

**CITY OF SUNNYVALE
DEPARTMENT OF PUBLIC WORKS
MEMORANDUM**



January 30, 2013

To: City Manager
From: Director of Public Works *MRP*
Subject: Follow-up to Memo Regarding Traffic Signal Installation Project at the Bernardo and Remington Intersection
KON KENT STEFFENS

In response to a request from Council Member Davis, the following is provided to give further explanation of the traffic signal warrant analysis completed for the Bernardo/Remington intersection.

Traffic signal warrant analyses provide technical information on roadway conditions at a given intersection identified for study. While they are often used as justification for installation of traffic signals, the satisfaction of a warrant or warrants does not in itself require the installation of a traffic signal. Per the Sunnyvale Municipal Code, this authority lies with the Sunnyvale City Council.

The Bernardo/Remington traffic signal was approved by the City Council in response to community concerns following a fatal collision at the intersection. Subsequent to the collision, the City of Sunnyvale Department of Public Safety conducted a collision investigation to determine the cause and factors involved. This investigation concluded that the cause of the collision was due to a violation of vehicle code section 21802(a), failure to yield (after stopping for the stop sign as required by section 22450 VC) by the driver traveling westbound on Remington. It should be noted that although the collision was significant, in that it caused the vehicle traveling southbound on Bernardo to roll over, an additional factor leading to the death of the driver may be attributed to the likelihood that the driver in the rollover vehicle was not wearing a seatbelt.

At the request of a number of citizens, the City completed a traffic engineering review of this location. This review was prompted by citizen requests and not by the nature of the collision, as the collision investigation determined that traffic controls were not a factor in the cause. Citizens desire new traffic controls as a possible means to calm traffic and improve pedestrian conditions. Traffic controls such as stop signs or traffic signals are not to be installed chiefly as a speed control or traffic calming measure. They are intended to improve intersection

safety at locations that have a higher degree of conflicting traffic or other physical conditions where they could improve traffic safety. The City of Sunnyvale utilizes engineering analysis procedures approved by the Federal Highway Administration and the California Department of Transportation in making determinations of whether to install new traffic controls.

The intersection of Bernardo and Remington had been evaluated several times in the past and has not met the conditions identified for traffic control installation as provided by the Federal and State governments. The most recent analysis also indicated that this location still does not experience many of the conditions that warrant the installation of new traffic controls. However, warrant analysis shows that the warrant for street classification is met, and traffic volumes approach the levels necessary to meet warrants. City staff notes that at least one approach to the intersection is on a curve, which introduces line of sight challenges for drivers. This may cause drivers attempting to enter Bernardo to divert to other locations on Bernardo to avoid the intersection. Also, vehicle volumes and speeds on Bernardo discourage pedestrian traffic, and no pedestrian crossing facilities are provided because there are no positive traffic controls for motor vehicles. Given these conditions, staff recommended the installation of a traffic signal to facilitate a more orderly and safe flow of traffic and improve pedestrian conditions at the intersection.

The attached breakdown by warrant explains the engineering evaluation of the intersection. Please contact me with any further questions or comments.

ATTACHMENT A

Explanation of Bernardo Avenue/Remington Drive Traffic Signal Warrant Analysis

The City follows the Manual of Uniform Traffic Control Devices California Supplement (MUTCD – CA) guidance on the evaluation of warrants for traffic signals. This is per the Sunnyvale Municipal Code Section 10.08.010, which directs that the city traffic engineer to have the power and duty to place and maintain or cause to be placed and maintained official traffic control devices when and as required under the traffic ordinances and resolutions of this city according to the latest standards or guidelines established by CalTrans. The MUTCD-CA is a document primarily prepared by the Federal Highway Administration (FHWA) with amendments specific to California provided by Caltrans and approved by FHWA.

FHWA guidance on the applicability and use of warrant analysis states that “Traffic Signals should not be installed unless one of the warrants specified by the MUTCD is satisfied.” However, the guidance goes on to state, “The satisfaction of a warrant is not in itself justification for a signal. A traffic engineering study must be conducted to determine whether the traffic signal should be installed.” Therefore, the warrant analysis is one evaluation tool that is utilized to quantify a set of differing and sometimes conflicting conditions. Ultimately, engineering judgment and a decision making process in combination with the information provided by a warrant analysis determines whether a signal is to be installed. This is the process that the City follows. At Bernardo and Remington, one warrant was met, and volume warrants were close to being met. Other factors were also taken into consideration in developing a recommendation to the City Council for installation of a traffic signal, which was approved by Council on June 14, 2011. A warrant by warrant summary of the analysis is provided below.

Warrant # 1 – Eight Hour Vehicular Volume
Warrant Met? **No**

This warrant looks at the traffic volume over the highest eight hour period of traffic at the intersection approaches to assess whether there is a high volume of intersecting (conflicting) traffic over a long period of the day, or if there is a high volume of main street traffic that causes excessive delay or conflict to minor street traffic.

For intersecting traffic (Condition A), either 100% values (traffic volumes as determined by the Federal Highway Administration (FHWA) and the California Department of Transportation (Caltrans)) for all eight hours for both approaches must be met, or 80% values for all eight hours must be met. For the Bernardo/Remington intersection, the 100% values are not met for the minor street approaches for two hours of the day, although for those two hours volumes are close to meeting the warrant, within 25 vehicles or less. Conflicting traffic volumes approaching the level of warrants was one of the reasons staff noted in its recommendation to install the signal. The location does meet the 80% criterion, which are slightly lower main and side street volume values over the entire 8 hour study period.

Warrant# 2 – Four Hour Vehicular Volume

Warrant Met? – **No**

For this warrant the peak four hour volumes on the approach streets must all exceed values defined by FHWA and Caltrans. This warrant focuses on the amount of intersecting traffic. This is calculated using a graph of total approach volumes graphed by approach against each other to take into account if one approach has a very high volume and the other has a lower volume, the warrant might still be met. For the Bernardo/Remington location, two of the four hour periods did not exceed the total volume value. It should be noted once again that one of the hours was below the value by less than 5 vehicles.

Warrant #3 – Peak Hour Volume

Warrant Met? - **No**

This warrant assesses whether conditions exist where high volumes of traffic in the peak hour causes undue delay on side street traffic. It is intended only for very high volume streets with short peaks of conflicting side street traffic. One of two conditions must be met:

A. The hours of minor street traffic delay, the volume of side street traffic, or the total volume of intersecting traffic exceed certain values.

B. The volumes of traffic for the main street approaches and the highest volume minor street approach exceed certain values.

At Bernardo/Remington, the level of minor street (Remington) delay did not exceed the minimum values for delay. However both the volumes of side street traffic and the total volume of intersecting traffic exceeded the threshold values. However, to meet this warrant, all three conditions must be satisfied. The intersection did not meet the value for total main

street approach traffic and highest volume minor street approach traffic. By not meeting all the criteria in either of the two conditions, this warrant was not met.

Warrant #4 – Pedestrian Volume

Warrant Met? – **No**

This warrant has two parts, one of which must be satisfied to meet warrants.

Part A analyzes pedestrian volumes crossing the main street and whether gaps in traffic are insufficient to allow safe pedestrian crossing. The warrant looks at four one hour periods, and analyzes peak hour and total highest four hour pedestrian volumes. It analyzes the average seconds of gap time as well. Two conditions must be met, either one hour or four hour pedestrian volumes over certain values, combined with gap times averaging less than sixty seconds for each of the four study hours.

Part B considers the distance to the nearest traffic signal (alternative pedestrian crossing location), or whether a traffic signal would restrict progressive traffic flow on the major street. This is in combination with meeting Part A requirements.

Remington/Bernardo did not meet The Part A or Part B of the pedestrian warrants. Gap times were insufficient in two of the four study hours, but pedestrian volumes were low. However it was noted by staff that pedestrian conditions are unfavorable due to the uncontrolled nature of the intersection and the lack of crosswalks across the main street. Staff has received many requests over the past several years to improve crossing facilities of Bernardo, but City practice has been to discourage the installation of crosswalks at locations without some sort of vehicular traffic control or warning device. This may contribute to the low volume of pedestrians at this location, and staff's recommendation to install a traffic signal noted that a signal would improve conditions for pedestrians. The nearest signal is farther than the value used by FHWA and Caltrans, so Bernardo Remington met this criterion, but a new signal would restrict progressive traffic on the main street by introducing new stop control. This could possibly be argued in that level of service analysis of signal operations shows that the new signal will operate at a high level of service, which implies insignificant traffic flow delay to the main street.

Warrant # 5 – School Crossing

Warrant Met? – **Not Performed**

This warrant analysis was not performed because Remington/Bernardo does not feature an existing pedestrian or school crossing, which is a requirement to consider this warrant. However, staff noted in its recommendation to install a signal, that a traffic signal would allow for a pedestrian crossing and improve the ability for school children to cross. Staff has received many requests over the years for the City to consider new traffic controls on Bernardo at locations such as Remington and Knickerbocker in order to serve school children residing west of Bernardo and attending Cherry Chase and Sunnyvale Middle.

Warrant # 6 – Coordinated Signal System

Warrant Met? – **No**

This is a two part warrant that evaluates the spacing of traffic signals to determine if the installation of a signal and coordination with adjacent signals will provide for efficient platooning of vehicles, and therefore efficient signal operations.

Remington/Bernardo meets the minimum requirements for spacing of traffic signals for consideration of platooning effects. Bernardo Avenue is the major corridor where platooning might be expected and desirable. The adjacent signals are Bernardo/Heatherstone and Bernardo/Fremont, which at 2,680 and 2,918 feet respectively are both greater than 1000 feet away from Bernardo/Remington,, which exceeds the 1,000 foot minimum threshold. However, given the distance of Fremont Avenue from Bernardo/Remington, and the lack of platooning through this intersection (much Bernardo traffic diverts at Fremont Avenue), there is not an existing degree of platooning that a signal at Remington/Bernardo would improve or provide, and signals in the Bernardo corridor are not currently interconnected or coordinated. However, it should be noted that the plans for traffic signal construction assume interconnection with the Bernardo/Heatherstone intersection, which will provide a limited degree of coordination and platooning.

Warrant #7 – Crash Experience

Warrant Met? - **No**

This warrant evaluates the number of correctable collisions that have occurred at the location, for which a traffic signal would likely have prevented the collision. The severity and frequency of correctable collisions are taken into consideration. Three conditions must be met to trigger this warrant:

1. If, within the prior 12 month period, five or more collisions correctable by traffic signal installation and involving personal injury or significant, reportable property damage have occurred.

2. Eight hour vehicular volumes on the intersecting streets meet the 80% minimum vehicular volume warrant or the interruption of continuous traffic warrant, or either of the pedestrian volume warrants.

3. Observance, enforcement and consideration of alternatives does not result in a reduction in collision frequency.

Remington/Bernardo meets the volume condition for this warrant, but it did not have the required number of correctable collisions within a 12 month period. Because the collision history features a low number of collisions, Public Safety observation and enforcement following the fatal collision in 2009 did not appear to have any effect on the rate of collisions at the intersection. The fatal collision that prompted consideration of a signal was driver error and impairment, and was not considered correctable by the installation of a traffic signal.

Warrant #8, Roadway Network

Warrant Met? - **Yes**

This warrant considers the organization of traffic flow over a roadway network. Signalization provides both safety and efficient traffic operations. This warrant considers how the presiding jurisdiction classifies the intended use of the roadways. If the roadway is a principal route for through traffic, a suburban highway, or a major route on an official plan, then the warrant is met.

Remington Drive and Bernardo Avenue are classified as residential collector streets in the Sunnyvale General Plan, which are considered major street classifications.