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*VISION ZERO SUCCESS STORY — DATA*

# Systemic Safety Analysis — San Diego, California

## Key Successes

The Systemic Safety Analysis Reporting Program in San Diego resulted in the following outcomes:

- Identified grouping of crashes by roadway user type and by location type.
- Identified left-turn permissive phases as a key concern.
- Identified 60 implementation locations for Leading Pedestrian Intervals (LPIs) with "No Turn" signs that activate when an LPI is in use.[1]
- Prioritized roundabouts as an essential countermeasure to improve safety for all modes and achieve Vision Zero in the long run.[2]

## Background

In 2015, the City of San Diego adopted a Vision Zero approach to eliminate fatalities and serious injuries on City streets by 2025. This approach included the development and implementation of strategies in the areas of engineering, enforcement, and education. A key element of the City's Vision Zero program was to use data to select projects with the greatest safety benefit. This data-driven philosophy was encapsulated in the City's Systemic Safety Analysis Reporting Program (SSARP). The Safe Transportation Research and Education Center at the University of California, Berkeley assisted with the development of SSARP, which included standardizing processes to perform crash analyses, identifying safety issues, and developing a list of low-cost proven safety countermeasures. The systemic safety approach evaluated the City's entire roadway network, rather than individual high-crash locations, and identified high-risk roadway features correlated with common crash types.

## Implementation

The SSARP grouped locations that had similar characteristics. The City-wide analysis of crashes revealed that many reported crashes occurred at intersections. The SSARP further revealed many mid-block crashes occur within proximity to intersections and exhibit crash characteristics different from other mid-block crashes further away from intersections. As a result, the City created three crash location categories: crashes at intersections, crashes within an intersection influence area (for those mid-block crashes within

[1] Federal Highway Administration. (2017). "Leading Pedestrian Intervals". https://safety.fhwa.dot.gov/provencountermeasures/lead_ped_int/

[2] Federal Highway Administration. (2017). "Roundabouts". https://safety.fhwa.dot.gov/provencountermeasures/roundabouts/

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Safe Roads for a Safer Future
Investment in roadway safety saves lives

| MODE | LOCATION | CRASH FACTORS (ROWS) | ROADWAY FACTORS (COLUMNS) |
|---|---|---|---|
| VEHICLE COLLISIONS  | Intersection Footprint | 1. Collision type<br>2. Violation type | 1. Traffic control type<br>2. Number of lanes of the primary and secondary roads<br>3. Traffic volume of the primary road<br>4. Traffic volume of the secondary road |
| | Intersection Influence Area | 1. Collision type<br>2. Violation type | 1. Traffic control type<br>2. Speed limit<br>3. Median presence and type |
| | Mid-block | 1. Collision type<br>2. Violation type | 1. Median presence and type<br>2. Speed limit<br>3. Traffic volume of the primary road |
| PEDESTRIAN COLLISIONS  | Intersection Footprint (Shown Above) | 1. Violation type<br>2. Pedestrian action<br>3. Movement of party 1 | 1. Traffic control type<br>2. Number of lanes of the primary and secondary roads<br>3. Traffic volume of the primary road |
| | Intersection Influence Area | 1. Violation type | 1. Traffic control type<br>2. Number of through lanes of primary road in both directions<br>3. Traffic volume of the primary road |
| | Mid-block | 1. Violation type<br>2. Pedestrian action | 1. Speed limit<br>2. Number of through lanes of primary road in both directions<br>3. Traffic volume of the primary road |
| BICYCLE COLLISIONS  | Intersection Footprint | 1. Party at fault<br>2. Violation Type | 1. Traffic control type<br>2. Number of lanes of the primary and secondary roads |
| | Mid-block (Combined Intersection Influence Area & Midblock) | 1. Party at fault<br>2. Violation type | 1. Bike lane presence<br>2. Speed limit<br>3. Parking presence |



**Figure 1. Graphic. Excerpt from San Diego's systemic analysis framework organized by crash characteristics, location category, and roadway user type.[3]**

100 feet from an intersection or the upstream end of a turn pocket), and crashes located midblock. In addition, the City conducted systemic safety analysis for each of the roadway user types of vehicles, pedestrians, and bicyclists, and applied the three crash categories to each of the user types. This resulted in a set of crash characteristics for each user type and by location category (figure 1).

## Outcomes

While the SSARP identified several safety concerns and associated countermeasures, it notably revealed a significant safety concern related to traffic signals with left-turn permissive phases which allowed for conflict between pedestrians and vehicles. This led to the City's recommendation to revisit the warrant system for left-turn permissive phases to account for the safety of pedestrians, particularly vulnerable pedestrians such as the elderly, children, and people with disabilities.

The SSARP also led two current efforts to retrofit many of the permissive left-turn locations with a Leading Pedestrian Interval (LPI).[1] The City is also systemically adding activated, blank-out "No Turn" symbol signs that turn on when an LPI is in use and reduces delay when an LPI is not in use.

[3] City of San Diego. (2019). Systemic Safety: The Data-Driven Path to Vision Zero.

The City also has a long-term goal of outfitting intersections with pedestrian countdown timers and high-visibility crosswalks. Bundling low-cost safety improvements like LPI's results in projects with high benefit-to-cost ratios and increases their success rate for Federal and State grant funds. The City plans to install LPIs with activated "No Turn" signs at over 60 traffic signals in the next couple of years.

The SSARP also identified the highest frequency crash locations are at traffic signals on four-lane two-way streets and three-lane one-way streets (figure 2).

As intersection projects in the City are less expensive and intrusive than roadway corridor projects, the City will focus on countermeasures at signalized intersections before corridors which are more complex due to timelines with utility projects and other constraints. The implementation of LPIs allows the City to apply an effective low-cost proven safety countermeasure City-wide in a short period of time.

In the long term, the City plans to replace many of its traffic signals with roundabouts (figure 3). On certain streets with adequate right-of-way, the City plans to deploy a series of roundabouts along with road diets.[4] Roundabouts in series make left turns and U-turns easy and can repurpose right-of-way for wider sidewalks, bikeways, or increased parking. The City has already built five roundabouts in series and will build three more in 2020 using Federal and State grant funding. Roundabouts are highly competitive with traffic signals. Besides the safety benefits, they confer reduction in long-term maintenance, less energy consumption, and fewer carbon emissions. In addition, roundabouts handle greater volumes of traffic, work when the power is out, and boost the economy.

[4] Federal Highway Administration. (2017). "Road Diets (Roadway Configuration)". https://safety.fhwa.dot.gov/provencountermeasures/road_diets/

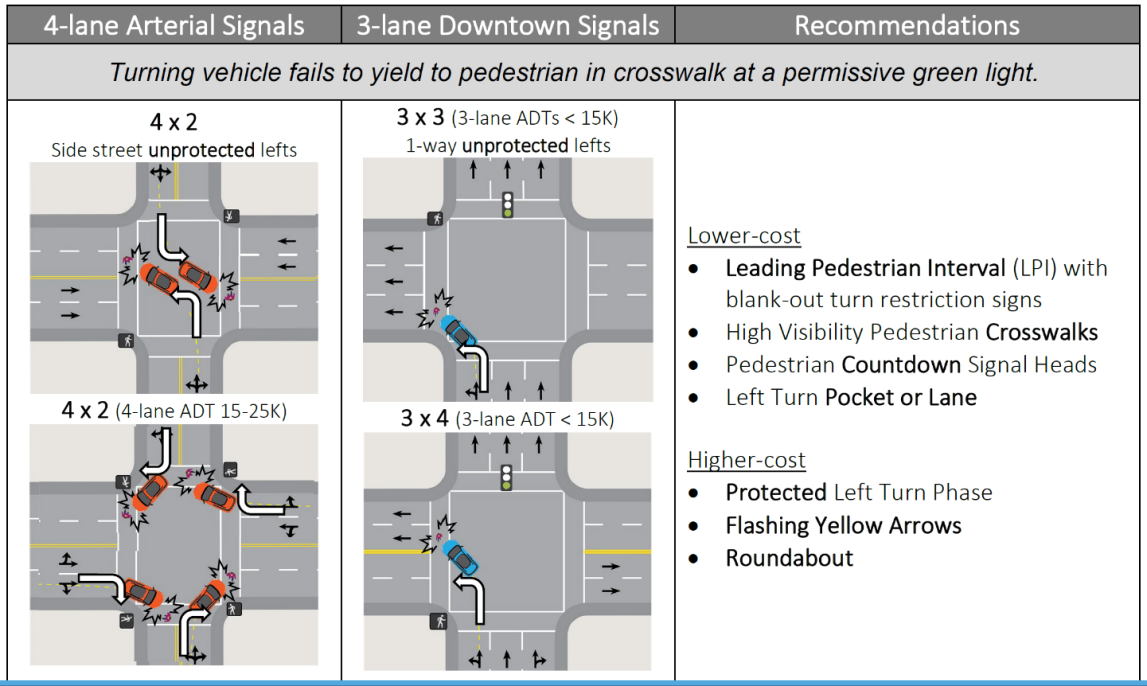


**Figure 2. Graphic. Recommended intersection improvements. Lower-cost improvements using existing right-of-way.[3]**




**Figure 3. Graphic. A roundabout installation in San Diego.**

## Funding

The City used Caltrans' Highway Safety Improvement Program (HSIP) funds for the systemic safety analysis. The City also used Caltrans HSIP funds for the installation of countermeasures identified in the systemic safety analysis, including LPIs, countdown timers, and continental crosswalks. The City will continue to identify specific hotspot locations, match them with countermeasures, and compete for sources of funding to implement these countermeasures.

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