TO: City of San Diego

FROM: Sasha Jovanovic, CR Associates

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RE: San Diego Bicycle Master Plan Collision Analysis

Introduction

This memorandum summarizes information from 92 bicyclist-involved collisions in San Diego which resulted in either a severe injury or fatality over a period of five years between 2019 and 2023. Each collision's notable attributes (party characteristics, injury severity, type of impact, primary collision factors, etc.) are analyzed and locations and environments in the City where collisions have occurred disproportionately are identified. Findings and narratives from this memo will be incorporated into the Bicycle Master Plan Update's assessment of existing conditions.

Data Sources

The City of San Diego provided historic records maintained by the San Diego Police Department of severe or fatal traffic collision locations through the end of 2023. These records have been vetted by City of San Diego staff for locational accuracy and final injury severity prior to analysis.

The City's data consisted of a generalized block address, injury severity and the date of the collision. To supplement the City's dataset and obtain additional collision attributes, the City's data was matched with corresponding records in the Statewide Integrated Traffic Records System (SWITRS). The SWITRS database contains a wider set of standardized attributes for traffic collisions, regardless of injury severity, reported to police departments across the state. SWITRS database collision attributes are based on police officer reports taken at the scene of the collision. These reports reflect their judgment and assessment at the time it occurred with the information they had available. This information is occasionally subject to later revision, which is why this report gives preference to analyzing the City of San Diego's data source, when its attributes are available.

Data Methods

Criteria used to determine a match between a City-sourced data record and its corresponding SWITRS record included finding consistency between the records' classification of the transportation mode(s) involved (confirming the involvement of a bicyclist), the records' injury severity, the date of the collision, and the geographic location provided by cross-streets or address. Eighty-seven (87) of the City's 92 records were matched with a corresponding SWITRS record to a high or reasonable degree of certainty. Some City records matched with a corresponding SWITRS record on multiple but not all criteria. These cases were ruled as matches with reasonable (though not 100%) certainty. For example, some records may have had close but slightly different dates, but all other criteria matched. There were some records, when compared, which matched dates, injury severity and geographic criteria, though were classified as involving a different mode (a motorcyclist instead of a bicyclist, for example). Another common scenario when records did not match entirely on all criteria was in the classification of injury severity. All fatal injury collisions, however, were matched successfully and analyzed in this memo.

For the five cases where a match could not be established, there were no corresponding SWITRS records which met any of the mode, geographic location, or injury severity criteria occurring within a reasonably close timeframe of the date listed in the City-sourced data. Where this memo's analysis examines variables only available from the SWITRS database (Tables 2 through 5), those five records are excluded from or listed as missing in the summaries. Otherwise, all 92 records are included in the summaries.

Collision Severity and Longitudinal Trends

Table 1 summarizes bicyclist-involved collisions between 2019 and 2023 by the year in which they occurred. The data shows an annual citywide average of approximately 15 severe injury collisions per year and three fatal injury collisions per year. It has been widely documented that the early stages of the COVID-19 pandemic contributed to lower travel activity for much of 2020, helping explain the sharp decrease in collisions of total bicycling collisions in 2020. Total collisions remained constant from 2020 to 2022. These years roughly approximate to the period where pandemic-related social distancing practices impacted levels of trip activity. However, with fewer collisions overall during that three-year stretch, it is notable that six bicycling fatalities occurred in 2021, more than any other year in the five-year period.

Table 1: Bicyclist-Involved Collisions per Year, 2019 to 2023

Year	Fatal Collisions[1]	Severe Injury Collisions[1]	Total Bicyclist Collisions[2]
2023	3	19	365
2022	2	16	323
2021	6	12	325
2020	3	9	324
2019	4	18	356
Total	*18 (1.1%)*	*74 (4.4%)*	*1,693 (94.5%)*
Mean per Year	**3.6**	**14.8**	**338.6**

Source: City of San Diego (2024) [1], SWITRS (2024) [2]

Over the five-year period, fatalities comprised about 1% and severe injuries about 4% of all police reported bicyclist collisions. Total bicyclist-involved collisions regardless of injury severity are about 339 per year.

Collisions by Party at Fault

Party at fault was not an available attribute from the City of San Diego-sourced collision data, hence the five collision records out of 92 which could not be matched to SWITRS were not analyzed. Of the 87 severe or fatal bicyclist-involved collisions with matches to corresponding SWITRS records, 71 involved a driver and their vehicle, 15 collisions were solo-bicyclist collisions, and one collision was bicyclist-pedestrian. All 16 of the City's fatal bicyclist-involved crashes over the five years of data involved a driver. Table 2 summarizes the party at fault by each type of collision.

Table 2: Severe and Fatal Collisions by Parties Involved

Parties Involved	Number of Collisions	Bicyclist at Fault	Non-Bicyclist at Fault	No Party at Fault
Bicyclist-Driver and their Vehicle	71	56.3% (40)	42.3% (30)	1.4% (1)
Solo-Bicyclist	15	86.7% (13)	n/a	13.3% (2)
Bicyclist-Pedestrian	1	0%	100% (1)	0%
Missing Data	5	n/a	n/a	n/a

Source: SWITRS (2024)

As shown, when bicyclists are involved in collisions with other parties, they are found at fault in collisions slightly more often (40 instances to 31, and one collision determined to have no party fault).

Collisions by Type of Impact

Table 3 summarizes the injury severity of bicyclist-involved collisions by the type of impact. Type of impact was not an available attribute from the City of San Diego-sourced collision data, hence the five collision records out of 92 which could not be matched to SWITRS were not analyzed. Of the 87 severe or fatal collisions where this attribute could be determined from SWITRS matches, broadside collisions were the most common collision type overall (though not the most common for fatal collisions). They represent over 40% of all severe injury collisions. Rear end collisions are the most common collision type that resulted in a bicyclist fatality. Exactly half of all bicycling fatalities were rear end collisions.

Table 3: Collisions by Type of Impact and Severity

Type of Impact	Combined Severe & Fatal	% of Combined	Severe Collisions	% of Severe	Fatal Bicyclist Collisions	% of Fatal
Broadside	**31**	**35.6%**	**28**	**40.6%**	3	16.7%
Rear End	21	24.1%	12	17.4%	**9**	**50.0%**
Other	10	11.5%	8	11.6%	2	11.1%
Overturned	8	9.2%	8	11.6%	-	-
Sideswipe	7	8.0%	4	5.8%	3	16.7%
Head-on	4	4.6%	3	4.3%	1	5.5%
Hit Object	4	4.6%	4	5.8%	-	-
Not Specified	2	2.3%	2	2.9%	-	-
Total	87	100%	69	100%	18	100%

***Bold** values = modal category*

Source: SWITRS (2024)

Table 4 summarizes bicyclist-involved collisions by type of impact and party at fault (excluding solo-bicyclist collisions). Between 2019 and 2023, there were 72 non-solo bicyclist collisions, with 18 resulting in fatality. Despite cyclists being at fault more often in collisions involving drivers, the driver was at fault more often when the outcome was fatal (11 instances to six).

Table 4: Collisions by Type of Impact and Party at Fault (Non-Solo Bicyclist Collisions)

Type of Impact	Bicyclist at-Fault	Bicyclist at-Fault Fatal Only	Non-Bicyclist at-Fault	Non-Bicyclist at-Fault Fatal Only	No Fault	No Fault Fatal Only
Broadside	**57.5% (23)**	**33.3% (2)**	25.8% (8)	9.1% (1)	-	-
Rear End	20.0% (8)	**33.3% (2)**	**42.0% (13)**	**63.6% (7)**	-	-
Other	2.5% (1)	-	16.1% (5)	9.1% (1)	**100% (1)**	**100% (1)**
Sideswipe	12.5% (5)	**33.3% (2)**	6.5% (2)	9.1% (1)	-	-
Head-on	2.5% (1)	-	6.5% (2)	9.1% (1)	-	-
Overturned	2.5% (1)	-	3.2% (1)	-	-	-
Not Specified	2.5% (1)	-	-	-	-	-
Total	40	6	31	11	1	1

***Bold** values = modal category*
Source: SWITRS (2024)

Broadsides occurred in most collisions with drivers when a cyclist was at fault. Rear end collisions were the most common type of collision when the driver was at fault (13 out of 31 instances) and the second most common type of collision when a cyclist was at fault (8 of 40 instances). Rear end collisions were by far the leading cause of a fatal bicyclist-involved collision when a driver was at fault.

Collisions by Violation Causes

Table 5 summarizes the violation causes of the 72 non-solo bicycling collisions grouped by primary collision factor. As shown, the most common violation category is unsafe left or right turn (all 14 violations were cited as CVC 22107[1]). Unsafe left or right turns occurred in almost 20% of all collisions analyzed. In the 14 collisions resulting from this violation, the cyclist and driver were at fault an equal number of times. Six of the 16 fatal bicyclist-involved collisions were attributed to this violation, with the driver at fault twice as often when the results were fatal.

Table 5: Collisions by Type of Impact and Party at Fault (Non-Solo Bicyclist Collisions)

Violation Category	Combined Severe & Fatal	Bicyclist at-Fault	Non-Bicyclist at-Fault	No Fault	Fatal Collisions Only	Bicyclist at-Fault	Non-Bicyclist at-Fault	No Fault
Unsafe Left or Right Turn	**19.4% (14)**	17.5% (7)	**22.6% (7)**	-	**33.3% (6)**	**33.3% (2)**	**36.4% (4)**	-
Failure to Yield to Party w/Right of Way	18.1% (13)	15.0% (6)	**22.6% (7)**	-	-	-	-	-
Unsafe Speeds	16.7% (12)	12.5% (5)	**22.6% (7)**	-	27.8% (5)	16.7% (1)	**36.4% (4)**	-
Traveling on Wrong Side of Road	16.7% (12)	**25.0% (10)**	6.5% (2)	-	5.5% (1)	16.7% (1)	-	-
Other Hazardous/Misc.	12.5% (9)	5.0% (2)	19.4% (6)	**100% (1)**	16.7% (3)	-	18.2% (2)	**100% (1)**
Disobeying Signals and Signs	11.1% (8)	17.5% (7)	3.2% (1)	-	-	-	-	-
Unsafe Lane Change	5.6% (4)	7.5% (3)	3.2% (1)	-	16.7% (3)	**33.3% (2)**	9.1% (1)	-
Total	72	40	31	1	18	6	11	1

***Bold** values = modal category*
Source: SWITRS (2024)

[1] CVC 22107: "No person shall turn a vehicle from a direct course or move right or left upon a roadway until such movement can be made with reasonable safety and then only after the giving of an appropriate signal in the manner provided in this chapter in the event any other vehicle may be affected by the movement."

Like unsafe turns, failure to yield to the party with the right of way was another common violation cause (18% of non-solo collisions) and fault for this violation was nearly equal between party types in those collisions. However, no fatalities occurred because of this violation.

Unsafe speeds were another common violation category (17%), with a driver committing this violation slightly more often in collisions attributed to this cause. Unsafe speeds resulted in five bicyclist fatalities (a driver was at fault in all but one of those five instances).

Unsafe lane changes were an infrequent violation category in collisions (6%), though were most likely to result in fatalities when occurring. Three of the four unsafe lane change attributed collisions were fatal. Bicyclists were at fault in these two of these collisions.

Traveling on the wrong side of the road was a common violation type that was heavily skewed toward bicyclist-at fault collisions (10 of the 12 collisions). Despite the high frequency of this violation category in bicyclist-involved collisions, only one fatality was attributed to it. Another violation which skewed heavily toward bicyclists at fault was disobeying signals and signs. Seven of 8 collisions of this violation category were attributed to cyclists. None of the eight collisions of this violation category were fatal.

Of the 15 solo-bicycling collisions, eight were attributed to unsafe speeds and five to unsafe left or right turns.

Collisions by Frequency of Locations

There is only one location in the City where multiple severe bicyclist-involved collision occurred: Balboa Avenue and Viewridge Avenue. The two collisions occurring at this location happened in 2019 and 2023.

Note: this assessment is limited due to the exclusion of non-severe/fatal collisions and the lack of geographic specificity in the City-provided GIS data. The Balboa/Viewridge and 9500 Balboa Avenue collisions in SWITRS are close enough by SWITRS distance offset to be reasonably defined within/near the same intersection. There are two records with 3600 Midway Avenue listed as the location, but they are over 300' apart when taking the SWITRS specified distance offset.

Collisions by Community Planning Areas

Table 6 shows the frequency of severe and fatal bicycling-involving collisions by Community Planning Areas (CPAs) (collisions on a CPA boundary were counted in both communities in the table). As shown, Peninsula had more bicyclist-involved severe injury collisions than any other community with nine. Mid-City: Eastern Area had the most fatal collisions of any community with three.

Table 6: Collisions by CPA

Community Planning Area	Severe and Fatal Collisions	Severe Collisions	Fatal Collisions
Peninsula	9	9	0
Uptown	8	8	0
Downtown	6	4	2
University	5	4	1
Mid-City: Eastern Area	4	1	3
Skyline-Paradise Hills	4	2	2
Mission Bay Park	4	3	1
Linda Vista	4	3	1
La Jolla	4	3	1
Kearny Mesa	4	4	0

Note this table counts collisions occurring on a CPA boundary in both CPAs
Source: City of San Diego (2024)

Table 7 shows the frequency of severe and fatal bicycling-involving collisions per capita by CPA, excluding communities with one or fewer collisions or a low population to avoid showing skewed data. When adjusting for population, Midway-Pacific Highway (5.3 collisions per 10,000 residents) and Barrio Logan (4.4 per 10,000) show the highest collision rates per capita.

Table 7: Collisions per Capita by CPA

Community Planning Area	Severe or Fatal Collisions[1]	Population[2]	Collisions per 10,000
Midway-Pacific Highway	3	5,677	5.3
Barrio Logan (including 32nd Street Naval Station area)	4	9,120	4.4
Kearny Mesa	4	11,458	3.5
Torrey Pines	2	6,496	3.1
Peninsula	9	42,604	2.1
Uptown	7	42,107	1.7
Ocean Beach	2	13,640	1.5
Black Mountain Ranch	2	14,745	1.4
La Jolla	4	30,200	1.3

Note: ranking excludes CPAs with fewer than two collisions or less than 3,000 population
Source: City of San Diego (2024) [1], SANDAG 2023 Estimates (2024) [2]

Collisions by Structurally Excluded Community Designation

Table 8 shows the frequency and rate of severe and fatal bicycling-involved collisions occurring within and outside of Structurally Excluded Communities. Structurally Excluded Communities are parts of San Diego that are designated as both Communities of Concern and Environmental Justice priority areas (identified in the General Plan's Environmental Justice element). These geographies comprise about 11% of the San Diego's geographic area and contain just over one quarter of its population. As shown, there is marginal difference in the rate per 100,000 Structurally Excluded Communities and Citywide rates.

Table 8: Collisions by Communities of Concern

Geographic Area	Severe or Fatal Collisions	Severe Collisions	Fatal Collisions	Population	Severe Collisions per 100,000	Fatal Collisions per 100,000

Within Structurally Excluded Communities	25	19	6	414,310	4.59	1.45
Outside of Structurally Excluded Communities	67	55	12	1,105,408	4.98	1.09
Citywide	92	74	18	1,519,718	4.87	1.18

Source: City of San Diego (2024)

Systemic Fatal Locations

The City of San Diego conducted a systemic safety analysis update in July 2024. The study analyzed ten years collision history (between 2014 and 2023) with the objective of identifying intersection environments where fatal injury collisions occurred disproportionately. The report identified four-lane by two-lane intersections with transit routes and a minimum of three injury collisions within the analyzed ten-year period as a priority environment for systemic safety improvements. About one quarter of fatal traffic collisions by any mode in the City over the ten year period occurred within these intersection environments (while these environments comprise only about 3% of all intersections in the City).

Four out of 18 fatal bicyclist-involved collisions (between 2019 and 2023) occurred within this systemic hotspot environment. These locations, with roadway the collision occurred on listed first and the intersecting cross-street listed second, were:

- Genesee Avenue and Sauk Avenue
- University Avenue and Alamo Drive
- Market Street and Fifth Avenue (signalized)
- Morena Boulevard and Napier Street

Only one of the systemic hotspot locations with a fatal bicycle collision, Genesee Avenue at Sauk Avenue, has an existing bicycle facility (Class II). The other systemic hotspot locations with fatal bicycle collisions all have previously planned bicycle facilities (Class II on University Avenue, Class III on Market Street, and Class IV on Morena Boulevard, respectively).

Three out of the 74 severe injury collisions (between 2019 and 2023) occurred within this systemic hotspot environments. These locations, with roadway the collision occurred on listed first and the intersecting cross-street listed second, included:

- Linda Vista Road and Fulton Street (signalized)
- Ingraham Street and Oliver Street
- Ingraham Street and Dana Landing Road/Perez Cove Way (signalized)

Two of the locations, Ingraham Street at Dana Landing Road/Perez Cove Way and Linda Vista Road at Fulton Street, have existing Class II bicycle facilities. The latter two locations have previously planned bicycle facilities (Class II on Ingraham Street, and Class IV (two-way) on Morena Boulevard, respectively).

All seven of the fatal and severe-injury bicyclist collisions occurred on the four-lane street. Except for the Market Street & Fifth Avenue collision (in Downtown San Diego) and Ingraham Street & Oliver Avenue (Pacific Beach) collisions, the environments had posted speed limits or 35 mph or greater. Drivers were at fault for five of the seven collisions. Three of the collisions, including two of the fatal collisions, were rear ends.

Citywide there are 487 systemic priority intersections, 299 of the systemic priority intersections have bicycle facility on one or both approaches. **Table 9** shows the distribution of systemic priority intersections by how they are configured with bicycle facilities. As shown, three of the four fatal bicyclist-involved collisions occurring at systemic priority intersections occurred at intersections with no bicycle facility on either cross-street.

Table 9: Systemic Priority Intersections with Existing Bicycle Facility

Bicycle Facility Characteristics	Number of Priority Intersections	Percent of Priority Intersections	Fatal Bicycle Collisions	Severe Bicycle Collisions
Bicycle Facility on Both Cross-Streets	31	6.4%	0	1
Bicycle Facility on Four-Lane Roadway Only	248	50.9%	1	1
Bicycle Facility on Two-Lane Roadway Only	20	4.1%	0	0
No Existing Bicycle Facility on Either Cross-Street	188	38.6%	3	1

Source: City of San Diego (2024)

Table 10 shows the bicycle facility classifications present at the 299 systemic priority intersections with existing bicycle facilities. As shown, when bicycle facilities are present at systemic priority intersections, the most common configuration is Class II on the four-lane street and no bicycle facility on the intersecting two-lane street. This configuration represents over half of all systemic priority intersections with bicycle facilities.

Table 10: Systemic Priority Intersections by Type of Bicycle Facility

Bicycle Facility on Four-Lane Street	Bicycle Facility on Two-Lane Street	Number of Priority Intersections	Percent of Priority Intersections
Class II	None	182	37.4%
Class III	None	34	11.4%
Bus-Bike Lane	None	17	5.7%
Class IV	None	15	5.0%
Class II	Class III	11	3.7%
Class II	Class II	10	3.3%
None	Class III	9	3.0%
None	Class II	6	2.0%
Class III	Class III	4	1.3%
Class IV	Class II	3	1.0%
None	Class IV	3	1.0%
Bus-Bike Lane	Class II	2	0.7%
None	Class IV (Two-Way)	2	0.7%
Bus-Bike Lane	Class IV	1	0.3%
Total Intersections with Bicycle Facility		**299**	**61.4%**

Source: City of San Diego (2024)

One of the objectives of the planned bicycle network will be to increase the quantity of systemic priority intersections with bicycle facilities from the current 61%, and to create more environments where both roadways have bicycle facilities. Presently only 6% of all systemic priority intersections have bicycle facilities on both intersecting roadways.

The installation of bicycle facilities at more systemic priority intersections will provide cyclists with their own space when maneuvering through intersections or treatments which provide separation or

exclusive travel phases. The implementation of some bikeways may also result in lane reductions to some four lane streets, which would also result in countermeasures which modify the characteristics of the identified systemic priority intersections.