</td> <td>○ 3</td> <td>○ 6</td> </tr> <tr> <td>○ 2</td> <td>○ 4</td> <td>○ 9</td> </tr> </table>	○ 1	○ 3	○ 6	○ 2	○ 4	○ 9	<p>Bicycle Facilities</p> <ul style="list-style-type: none"> — Class 1: Bicycle Path — Class 2: Bicycle Lane — Class 2B: Buffered Bicycle Lane — Class 3: Bicycle Route
○ 1	○ 3	○ 6						
○ 2	○ 4	○ 9						