

MEMORANDUM (FINAL, REV 1)

Date: February 21, 2025 (FINAL)
April 11, 2025 (Revision 1)

To: Joanna Kwok, City of San Rafael
Grey Shankel Melgard, City of San Rafael

From: Kevin Aguigui, Kimley-Horn
Joe Arroyo, Kimley-Horn

Subject: **City of San Rafael 2nd and 4th Street Signal and Intersection
Modification – Concept Evaluation**

1.0 Purpose of the Memorandum

In an effort to improve safety, design plans to reconfigure the intersection of 2nd and 4th Street in the City of San Rafael are being finalized. These design plans include improvements that consider the removal of the westbound left turn lane from 2nd Street to Marquard Avenue and potentially the northbound right turn lane from Marquard Avenue to West End Avenue/2nd Street. To determine whether these improvements are feasible, a traffic analysis was conducted to evaluate the proposed intersection configurations. This memorandum provides a summary of the proposed configurations, results of the traffic analysis, and pros and cons of the various options being considered.

2.0 Background

The City of San Rafael 2nd and 4th Street Signal and Intersection Modification Project (Project) is an ongoing effort. A preliminary reconfiguration for the intersection has been designed. To analyze the existing and proposed conditions during the peak periods of the day, a traffic signal operations model was developed. This analysis used existing traffic signal timings and volumes. Using this data, delays and corresponding levels of service (a measurement that indicates how well an intersection is operating) were determined. To evaluate the impacts of the proposed improvements, existing volumes were then used to analyze the intersection with the proposed improvements. Through this analysis, it was determined that the proposed improvements for the intersection would serve to enhance safety and improve overall intersection operations.

3.0 Existing Conditions

Figure 1 below shows the project location and its traffic signal operations, highlighting how pedestrians, vehicles, and bicyclists interact at the intersection today.

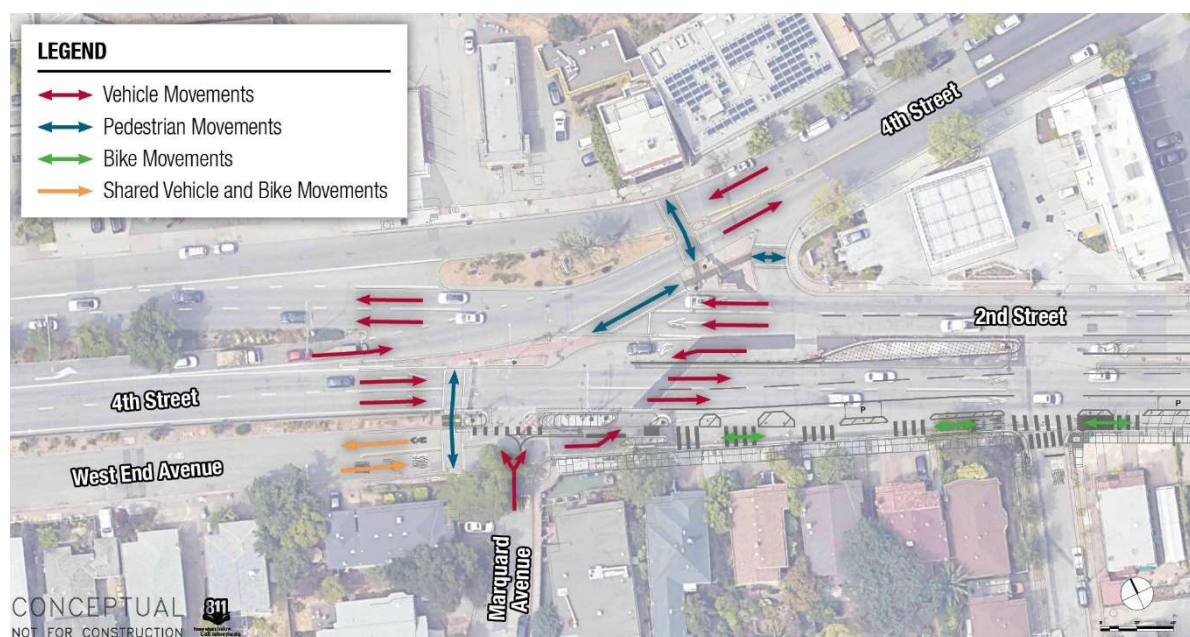


Figure 1: Existing Intersection Operations

The existing intersection of 2nd and 4th Street currently operates as a single complex intersection providing unique challenges to roadway users due to its geometry. This intersection is comprised of the merging area of 2nd Street and 4th Street in its northern half and the intersection of Marquard Avenue and West End Avenue/2nd Street in its southern half.

The existing intersection configuration consists of potential conflicts that impact user safety due to the interactions of vehicle, bicycle, and pedestrian movements. The main conflict being the westbound left turning vehicles from 2nd Street onto Marquard Avenue (controlled by a traffic signal) crossing over to the intersection of West End Avenue and Marquard Avenue (controlled by a stop sign). At this location, there is an additional conflict point between vehicles and bicyclists.

Another conflict point exists for pedestrians crossing West End Avenue. Unlike pedestrians crossing 4th Street where the pedestrian crossing is controlled by the existing traffic signal, pedestrians crossing West End Avenue have to cross when

they see existing gaps in vehicular traffic as this crossing is not controlled by a traffic signal.

4.0 Proposed Improvements

The proposed intersection improvements at this project intersection include the following:

- The westbound left turn movement from 2nd Street to Marquard Avenue is removed. This modification would affect approximately 17 vehicles in the morning peak hour, 26 vehicles in the midday peak hour, and 34 vehicles in the evening peak hour. It should be noted that emergency vehicles will still be able to make the left turn to respond to incidents occurring along Marquard Avenue with a proposed mountable curb in the median.
- The intersection will operate as two separate and independent movements without vehicular traffic flow interacting between the following:
 - Eastbound 4th Street left turn onto 4th Street, Westbound through 4th Street, and Westbound through 2nd Street, and north-south pedestrian movement across 4th and 2nd Street (northern half of the existing intersection)
 - Eastbound through 4th Street and north-south pedestrian movement across 2nd Street (southern half of the existing intersection)
- The timing of the north-south pedestrian movement will be coordinated between these two intersections to minimize pedestrian delay.
- Pedestrian crossings will be relocated to the eastern edge.

It is noted that bicycles will be able access the bike track along 2nd Street. Additionally, the new intersection configuration will maintain business-access only to driveways on the north side of 4th Street.

The proposed conceptual layout with modifications described above are shown in Figure 2.

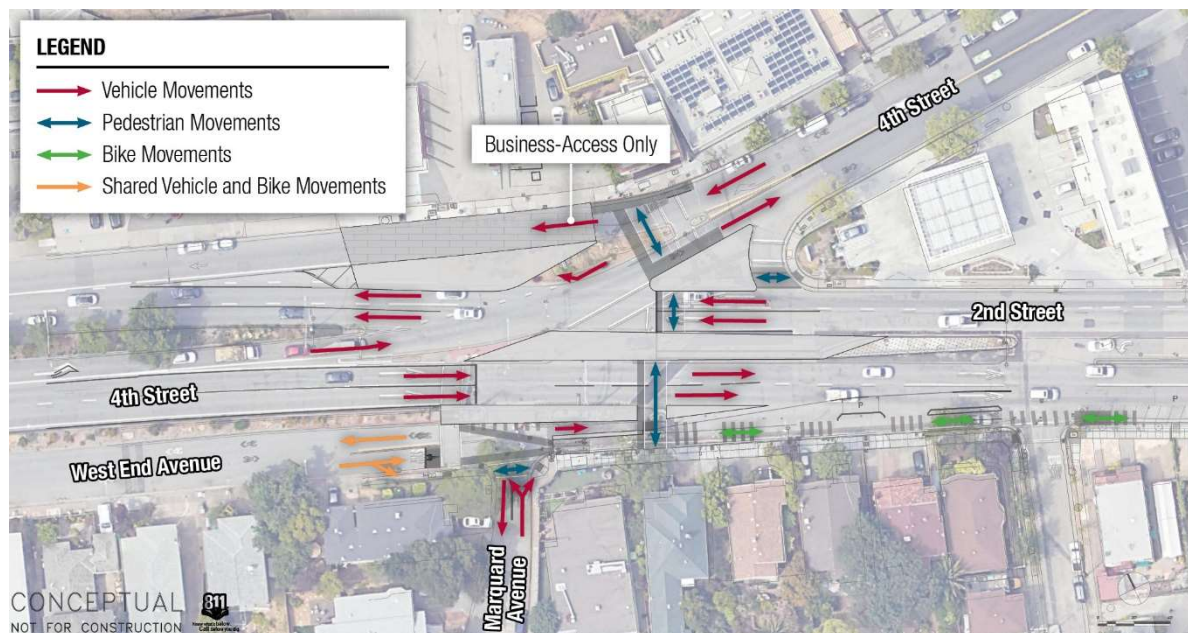


Figure 2: Proposed Intersection Operations Northbound Right Turns Permitted at Marquard Avenue

The proposed concept modification assumes that Marquard Avenue will be accessed as follows:

- Vehicles entering Marquard Avenue from 2nd Street will either take a left turn on West Street or continue past Marquard Avenue and then take a left turn at Greenfield Avenue and another left at West End Avenue.

It is expected that the majority of the vehicles that need to access Marquard Avenue that are driving along 2nd Street will make a left turn earlier at the intersection of 2nd Street and West Street. The rest will reroute at the intersection of 4th Street and Greenfield Avenue. The expected split of rerouted volumes is shown in Table 1.

Table 1 – Anticipated Re-routed Traffic Volumes*			
Intersection	Morning	Midday	Evening
West Street Intersection	5	8	11
Greenfield Avenue Intersection	12	18	23**

*Volumes are derived from peak-hour conditions from westbound 2nd Street onto Marquard Avenue.

**Average of four (4) vehicles in 10 minutes.

The changes to travel time due to these reroutes are minimal. It is expected that the accessing facilities on Marquard Avenue from the West Street intersection or the Greenfield Avenue intersection will take an additional one to two minutes.

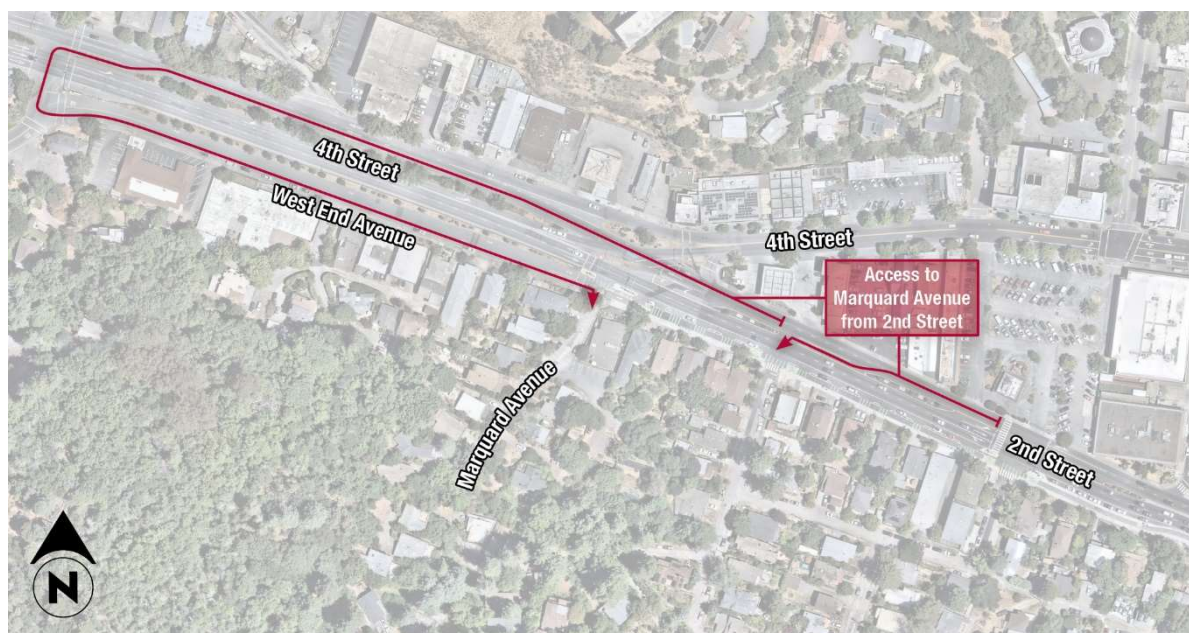


Figure 3: Access to and from Marquard Avenue

Figure 3 illustrates how drivers are expected to reroute based on the changes proposed. The curb on the new median being added between 4th Street and West End Avenue will be mountable, maintaining emergency vehicle access to Marquard Avenue through 2nd Street going westbound.

5.0 Traffic Analysis

Traffic models were developed for the traffic analysis of the existing and proposed intersection operating conditions. These traffic models were used to evaluate intersection conditions during “peak” periods, when traffic conditions are the most congested. These peak periods typically include a morning peak, a midday peak, and an evening peak. For example, the morning peak correlates to the morning commute.

The main parameter in the traffic analysis is the delay experienced by roadway users at the intersection of 2nd Street and 4th Street. Delay is any additional travel

or wait time that a roadway user experiences from an “ideal” travel experience expected for the conditions being analyzed.

Along all approaches and across all peak periods, delay is shown to be reduced as a result of the intersection and traffic signal improvements, as seen in Tables 2 through 4 below. The largest reductions in delay are found in the westbound through movement at the northern intersection along 2nd Street, where improvements between about five and eight seconds per vehicle are anticipated during the three peak periods. Some delay at the 2nd Street and West Street intersection and the 4th Street and Greenfield Avenue intersection may be experienced due to the vehicles being rerouted for access to Marquard.

Table 2 - Existing Intersection			
Peak Hour	AM	Midday	PM
Average Intersection Delay (s)	12.4	14.4	14.4
Intersection LOS	B	B	B

LOS=Level of Service; Delay is in seconds

Table 3 - Proposed Northern Intersection Movement			
Peak Hour	AM	Midday	PM
Average Intersection Delay (s)	9.9	10	9.9
Intersection LOS	A	A	A

LOS=Level of Service; Delay is in seconds

Table 4 - Proposed Southern Intersection Movement			
Peak Hour	AM	Midday	PM
Average Intersection Delay (s)	0.2	0.2	0.2
Intersection LOS	A	A	A

LOS=Level of Service; Delay is in seconds

6.0 Summary

The proposed intersection improvements will remove existing conflict points and allow for greater overall accessibility and safety for pedestrians and bicyclists

compared with the existing conditions. A summary of the Pros and Cons of the proposed conditions is presented in Table 5.

Table 5 – Summary of Pros and Cons		
Proposed Condition	Pros	Cons
2 nd and 4 th Street Reconfiguration	<ul style="list-style-type: none">• Delay is being reduced across all peak time periods with the elimination of points of conflict• Vehicle, pedestrian and bicycle movements along 4th Street and westbound 2nd Street can be operated independently from those along eastbound 2nd Street• Pedestrian crosswalk distances and crossing times will be reduced	<ul style="list-style-type: none">• Access to Marquard Avenue is reduced, except for emergency response vehicles• Delay may increase at the intersection of West St and 2nd Street because of vehicles attempting to access Marquard Avenue• Delay may also increase at the intersections of 4th Street and Greenfield Avenue and West End Avenue because of vehicles attempting to access Marquard Avenue