



## Memorandum

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**Date:** April 24, 2014  
**To:** Mr. Majid Yamin, Public Works Department, City of Scotts Valley  
**From:** Gary Black  
**Subject:** Glenwood Drive and Casa Way/Kerry Court Intersection Study

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## Introduction

The intersection of Glenwood Drive and Casa Way/Kerry Court had operated as a four-way stop-controlled intersection until March 1, 2014. This intersection is near Scotts Valley High School, which generates a lot of traffic before and after school. The four-way stop created lengthy delays on Glenwood Drive and was believed to cause traffic to divert through the adjacent residential area using Casa Way. On March 1, 2014, the City of Scotts Valley removed the stop control on Glenwood Drive as an experiment to alleviate congestion and diversion. At the time of this report, the intersection operates with stop signs on Casa Way/Kerry Court. This memo evaluates the effectiveness of two-way versus four-way stop control with regard to safety, capacity, delay, and level of service, as well the effect on traffic diversion. At the request of the City, we have also analyzed the traffic impact of the two-way and multi-way stop control options at the intersection of Glenwood Drive and Casa Way/Kerry Court on the nearby signalized intersection of Scotts Valley Drive and Glenwood Drive. Figure 1 shows the study intersection and count locations.

## Scope of Work

This study looks at two study intersections for the following traffic scenarios. All volumes were taken from new traffic counts obtained in February and March of 2014.

**Scenario 1: *Before Conditions.*** Before Conditions represent traffic conditions with four-way stop control in place at the intersection of Glenwood/Casa/Kerry. Before Conditions traffic counts were taken on February 25, 2014, while the high school was in session.

**Scenario 2: *After Conditions.*** After Conditions represent traffic conditions after the removal of the stop control on Glenwood Drive at the intersection of Glenwood/Casa/Kerry. After the stop signs were removed on March 1, 2014, three weeks were allowed for traffic to readjust to the new conditions. After Conditions counts were taken on March 25, 2014, while the high school was in session.

## Intersection Study

This study evaluates the intersection of Glenwood/Casa/Kerry from three perspectives. 1) The intersection is checked for All-Way Stop-Control (AWSC) and signal-control warrants to see if any warrants are met under the California Manual on Uniform Traffic Control Devices (MUTCD) guidelines. 2) The warranted stop control is evaluated for safety, capacity, delay, and level of service, as well as effectiveness in alleviating traffic diversion. 3) The effect of the warranted control on the nearby intersection of Scotts Valley Drive/Glenwood Drive is evaluated.



**Figure 1**  
**Study Intersections and Count Locations**

## Warrant Checks

### All-Way Stop-Controlled Warrant

The intersection of Glenwood Drive & Casa Way/Kerry Court was checked for AWSC warrants. According to the California MUTCD Section 2B.07, Criteria C, a multi-way STOP sign installation should meet the following three minimum volume standards:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and
2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but
3. If the 85<sup>th</sup>-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.

According to these criteria, the intersection of Glenwood/Casa/Kerry is not warranted for four-way stop control (see Table 1).

**Table 1**  
**AWSC Warrant Check – Threshold Volume**

Hour Start Time	Major Street - Glenwood Drive			Minor Street - Casa Way/Kerry Court		
	Total Volume	Threshold	Warrant Met	Total Volume	Threshold	Warrant Met
7:00 AM	651	300	YES	27	200	NO
8:00 AM	498	300	YES	19	200	NO
12:00 PM	323	300	YES	12	200	NO
2:00 PM	267	300	NO	24	200	NO
3:00 PM	546	300	YES	21	200	NO
4:00 PM	305	300	YES	16	200	NO
5:00 PM	397	300	YES	22	200	NO
6:00 PM	220	300	NO	6	200	NO
	<b>Warrant Met?</b>		<b>NO</b>	<b>Warrant Met?</b>		<b>NO</b>

### Signal-Controlled Warrant

The intersection of Glenwood Drive & Casa Way/Kerry Court was also checked for signal warrants. Since the current two-way stop control could potentially cause lengthy delays for the minor street traffic, Hexagon checked the signal warrant in accordance with the California MUTCD Section 4C.04 (Warrant 3, Peak Hour).

Our evaluation determined that the intersection of Glenwood Drive & Casa Way/Kerry Court is not warranted for a traffic signal under either the Before Condition or the After Condition (see Table 2).

The signal warrant worksheets are included in Appendix B.

## Operational Conditions Analysis

Using approach volumes collected both before and after the removal of the two stop signs on Glenwood Drive, Hexagon has quantitatively analyzed the study intersection of Glenwood/Casa/Kerry in terms of capacity, delay, and level of service. As Table 3 indicates, although the minor street approaches experienced minimal increases in delay, and the LOS worsened from LOS A to LOS B, the intersection presents no significant operational issues with the current two-way stop control.

Hexagon also analyzed the study intersection’s effect on neighborhood diversion traffic. As Figure 2 indicates, the removal of the stop signs on Glenwood Drive has increased AM peak hour traffic on northbound Glenwood Drive south of Casa Way by 112 vehicles, a 43% increase from the original 261 vehicles per hour. Meanwhile, eastbound Casa Way west of Glenwood Drive has decreased AM peak hour traffic by 81 vehicles, an 83% reduction from the original 98 vehicles per hour. Casa Way south of Sandraya Heights Road (within the residential area) also experienced measurable decreases in peak hour volume. The consistent pattern indicates that the previous congestion on Glenwood Drive, caused by the four-way stop control, was causing traffic to divert through the neighborhood on Casa Way. Sandraya Heights Road experienced minimal fluctuation in daily volumes.

Hexagon also checked speeds on Glenwood Drive and Casa Way. Comparing the speed data collected for Scenario 1 (Before Condition) and Scenario 2 (After Condition), we have concluded that removal of the stop signs on Glenwood Drive has caused insignificant increases to the 85<sup>th</sup> percentile speed on Glenwood Drive near Casa Way/Kerry Court (see Figure 3), ranging from 2 to 6 miles per hour (mph). Sandraya Heights Road and Casa Way within the residential area also saw minimal fluctuation in speed data.

We considered the fact that the Scotts Valley Fire Station and the San Agustin Catholic Church are both located on Glenwood Drive south of Casa Way. However, the presence of these facilities does not affect our study methodology or conclusions.

**Table 2**  
**Signal Warrant Check**

Warrant Criteria <sup>1</sup>	Before Condition		After Condition	
	AM Peak	PM Peak	AM Peak	PM Peak
Major Street Volume - Glenwood Drive (both approaches)	538	NO	450	NO
Minor Street Volume - Casa Way/Kerry Ct (highest volume approach)	98	NO	16	NO
<b>Warrant Met?</b>	<b>NO</b>		<b>NO</b>	
<u>Note</u>				
1. Warrant satisfaction is based on the applicable curves in California MUTCD Figure 4C-3 or 4C-4. See Appendix B for complete warrant worksheet				

**Table 3**  
**Intersection of Glenwood/Casa Approach Legs Operating Conditions**

Glenwood/Casa Approaches	Peak Hour	Before Condition			After Condition		
		V/C	Avg Delay	LOS	V/C	Avg Delay	LOS
Glenwood Drive (NB)	AM	0.33	9.6	A	-	0.0	-
	PM	0.30	8.8	A	-	0.0	-
Glenwood Drive (SB)	AM	0.35	9.7	A	-	0.0	-
	PM	0.22	8.2	A	-	0.0	-
Casa Way (EB)	AM	0.15	9.1	A	0.03	13.6	B
	PM	0.02	8.1	A	0.02	12.6	B
Kerry Court (WB)	AM	0.01	8.3	A	0.02	14.2	B
	PM	0.00	7.8	A	0.02	12.4	B

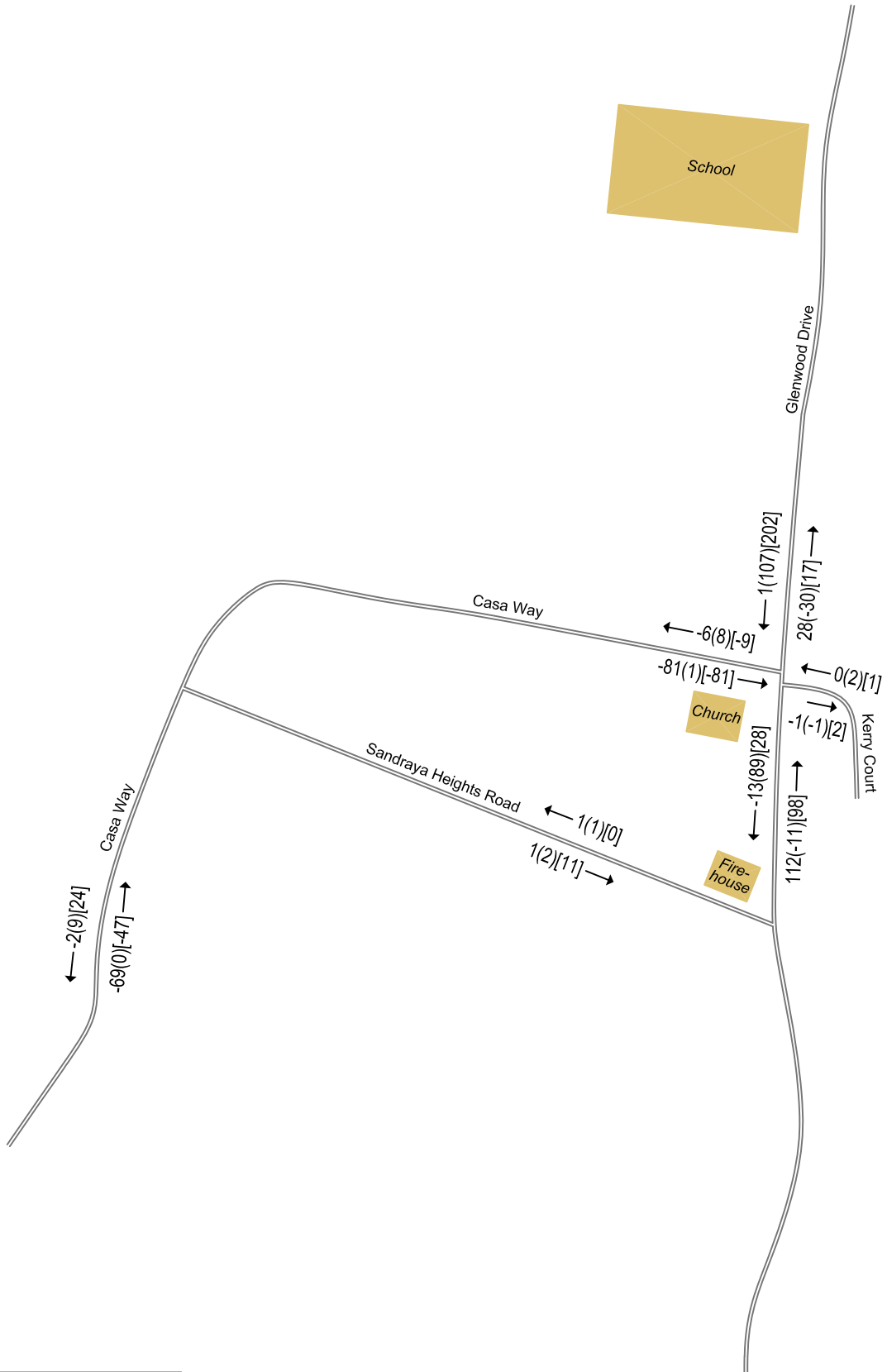
### Intersection of Scotts Valley Drive/Glenwood Drive

Hexagon conducted turning movement counts at the intersection of Scotts Valley/Glenwood both before and after the removal of the stop signs. The intersection level of service calculates to LOS B for both the AM and PM peak hour in both the Before and After conditions (see Table 4). There was no measurable change in volume or delay. Therefore, Hexagon concludes that the change to two-way stop control at the intersection of Glenwood/Casa/Kerry had no significant impact on the nearby signalized intersection.

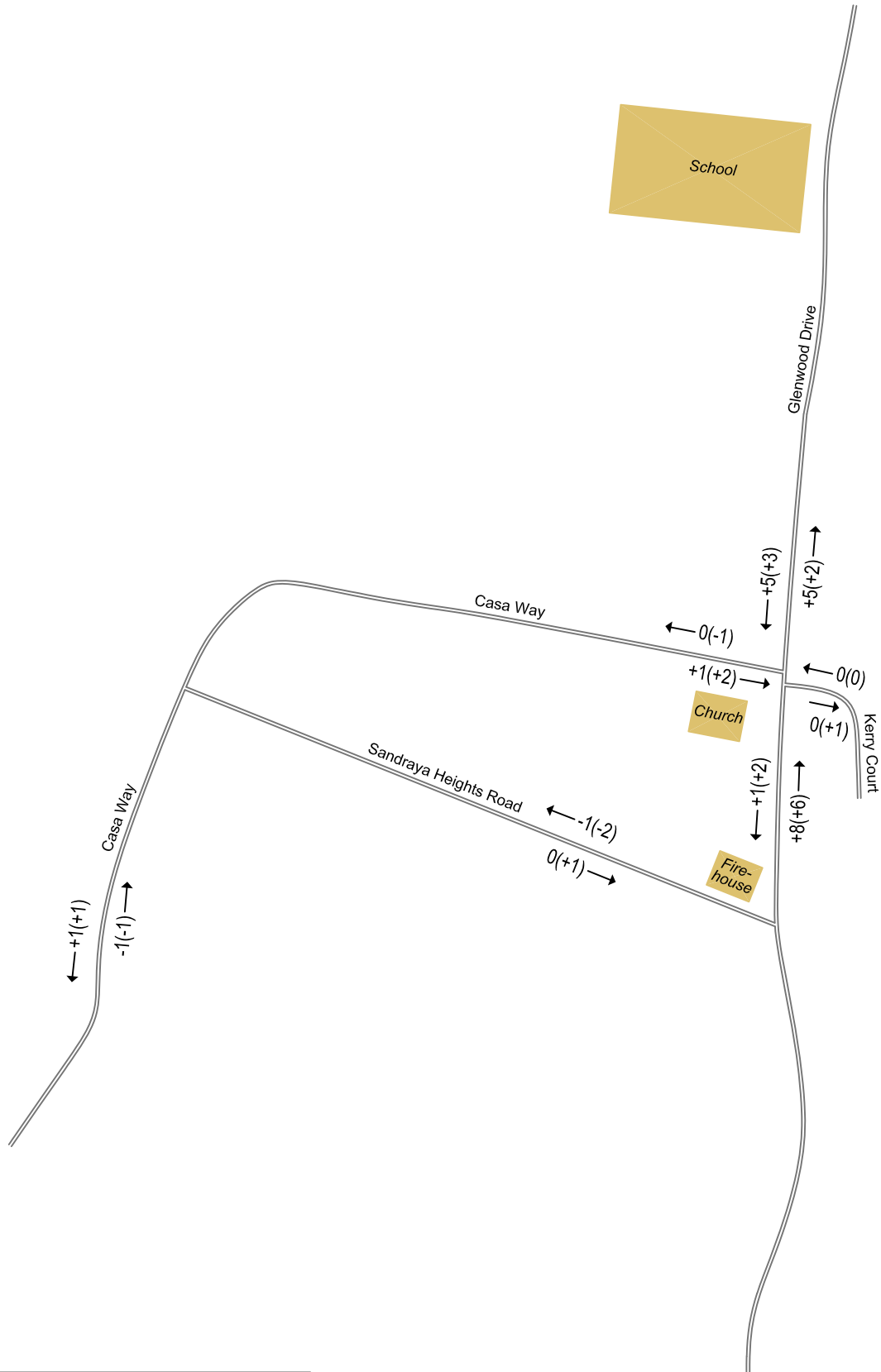
Intersection LOS calculation sheets are presented in Appendix C.

**Table 4**  
**Level of Service Results for the Signalized Intersection at Scotts Valley/Glenwood**

Intersection	Peak Hour	Before Condition		After Condition	
		Avg Delay	LOS	Avg Delay	LOS
Scotts Valley/Glenwood	AM	18.8	B	18.7	B
	PM	18.0	B	18.0	B



**Figure 2**  
**Two-Way Stop Minus Four-Way Stop Traffic Volume Differences**



LEGEND

XX(XX)= Average Speed (85th Percentile Speed)

**Figure 3**  
Two-Way Stop Minus Four-Way Stop Speed Data Differences

## Conclusions

This memo presents the results of the study of two-way stop control versus a four-way stop control at the intersection of Glenwood Drive & Casa Way/Kerry Court. The key findings are summarized below:

- Neither the four-way stop control nor the signal control is warranted at the intersection of Glenwood/Casa/Kerry.
- The minor street approaches at the study intersection have experienced minimal increases in average delay since removal of the stop signs on Glenwood Drive. The approach LOS has degraded from LOS A to LOS B.
- The removal of the stop signs on Glenwood Drive has reduced traffic diversion through the adjacent residential area.
- The removal of the stop signs on Glenwood Drive has caused insignificant increases to speed in the vicinity of Casa Way/Kerry Court. The City has installed a speed feedback sign on northbound Glenwood Drive south of Casa Way, and plans on installing a similar sign on southbound Glenwood Drive north of Casa Way.
- The change in stop control has not affected traffic volume or delay at the nearby intersection of Scotts Valley Drive/Glenwood Drive.