

RANCHERIA IMPACT ANALYSIS



Memorandum

To: City of Redding	Date: December 21, 2017
Attn: Kent Manual	Project: River Crossing Marketplace Specific Plan (Costco Wholesale Development)
From: Russ Wenham, P.E., T.E. Kamesh Vedula, P.E., T.E.	
Re: Impacts from proposed Redding Rancheria	Job No.: 25-1809-01
	File No.: C2226MEM017.DOCX
CC: John Abshier, P.E., Michael Okuma	

Introduction

City of Redding retained Omni-Means to perform a Traffic Impact Analysis Memorandum of the Redding Rancheria as it relates to the Costco River Crossing Marketplace. Based on the direction from the City Staff, the following scenarios will be analyzed:

- Year 2040 No Project with Rancheria Conditions
- Year 2040 Plus Project with Rancheria Conditions

Rancheria Project Description

The term "Rancheria", as used in this memorandum, refers to the Redding Rancheria development. As part of Rancheria, four alternatives at the planned site are considered. The alternatives are as follows:

- **Alternative A: Proposed Project** – Consists of a new casino and resort, including an approximately 69,515 square foot casino, a 250-room hotel, an event/convention center, and a retail center, as well as associated parking and infrastructure.
- **Alternative B: Proposed Project with No Retail** – Consists of the same land uses and intensities as the Proposed Project without the retail center.
- **Alternative C: Reduced Intensity Alternative** – Consists of a reduced version of the Proposed Project including a new casino and resort, an approximately 250-room hotel, an event/convention center, and a retail center, as well as associated parking and infrastructure.
- **Alternative D: Non-Gaming Alternative** – Consists of an approximately 128-room hotel, restaurants, and a retail center, as well as associated parking and infrastructure.

Alternative A is the only alternative analyzed in this memorandum.

Site Access

As part of Rancheria, three project access options were evaluated for each development alternative (A through D). The access options are listed below:

- Option 1 (North Access Only) – access to South Bonnyview Road via Bechelli Lane
- Option 2 (North and South Access) – access to South Bonnyview Road via Bechelli Lane and access to Smith Road via a new connecting roadway (overpass only at Smith Road).

- Option 3 (South Access Only) – access to Smith Road via a new connecting roadway and a new I-5 Interchange at Smith Road.

Option 1 is the only site access assumed in this memorandum.

Rancheria Trip Generation

The Rancheria trip generation is based on the Traffic Impact Study for the Redding Rancheria completed by Kimley-Horn.

Rancheria Trip Distribution

The Rancheria trip distribution is based on the Traffic Impact Study for the Redding Rancheria completed by Kimley-Horn.

Project Description

The term "project", as used in this memorandum, refers to the development as follows:

- Location: ± 25.16 acres east of Bechelli Lane, north of S. Bonnyview Road, west of I-5, and south of Rivercrest Estates subdivision.
 - Land Use Quantities:
 - ± 152,101 sq. ft. Costco
 - ± 70,100 sq. ft. General Commercial Retail
 - 30 fueling positions
- Access to the project will be via three (3) proposed driveways along Bechelli Lane and one (1) proposed driveway along S. Bonnyview Road.
 - One full-access unsignalized driveway on Bechelli Lane (northern driveway).
 - One full-access signalized driveway on Bechelli Lane at the existing Blue Shield Driveway (middle driveway).
 - One unsignalized driveway with Right-In/Right-Out (RIRO) access on Bechelli Lane (southern driveway).
 - One unsignalized driveway with RIRO access on S. Bonnyview Road (S. Bonnyview driveway).

Project Trip Generation

The project trip generation is consistent with the River Crossing Marketplace Report.

Project Trip Distribution

The proposed project trip distribution is consistent with the River Crossing Marketplace Report.

Level of Service Methodologies and Guidelines

The following section presents a summary of the general level of service (LOS) methodologies and guidelines used in the analysis of intersections, freeway segments and roadway segments.

General LOS Methodologies

Intersection and ramp level of service (LOS) was calculated for all control types (e.g. signalization, stop sign controlled) using the methods documented in the Transportation Research Board publications *Highway Capacity Manual 2000 and 2010*. LOS determinations are presented on a letter grade scale from "A" to "F", whereby LOS "A" represents "free-flow" conditions and LOS "F" represents over capacity conditions.



Freeway Mainline and Ramp LOS Methodologies

Mainline and ramp LOS was calculated using *HCS 2010* software by McTrans. LOS was calculated on a density basis in passenger cars per mile per lane (pc/mi/ln). Table 1 presents the LOS thresholds for ramps in the study area.

TABLE 1
LEVEL OF SERVICE (LOS) CRITERIA FOR FREEWAY MAINLINE SEGMENTS AND RAMPS

BASIC FREEWAY SEGMENTS		RAMP MERGE AND DIVERGE AREAS	
LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
A	0 - 11	A	≤ 10
B	> 11 - 18	B	> 10 - 20
C	> 18 - 26	C	> 20 - 28
D	> 26 - 35	D	> 28 - 35
E	35 - 45	E	> 35
F	> 45	F	Demand exceeds capacity

References: 2010 Highway Capacity Manual

Intersection LOS Methodologies

Level of Service (LOS) was calculated for all intersection control types using the methods documented in the Transportation Research Board's *Highway Capacity Manual 2000 and 2010*. Level of service is a qualitative measure of traffic operating conditions, whereby a letter grade A through F is assigned to an intersection or roadway segment representing progressively worsening traffic conditions.

For signalized intersections, intersection delays and LOS are average values for all intersection movements. For two-way stop-controlled (TWSC) intersections, the intersection delays and LOS are represented by the worst approach. Table 2 presents the delay-based LOS criteria for different types of intersection control.

**TABLE 2
LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS**

Level of Service	Type of Flow	Delay	Maneuverability	Stopped Delay/Vehicle (sec)	
				Signalized/ Roundabouts	Unsignalized/ All-Way Stop
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	≤ 10.0	≤ 10.0
B	Stable Flow	Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	>10 and ≤ 20.0	>10 and ≤ 15.0
C	Stable Flow	Higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted	>20 and ≤ 35.0	>15 and ≤ 25.0
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	>35 and ≤ 55.0	>25 and ≤ 35.0
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	>55 and ≤ 80.0	>35 and ≤ 50.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	> 80.0	> 50.0

References: 2010 Highway Capacity Manual

Arterial LOS Methodologies

Level of Service was calculated for the seven (7) roadway/arterial segments by using the methods documented in Section 4.5.E of the City of Redding Traffic Impact Analysis (TIA) Guidelines. As outlined within this section, the following two methods may be used to obtain roadway level of service:

Method 1 is based on the average travel speed and the methods presented in Chapter 15 of HCM (2010). This method is not intended for application to a short roadway segment. While this method determines the directional LOS for each individual segment along a roadway, only the over-all directional LOS shall be used for identifying project impacts. The results for individual segments along the overall roadway shall be provided for information only.

Method 2 uses the peak hour service volumes presented in Table 3.



**TABLE 3
MAXIMUM PEAK HOUR VOLUME PER LANE**

#	Roadway Type	Maximum Peak Hour Volume Per Lane				
		LOS				
		A	B	C	D	E
1	Expressway - High Access Control	570	660	760	850	950
2	Expressway - Moderate Access Control	520	610	700	790	870
3	Divided Arterial (w/LTL)	500	560	650	730	810
4	Undivided Arterial (no LTL)	410	470	540	610	680
5	Collector	270	340	410	470	540

Notes

1. Based on HCM 2000 Chapter 10.

For all scenarios, Method 1 was used to obtain the arterial LOS for the S. Bonnyview Corridor between State Route 273 and Churn Creek Road. As this segment of S. Bonnyview Road spans approximately 2 miles and nine (9) intersections, this corridor would not be classified as a short roadway segment. For each scenario, the overall directional average travel speed and LOS is reported for the direction in which the minimum travel time is recorded.

For all scenarios, Method 2 was used to obtain the arterial LOS of all roadway segments except for S. Bonnyview Corridor between SR 273 and Churn Creek Road. For each roadway segment, the existing geometric configuration was used to determine the roadway type. The maximum directional peak hour volume per lane was used to determine the roadway LOS.

Agency LOS Guidelines and Policies

City of Redding LOS Guidelines

The City of Redding's General Plan Transportation Element contains the following policy pertaining to LOS standards in the City:

Policy T1A: Establish the following peak-hour LOS standards for transportation planning and project review. They reflect the special circumstances of various areas of the community:

- Use LOS "C" – for most arterial streets and their intersections.
- Use LOS "D" – for the Downtown area where vitality, activity, and pedestrian and transit use are primary goals.
- Use LOS "D" – for streets within the State highway system and interchanges.
- Use LOS "D" – for river-crossing street corridors whose capacity is affected by adjacent intersections.

The City of Redding General Plan Transportation Element is accessible via the following internet site: <http://www.cityofredding.org/home/showdocument?id=5513>.

Shasta County LOS Guidelines

Shasta County's General Plan Circulation Element contains the following policy pertaining to LOS standards in the County:

- C-6I New development which may result in exceeding LOS E on existing facilities shall demonstrate that all feasible methods of reducing travel demand have been attempted to reach LOS C. New development shall not be approved unless traffic impacts are adequately mitigated. Such mitigation may take the form of, but not limited to the following:*

- Provision of capacity improvements to the specific road link to be impacted, the transit system, or any reasonable combination;
- Provision of demand reduction measures included as part of the project design or project operation or any feasible combination.

Caltrans LOS Guidelines

The Caltrans published Guide for the Preparation of Traffic Impact Studies (dated December 2002) states the following:

“Caltrans endeavors to maintain a target LOS at the transition between LOS “C” and LOS “D” on State highway facilities, however, Caltrans acknowledges that this may not be always feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS.”

Consistent with the agencies’ policies, this study will consider LOS “C” and LOS “D” as the standard acceptable threshold for all intersections in the jurisdiction of the City of Redding, LOS “E” as the standard acceptable threshold for all intersections in the jurisdiction of Shasta County, and LOS “D” as the standard acceptable threshold for all intersections in the jurisdiction of Caltrans. Table 4 presents the intersection, jurisdiction, and LOS threshold for each of the study intersections.

**TABLE 4
INTERSECTION LEVEL OF SERVICE THRESHOLD AND JURISDICTION**

#	Intersection	Jurisdiction	Target LOS
1	S. Bonnyview Rd/ Cedars Rd & SR 273	Caltrans	D
2	S. Bonnyview Rd/ Eastside Rd	City of Redding	D
3	S. Bonnyview Rd/ E. Bonnyview Rd	City of Redding	D
4	S. Bonnyview Rd/ Indianwood Dr	City of Redding	D
5	S. Bonnyview Rd/ Bechelli Ln	City of Redding	D
6	S. Bonnyview Rd/ Texaco Dwy	City of Redding	D
7	S. Bonnyview Rd/ I-5 SB Ramps	Caltrans	D
8	S. Bonnyview Rd/ I-5 NB Ramps	Caltrans	D
9	S. Bonnyview Rd/ Churn Creek Rd	City of Redding	D
10	Churn Creek Rd/ Alose Ln	City of Redding	D
11	Churn Creek Rd/ Hartmeyer Ln	Shasta County	E
12	Churn Creek Rd/ Huntington Dr	City of Redding	D
13	Churn Creek Rd/ Victor Ave	City of Redding	D
14	Churn Creek Rd/ Rancho Rd	City of Redding	C
15	Rancho Rd/ Alta Mesa Dr	City of Redding	C
16	Rancho Rd/ Shasta View Dr	City of Redding	C
17	Rancho Rd/ Airport Rd	City of Redding	C
18	Bechelli Ln/ Blue Shield Dwy	City of Redding	C
19	Bechelli Ln/ Chinook Dr	City of Redding	C
20	Bechelli Ln/ Rivercrest Pkwy	City of Redding	C
21	Bechelli Ln/ Loma Vista Dr	City of Redding	C
22	Bechelli Ln/ Hartnell Ave	City of Redding	C
23	Churn Creek Rd/ Public ROW to Chevron	City of Redding	C
24	Churn Creek Rd/ Arizona Ln	City of Redding	C
25	Churn Creek Rd/ Loma Vista Dr	City of Redding	C
26	Churn Creek Rd/ Shirley Ln & Enterprise HS Dwy	City of Redding	C
27	Churn Creek Rd/ Hartnell Ave	City of Redding	C

Mitigations and Fees

In accordance with the January 2009 City of Redding TIA Guidelines, the following guidelines apply if the proposed project causes a significant impact and requires a payment into the Traffic Impact Fee program:

6.1 Impacts in Existing Plus Project Conditions - *It is the project's responsibility to install the project's recommended improvements at the time of development in order to mitigate impacts to a less-than-significant level. The project is 100% responsible for these improvements.*

6.2 Impacts in Cumulative Conditions

A. *If the project's fair share of a cumulative impact is 25 percent or more, then the recommended improvements shall be installed at the time of development, subject to a reimbursement agreement. If the recommended improvement is included in the current list of Traffic Impact Fee (TIF) projects, reimbursement will be in the form of either TIF credit or payment from the TIF.*

B. *If the project's fair share of a cumulative impact is less than 25 percent, then the project will be required to pay its fair share of the cost of the improvements to be constructed later by others, prior to the realization of the impact. If the recommended improvement is included in the current list of TIF projects, then payment of the project's TIF fee will be considered mitigation for the impact.*

Technical Analysis Parameters

This TIAR provides a "preliminary operational level" evaluation of traffic operating conditions. Table 5 presents the technical analysis parameters that were used in this study.

**TABLE 5
INTERSECTION TECHNICAL ANALYSIS PARAMETERS**

1	Analysis Period - 15 Minutes
2	Peak Hour Factor (PHF)- from counts for Existing conditions, 0.92 or higher for Year 2040 conditions. PHF Greater than 0.92 due to Existing counts showing higher PHF.
3	% Trucks: weekday peak hour analysis - from counts
4	25 ft. assumed vehicle length for stacking and queues
5	Cycle Length - 80 sec min, 150 sec max (optimize signal timing)
6	Coordinated Cycle Length - obtained from City and Caltrans (optimize signal timing for Year 2040 conditions)
7	Total Lost Time Per Signal Phase - 4 seconds (24 sec max for 8-phase signal)
8	Pedestrian Speed - 3.5 ft/s and 10 mph for bicycles

Source: Figure 4.5 City of Redding TIA Guideline January 2009, modified as appropriate.

Warrant Analysis

A supplemental traffic signal "warrant" analysis was completed for unsignalized intersections determined to be operating at an unacceptable LOS. The term "signal warrant" refers to the list of established criteria used by public agencies to quantitatively justify or ascertain the need for installation of a traffic signal at an unsignalized intersection. This study has employed the signal warrant criteria presented in the latest edition of the California Manual on Uniform Traffic Control Devices (MUTCD) for all unsignalized study intersection.

The California MUTCD indicates that the installation of a traffic signal should be considered if one or more of the signal warrants are met. Specifically, this study utilizes the peak hour volume-based Warrant 3 as one representative type of traffic signal warrant analysis. It should be noted that the Peak Hour Volume Warrant was only applied when the intersection was found to be operating at an unacceptable LOS. Therefore, there may be instances when the unsignalized intersection operates at acceptable LOS conditions but still meets the Peak Hour Volume Warrant.

EXECUTIVE SUMMARY TABLE 1
 COSTCO WHOLESALE TRAFFIC IMPACT ANALYSIS REPORT
 SUMMARY OF INTERSECTION OPERATIONS

SUMMARY OF INTERSECTION OPERATIONS	S. Bonnyview Rd/ Cedars Rd & SR 273	S. Bonnyview Rd/ Eastside Rd	S. Bonnyview Rd/ E. Bonnyview Rd	S. Bonnyview Rd/ Indianwood Dr	S. Bonnyview Rd/ Bechelli Ln	S. Bonnyview Rd/ Texaco Dwy	S. Bonnyview Rd/ I-5 SB Ramps	S. Bonnyview Rd/ I-5 NB Ramps	S. Bonnyview Rd/ Churn Creek Rd	Churn Creek Rd/ Alrose Ln	Churn Creek Rd/ Hartmeyer Ln	Churn Creek Rd/ Huntington Dr	Churn Creek Rd/ Victor Ave	Churn Creek Rd/ Rancho Rd
Intersection Number	1	2	3	4	5	6A	7	8	9	10	11	12	13	14
Control Type	Signal	Signal	Signal	Signal	Signal	TWSC	Signal	Signal	Signal	TWSC	TWSC	TWSC	TWSC	TWSC
Target LOS	D	D	D	D	D	D	D	D	D	D	E	D	D	C
AM PEAK HOUR	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%
Year 2040 No Project with Rancheria	D 40.3 -	D 39.7 -	D 40.6 -	A 7.0 -	D 47.9 Not Ok	C 20.2 -	E 58.6 Not Ok	D 54.1 Not Ok	D 42.4 Not Ok	B 14.3 -	F 55.5 -	E 42.1 -	F 68.9 Not Ok	E 39.9 Not Ok
Year 2040 Plus Project with Rancheria	D 41.5 -	D 42.2 -	D 50.4 -	A 7.1 -	E 65.1 Not Ok	C 23.2 -	F 83.8 Not Ok	E 70.6 Not Ok	D 42.4 Not Ok	B 14.8 -	F 67.2 -	E 48.8 -	F 98.0 Not Ok	F 51.0 Not Ok
Delay Increase Due to Project	1.2	2.5	9.8	0.1	17.2	3.0	25.2	16.5	0.0	0.5	11.7	6.7	29.1	11.1
Significant Impact?	No	No	No	No	Yes	No	Yes	Yes	No	No	No	No	Yes	Yes
PM PEAK HOUR														
Year 2040 No Project with Rancheria	D 40.0 -	D 52.8 -	D 47.9 -	A 9.5 -	F 104.1 Not Ok	D 32.5 -	E 60.6 Not Ok	D 42.7 Not Ok	D 42.3 Not Ok	C 24.7 -	F 94.7 Not Ok	E 35.2 -	F OVR Not Ok	F 62.9 Not Ok
Year 2040 Plus Project with Rancheria	D 40.5 -	D 54.2 -	D 53.4 -	B 10.3 -	F 152.3 Not Ok	E 49.8 -	F 114.9 Not Ok	E 77.8 Not Ok	D 45.5 Not Ok	D 26.4 -	F 125.1 Not Ok	E 39.5 -	F OVR Not Ok	F 90.6 Not Ok
Delay Increase Due to Project	0.5	1.4	5.5	0.8	48.2	17.3	54.3	35.1	3.2	1.7	30.4	4.3	Delay>5	27.7
Significant Impact?	No	No	No	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes
SUMMARY OF INTERSECTION OPERATIONS	Rancho Rd/ Alta Mesa Dr	Rancho Rd/ Shasta View Dr	Rancho Rd/ Airport Rd	Bechelli Ln/ Blue Shield Dwy	Bechelli Ln/ Chinook Dr	Bechelli Ln/ Rivercrest Pkwy	Bechelli Ln/ Loma Vista Dr	Bechelli Ln/ Hartnell Ave	Churn Creek Rd/ Public ROW to Chevron	Churn Creek Rd/ Arizona Ln	Churn Creek Rd/ Loma Vista Dr	Churn Creek Rd/ Shirley Ln & Enterprise HS Dwy	Churn Creek Rd/ Hartnell Ave	
Intersection Number	15	16	17	18	19	20	21	22	23	24	25	26	27	
Control Type	TWSC	TWSC	Signal	Signal	TWSC	TWSC	TWSC	Signal	Signal	TWSC	Signal	Signal	Signal	
Target LOS	C	C	C	C	C	C	C	C	C	C	C	C	C	
AM PEAK HOUR	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	LOS Delay Q95%	
Year 2040 No Project with Rancheria	C 17.6 -	F 131.3 Not Ok	D 39.4 -	A 7.6 -	B 13.8 -	C 15.9 -	F 112.3 Not Ok	C 34.9 Not Ok	B 16.6 -	B 13.9 -	C 21.3 Not Ok	C 34.2 -	E 57.1 Not Ok	
Year 2040 Plus Project with Rancheria	C 18.7 -	F 164.1 Not Ok	D 42.6 -	B 19.7 -	B 14.2 -	C 16.6 -	F 160.2 Not Ok	C 34.9 Not Ok	B 18.3 -	B 14.1 -	C 21.8 Not Ok	C 34.7 -	E 60.0 Not Ok	
Delay Increase Due to Project	1.1	32.8	3.2	12.1	0.4	0.7	47.9	0.0	1.7	0.2	0.5	0.5	2.9	
Significant Impact?	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
PM PEAK HOUR														
Year 2040 No Project with Rancheria	C 15.1 -	F 76.1 Not Ok	C 24.0 -	A 6.4 -	C 16.2 -	C 15.5 -	F OVR Not Ok	C 34.9 Not Ok	C 20.5 -	B 13.2 -	B 17.4 -	B 14.3 -	E 58.9 Not Ok	
Year 2040 Plus Project with Rancheria	C 15.6 -	F 110.0 Not Ok	C 26.9 -	C 25.0 -	C 16.6 -	C 16.4 -	F OVR Not Ok	C 35.0 Not Ok	C 24.1 -	B 13.4 -	B 17.7 -	B 14.5 -	E 60.8 Not Ok	
Delay Increase Due to Project	0.5	33.9	2.9	18.6	0.4	0.9	Delay>5	0.1	3.6	0.2	0.3	0.2	1.9	
Significant Impact?	No	No	No	No	No	No	Yes	No	No	No	No	No	No	

Notes:
 LOS - Level of Service
 TWSC = Two Way Stop Control
 Red = Unacceptable Conditions
 OVR = Delays exceeds 300 seconds

Year 2040 No Project with Rancheria Conditions

The *Year 2040 No Project with Rancheria* Conditions were simulated by superimposing traffic generated by the build-out of the proposed Redding Rancheria onto *Year 2040 No Project* traffic volumes.

Intersection Operations

Table 6 presents a summary of the *Year 2040 No Project with Rancheria* study intersection LOS conditions.

**TABLE 6
YEAR 2040 NO PROJECT WITH RANCHERIA INTERSECTION OPERATIONS**

#	Intersection	Control Type ^{1,2}	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? ³	Delay	LOS	Warrant Met? ³
1	S. Bonnyview Rd/ Cedars Rd & SR 273	Signal	D	40.3	D	-	40.0	D	-
2	S. Bonnyview Rd/ Eastside Rd	Signal	D	39.7	D	-	52.8	D	-
3	S. Bonnyview Rd/ E. Bonnyview Rd	Signal	D	40.6	D	-	47.9	D	-
4	S. Bonnyview Rd/ Indianwood Dr	Signal	D	7.0	A	-	9.5	A	-
5	S. Bonnyview Rd/ Bechelli Ln	Signal	D	47.9	D	-	104.1	F	-
6A	S. Bonnyview Rd/ Texaco Dwy	TWSC	D	20.2	C	-	32.5	D	-
7	S. Bonnyview Rd/ I-5 SB Ramps	Signal	D	58.6	E	-	60.6	E	-
8	S. Bonnyview Rd/ I-5 NB Ramps	Signal	D	54.1	D	-	42.7	D	-
9	S. Bonnyview Rd/ Churn Creek Rd	Signal	D	42.4	D	-	42.3	D	-
10	Churn Creek Rd/ Alrose Ln	TWSC	D	14.3	B	-	24.7	C	-
11	Churn Creek Rd/ Hartmeyer Ln	TWSC	E	55.5	F	No	94.7	F	Yes
12	Churn Creek Rd/ Huntington Dr	TWSC	D	42.1	E	No	35.2	E	No
13	Churn Creek Rd/ Victor Ave	TWSC	D	68.9	F	Yes	OVR	F	Yes
14	Churn Creek Rd/ Rancho Rd	TWSC	C	39.9	E	Yes	62.9	F	Yes
15	Rancho Rd/ Alta Mesa Dr	TWSC	C	17.6	C	-	15.1	C	-
16	Rancho Rd/ Shasta View Dr	TWSC	C	131.3	F	No	76.1	F	No
17	Rancho Rd/ Airport Rd	Signal	C	39.4	D	-	24.0	C	-
18	Bechelli Ln/ Blue Shield Dwy	Signal	C	7.6	A	-	6.4	A	-
19	Bechelli Ln/ Chinook Dr	TWSC	C	13.8	B	-	16.2	C	-
20	Bechelli Ln/ Rivercrest Pkwy	TWSC	C	15.9	C	-	15.5	C	-
21	Bechelli Ln/ Loma Vista Dr	TWSC	C	112.3	F	Yes	OVR	F	Yes
22	Bechelli Ln/ Hartnell Ave	Signal	C	34.9	C	-	34.9	C	-
23	Churn Creek Rd/ Public ROW to Chevron	Signal	C	16.6	B	-	20.5	C	-
24	Churn Creek Rd/ Arizona Ln	TWSC	C	13.9	B	-	13.2	B	-
25	Churn Creek Rd/ Loma Vista Dr	Signal	C	21.3	C	-	17.4	B	-
26	Churn Creek Rd/Shirley Ln & Enterprise HS Dwy	Signal	C	34.2	C	-	14.3	B	-
27	Churn Creek Rd/ Hartnell Ave	Signal	C	57.1	E	-	58.9	E	-

Notes:

1. TWSC = Two Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal

3. Warrant = Based on California MUTCD Warrant 3

4. **Bold** = Unacceptable Conditions

5. OVR = Delay exceeds 300 seconds

As presented in Table 6, all study intersections, except the intersections listed below, are projected to operate at or above the target LOS:

- Intersection 5 – S. Bonnyview Road & Bechelli Lane
- Intersection 7 – S. Bonnyview Road & Interstate 5 SB Ramps
- Intersection 11 – Churn Creek Road & Hartmeyer Lane
- Intersection 12 – Churn Creek Road & Huntington Drive
- Intersection 13 – Churn Creek Road & Victor Avenue
- Intersection 14 – Churn Creek Road & Rancho Road
- Intersection 16 – Rancho Road & Shasta View Drive



- Intersection 17 – Rancho Road & Airport Road
- Intersection 21 – Bechelli Lane & Loma Vista Drive
- Intersection 27 – Churn Creek Road & Hartnell Avenue

Roadway Segment Operations

Table 7 presents a summary of the *Year 2040 No Project with Rancheria* roadway segment operations.

**TABLE 7
YEAR 2040 NO PROJECT WITH RANCHERIA ROADWAY OPERATIONS**

#	Roadway Segment	Capacity Configuration	Target LOS	AM Peak Hour		PM Peak Hour	
				ATS ² / Volume ³	LOS	ATS ² / Volume ³	LOS
1	S. Bonnyview Rd between SR 273 & Churn Creek Rd	Divided Arterial	D	16	E	15.4	E
2	Churn Creek Rd between S. Bonnyview Rd & Rancho Rd	Undivided Arterial	D	706	F	746	F
3	Rancho Rd between Churn Creek Rd & Airport Rd	Undivided Arterial	C	451	B	415	B
4	Bechelli Ln between S. Bonnyview Rd & Chinook Dr	Undivided Arterial	C	591	D	508	C
5	Bechelli Ln between Chinook Dr & 3rd St	Divided Arterial	C	549	B	761	E
6	Churn Creek Rd between S. Bonnyview Rd & Hartnell Ave	Divided Arterial	C	406	A	433	A
7	Churn Creek Rd between Rancho Rd & Knighton Rd	Collector	C	215	A	250	A

Notes:

1. Roadway Type as designated by Table 4.5 E of the City of Redding TIA Guidelines
2. ATS= Arterial Travel Speed. ATS is indicated only for the S. Bonnyview Road corridor between SR 273 & Churn Creek Rd.
3. Volume indicates Maximum Peak Hour Volume Per Lane.
4. **Bold** = Unacceptable Conditions

As presented in Table 7, all study roadway segments, except the segments listed below, are projected to operate at or above the target LOS:

- Segment 1 – S. Bonnyview Road between SR 273 and Churn Creek Road
- Segment 2 – Churn Creek Road between S. Bonnyview Road and Rancho Road
- Segment 4 – Bechelli Lane between S. Bonnyview Road and Chinook Drive
- Segment 5 – Bechelli Lane between Chinook Drive and 3rd Street

Intersection Queues

Tables 8A and 8B present a summary of the *Year 2040 No Project with Rancheria* queues projected for critical intersections along S. Bonnyview Road, Bechelli Lane, and Churn Creek Road corridors.



**TABLE 8A
YEAR 2040 NO PROJECT WITH RANCHERIA 95TH PERCENTILE QUEUE LENGTHS**

Int. #	Intersection/Approach	Control Type	Yr 2040 No Project with Rancheria 95th Percentile Queue (ft)		Available Storage
			AM Peak Hour	PM Peak Hour	
5	<i>S Bonnyview Rd & Bechelli Ln</i>				
	Eastbound Left	Signal	330	399	200
	Eastbound Thru		460	565	
	Eastbound Thru/Right		514	547	
	Westbound Left/U-Turn		215	214	140
	Westbound Thru		320	320	
	Westbound Right		136	83	
	Northbound Thru/Left		231	211	
	Northbound Right		94	83	30
	Southbound Left/U-Turn		221	791	
	Southbound Left/Thru		374	833	
	Southbound Right		185	255	110
7	<i>S Bonnyview Rd & I-5 SB Ramps</i>				
	Eastbound Thru	Signal	402	430	250
	Eastbound Right		179	373	250
	Westbound Left		236	324	
	Westbound Thru		408	506	
	Southbound Left/Thru		553	460	175
	Southbound Right		506	485	
8	<i>S Bonnyview Rd & I-5 NB Ramps</i>				
	Eastbound Left	Signal	302	340	
	Eastbound Thru		409	423	
	Westbound Thru		329	309	
	Westbound Right		273	260	110
	Northbound Thru/Left		699	602	
	Northbound Right		645	690	285
9	<i>S Bonnyview Rd & Churn Creek</i>				
	Eastbound Left	Signal	253	271	130
	Eastbound Thru		303	317	
	Eastbound Right		109	170	115
	Westbound Left		156	126	75
	Westbound Thru		311	414	
	Westbound Thru/Right		451	495	
	Northbound Left/Thru		182	183	
	Northbound Right		70	45	
	Southbound Thru/Left		564	671	
	Southbound Right		744	698	



**TABLE 8B
YEAR 2040 NO PROJECT WITH RANCHERIA 95TH PERCENTILE QUEUE LENGTHS**

Int. #	Intersection/Approach	Control Type	Yr 2040 No Project with Rancheria 95th Percentile Queue (ft)		Available Storage
			AM Peak Hour	PM Peak Hour	
10	Churn Creek Rd & Alrose Ln				
	Eastbound Left/Thru/Right	Signal	197	347	
	Westbound Left/Thru		704	359	
	Westbound Thru/Right		697	374	
	Northbound Left/Thru/Right		-	93	
	Southbound Left		118	104	
	Southbound Right		177	152	
22	Bechelli Ln & Hartnell Ave				
	Eastbound Left	Signal	50	83	140
	Eastbound Thru		125	280	
	Eastbound Right		51	88	140
	Westbound Left		296	414	150
	Westbound Thru		188	192	
	Westbound Right		51	45	155
	Northbound Left		444	266	50
	Northbound Thru		188	236	
	Southbound Left		184	324	50
	Southbound Thru		153	224	
25	Churn Creek Rd & Loma Vista Dr				
	Eastbound Left/Thru/Right	Signal	238	159	
	Westbound Left/Thru/Right		73	59	
	Northbound Left		135	70	60
	Northbound Thru		234	214	
	Southbound Left		38	41	75
	Southbound Thru		194	370	
27	Churn Creek Rd & Hartnell Ave				
	Eastbound Left	Signal	101	135	110
	Eastbound Thru		159	285	
	Eastbound Right		78	132	75
	Westbound Left		331	330	75
	Westbound Thru		238	193	
	Westbound Right		99	65	205
	Northbound Left		558	252	115
	Northbound Thru		687	513	
	Southbound Left		184	632	110
	Southbound Thru		327	503	

Note: **Bold** text indicates queues that exceed available storage



Freeway and Ramp Operations

Table 9 presents a summary of the *Year 2040 No Project with Rancharia* ramp merge, diverge, and freeway mainline operations.

**TABLE 9
YEAR 2040 NO PROJECT WITH RANCHERIA RAMP AND FREEWAY OPERATIONS**

#	Interchange Location	Target LOS	Segment Type	No. of Lanes	AM Peak Hour			PM Peak Hour		
					Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
<i>Interstate 5 (I-5)</i>										
1	Cypress Ave Off Ramp NB	D	Diverge	1	969	28.0	C	742	23.2	C
2	S. Bonnyview Rd to Cypress Ave NB	D	Mainline	3	3,912	23.2	C	3,128	18.5	C
3	S. Bonnyview Rd On Ramp NB	D	Merge	1	1,082	26.1	C	1,136	21.4	C
4	S. Bonnyview Rd Off Ramp NB	D	Diverge	1	1,017	26.0	C	839	19.9	B
5	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	3	3,847	22.8	C	2,831	16.7	B
6	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	2	3,847	39.9	E	2,831	25.4	C
7	Knighton Rd On Ramp NB	D	Merge	1	271	37.1	E	328	27.8	C
8	Knighton Rd Off Ramp SB	D	Diverge	1	228	22.9	C	384	39.6	E
9	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	2	2,261	20.0	C	3,947	42.0	E
10	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	3	2,261	13.4	B	3,947	23.4	C
11	S. Bonnyview Rd On Ramp SB	D	Diverge	1	648	17.5	B	1,030	26.8	C
12	S. Bonnyview Rd Off Ramp SB	D	Mainline	1	1,108	20.6	C	1,057	26.9	C
13	Cypress Ave to S. Bonnyview Rd SB	D	Mainline	3	2,721	16.1	B	3,974	23.6	C
14	Cypress Ave On Ramp SB	D	Merge	1	440	17.9	B	1,019	25.6	C

Notes:

Capacity of Upstream/Downstream Freeway segment is 7,200 pc/h or 2,400 pc/hr/ln

Bold text indicates unacceptable roadway operations.

As presented in Table 9, all study freeway segments and ramps, except the following, are projected to operate at or above the target LOS:

- Knighton Road to S. Bonnyview Road NB – Mainline (4-lane section)
- Knighton Road On Ramp NB – Merge
- Knighton Road Off Ramp SB – Diverge
- S. Bonnyview Road to Knighton Road SB – Mainline (4-lane section)

Year 2040 Plus Project and Rancharia Conditions

The *Year 2040 Plus Project with Rancharia* Conditions were simulated by superimposing traffic generated by the build-out of the proposed project onto *Year 2040 No Project with Rancharia* traffic volumes.

Intersection Operations

Table 10 presents a summary of the *Year 2040 Plus Project with Rancharia* study intersection LOS conditions.



**TABLE 10
YEAR 2040 PLUS PROJECT WITH RANCHERIA INTERSECTION OPERATIONS**

#	Intersection	Control Type ^{1,2}	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? ³	Delay	LOS	Warrant Met? ³
1	S. Bonnyview Rd/ Cedars Rd & SR 273	Signal	D	41.5	D	-	40.5	D	-
2	S. Bonnyview Rd/ Eastside Rd	Signal	D	42.2	D	-	54.2	D	-
3	S. Bonnyview Rd/ E. Bonnyview Rd	Signal	D	50.4	D	-	53.4	D	-
4	S. Bonnyview Rd/ Indianwood Dr	Signal	D	7.1	A	-	10.3	B	-
5	S. Bonnyview Rd/ Bechelli Ln	Signal	D	65.1	E	-	152.3	F	-
6A	S. Bonnyview Rd/ Texaco Dwy	TWSC	D	23.2	C	-	49.8	E	No
6B	S. Bonnyview Rd/ S. Bonnyview Dwy	TWSC	D	52.6	F	No	51.4	F	No
7	S. Bonnyview Rd/ I-5 SB Ramps	Signal	D	83.8	F	-	114.9	F	-
8	S. Bonnyview Rd/ I-5 NB Ramps	Signal	D	70.6	E	-	77.8	E	-
9	S. Bonnyview Rd/ Churn Creek Rd	Signal	D	42.4	D	-	45.5	D	-
10	Churn Creek Rd/ Alrose Ln	TWSC	D	14.8	B	-	26.4	D	-
11	Churn Creek Rd/ Hartmeyer Ln	TWSC	E	67.2	F	No	125.1	F	Yes
12	Churn Creek Rd/ Huntington Dr	TWSC	D	48.8	E	No	39.5	E	No
13	Churn Creek Rd/ Victor Ave	TWSC	D	98.0	F	Yes	OVR	F	Yes
14	Churn Creek Rd/ Rancho Rd	TWSC	C	51.0	F	Yes	90.6	F	Yes
15	Rancho Rd/ Alta Mesa Dr	TWSC	C	18.7	C	-	15.6	C	-
16	Rancho Rd/ Shasta View Dr	TWSC	C	164.1	F	No	110.0	F	No
17	Rancho Rd/ Airport Rd	Signal	C	42.6	D	-	26.9	C	-
18	Bechelli Ln/ Blue Shield Dwy	Signal	C	19.7	B	-	25.0	C	-
19	Bechelli Ln/ Chinook Dr	TWSC	C	14.2	B	-	16.6	C	-
20	Bechelli Ln/ Rivercrest Pkwy	TWSC	C	16.6	C	-	16.4	C	-
21	Bechelli Ln/ Loma Vista Dr	TWSC	C	160.2	F	Yes	OVR	F	Yes
22	Bechelli Ln/ Hartnell Ave	Signal	C	34.9	C	-	35.0	C	-
23	Churn Creek Rd/ Public ROW to Chevron	Signal	C	18.3	B	-	24.1	C	-
24	Churn Creek Rd/ Arizona Ln	TWSC	C	14.1	B	-	13.4	B	-
25	Churn Creek Rd/ Loma Vista Dr	Signal	C	21.8	C	-	17.7	B	-
26	Churn Creek Rd/ Shirley Ln & Enterprise HS Dwy	Signal	C	34.7	C	-	14.5	B	-
27	Churn Creek Rd/ Hartnell Ave	Signal	C	60.0	E	-	60.8	E	-
28	Bechelli Ln/Northern Dwy	TWSC	C	21.0	C	-	39.5	E	No
29	Behcelli Ln/Southern Dwy	TWSC	C	13.5	B	-	11.9	B	-

Notes:

1. TWSC = Two Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal

3. Warrant = Based on California MUTCD Warrant 3

4. **Bold** = Unacceptable Conditions

5. OVR = Delay exceeds 300 seconds

As presented in Table 10, all study intersections, except the intersections listed below, are projected to operate at or above the target LOS:

- Intersection 5 – S. Bonnyview Road & Bechelli Lane
- Intersection 6A – S. Bonnyview Road & Texaco Driveway
- Intersection 6B – S. Bonnyview Road & S. Bonnyview Driveway
- Intersection 7 – S. Bonnyview Road & Interstate 5 SB Ramps
- Intersection 8 – S. Bonnyview Road & Interstate 5 NB Ramps
- Intersection 11 – Churn Creek Road & Hartmeyer Lane
- Intersection 12 – Churn Creek Road & Huntington Drive
- Intersection 13 – Churn Creek Road & Victor Avenue
- Intersection 14 – Churn Creek Road & Rancho Road
- Intersection 16 – Rancho Road & Shasta View Drive
- Intersection 17 – Rancho Road & Airport Road
- Intersection 21 – Bechelli Lane & Loma Vista Drive
- Intersection 27 – Churn Creek Road & Hartnell Avenue
- Intersection 28 – Bechelli Lane & Northern Driveway



Roadway Segment Operations

Table 11 presents a summary of the *Year 2040 Plus Project with Rancheria* roadway segment operations.

**TABLE 11
YEAR 2040 PLUS PROJECT WITH RANCHERIA ROADWAY OPERATIONS**

#	Roadway Segment	Capacity Configuration	Target LOS	AM Peak Hour		PM Peak Hour	
				ATS ² / Volume ³	LOS	ATS ² / Volume ³	LOS
1	S. Bonnyview Rd between SR 273 & Churn Creek Rd	Divided Arterial	D	14.8	E	12.5	F
2	Churn Creek Rd between S. Bonnyview Rd & Rancho Rd	Undivided Arterial	D	738	F	781	F
3	Rancho Rd between Churn Creek Rd & Airport Rd	Undivided Arterial	C	472	C	434	B
4	Bechelli Ln between S. Bonnyview Rd & Chinook Dr	Undivided Arterial	C	492	C	689	F
5	Bechelli Ln between Chinook Dr & 3rd St	Divided Arterial	C	566	C	781	E
6	Churn Creek Rd between S. Bonnyview Rd & Hartnell Ave	Divided Arterial	C	415	A	442	A
7	Churn Creek Rd between Rancho Rd & Knighton Rd	Collector	C	218	A	253	A

Notes:

1. Roadway Type as designated by Table 4.5 E of the City of Redding TIA Guidelines
2. ATS= Arterial Travel Speed. ATS is indicated only for the S. Bonnyview Road corridor between SR 273 & Churn Creek Rd.
3. Volume indicates Maximum Peak Hour Volume Per Lane.
4. **Bold** = Unacceptable Conditions

As presented in Table 11, all study roadway segments, except the segments listed below, are projected to operate at or above the target LOS:

- Segment 1 – S. Bonnyview Road between SR 273 and Churn Creek Road
- Segment 2 – Churn Creek Road between S. Bonnyview Road and Rancho Road
- Segment 4 – Bechelli Lane between S. Bonnyview Road and Chinook Drive
- Segment 5 – Bechelli Lane between Chinook Drive and 3rd Street

Intersection Queues

Tables 12A and 12B present a summary of the *Year 2040 Plus Project with Rancheria* queues projected for critical intersections along S. Bonnyview Road, Bechelli Lane, and Churn Creek Road corridors.



**TABLE 12A
YEAR 2040 PLUS PROJECT WITH RANCHERIA 95TH PERCENTILE QUEUE LENGTHS**

Int. #	Intersection/Approach	Control Type	Yr 2040 No Project with Rancheria 95th Percentile Queue (ft)		Yr 2040 Plus Project with Rancheria 95th Percentile Queue (ft)		Available Storage
			AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	
5	S Bonnyview Rd & Bechelli Ln						
	Eastbound Left	Signal	330	399	353	399	200
	Eastbound Thru		460	565	569	612	
	Eastbound Thru/Right		514	547	570	547	
	Westbound Left/U-Turn		215	214	215	221	140
	Westbound Thru		320	320	329	322	
	Westbound Right		136	83	136	83	
	Northbound Thru/Left		231	211	239	211	
	Northbound Right		94	83	94	114	30
	Southbound Left/U-Turn		221	791	544	1318	
	Southbound Left/Thru		374	833	656	1023	
	Southbound Right		185	255	260	270	110
7	S Bonnyview Rd & I-5 SB Ramps						
	Eastbound Thru	Signal	402	430	423	430	250
	Eastbound Right		179	373	196	373	250
	Westbound Left		236	324	246	324	
	Westbound Thru		408	506	527	506	
	Southbound Left/Thru		553	460	575	569	175
	Southbound Right		506	485	506	485	
8	S Bonnyview Rd & I-5 NB Ramps						
	Eastbound Left	Signal	302	340	326	340	
	Eastbound Thru		409	423	409	559	
	Westbound Thru		329	309	329	318	
	Westbound Right		273	260	288	260	110
	Northbound Thru/Left		699	602	699	602	
	Northbound Right		645	690	660	690	285
9	S Bonnyview Rd & Churn Creek Rd						
	Eastbound Left	Signal	253	271	253	271	130
	Eastbound Thru		303	317	303	332	
	Eastbound Right		109	170	109	170	115
	Westbound Left		156	126	156	126	75
	Westbound Thru		311	414	311	414	
	Westbound Thru/Right		451	495	451	495	
	Northbound Left/Thru		182	183	182	183	
	Northbound Right		70	45	76	45	
	Southbound Thru/Left		564	671	564	671	
	Southbound Right		744	698	764	698	



**TABLE 12B
YEAR 2040 PLUS PROJECT WITH RANCHERIA 95TH PERCENTILE QUEUE LENGTHS**

Int. #	Intersection/Approach	Control Type	Yr 2040 No Project with Rancheria 95th Percentile Queue (ft)		Yr 2040 Plus Project with Rancheria 95th Percentile Queue (ft)		Available Storage
			AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	
10	Churn Creek Rd & Alrose Ln						
	Eastbound Left/Thru/Right	Signal	197	347	197	347	
	Westbound Left/Thru		704	359	704	700	
	Westbound Thru/Right		697	374	699	659	
	Northbound Left/Thru/Right		-	93	-	131	
	Southbound Left		118	104	118	127	
	Southbound Right		177	152	177	171	
22	Bechelli Ln & Hartnell Ave						
	Eastbound Left	Signal	50	83	50	83	140
	Eastbound Thru		125	280	125	280	
	Eastbound Right		51	88	52	88	140
	Westbound Left		296	414	296	414	150
	Westbound Thru		188	192	188	192	
	Westbound Right		51	45	51	45	155
	Northbound Left		444	266	454	287	50
	Northbound Thru		188	236	188	236	
	Southbound Left		184	324	184	333	50
	Southbound Thru		153	224	153	224	
25	Churn Creek Rd & Loma Vista Dr						
	Eastbound Left/Thru/Right	Signal	238	159	245	166	
	Westbound Left/Thru/Right		73	59	77	62	
	Northbound Left		135	70	136	71	60
	Northbound Thru		234	214	242	223	
	Southbound Left		38	41	38	41	75
	Southbound Thru		194	370	206	386	
27	Churn Creek Rd & Hartnell Ave						
	Eastbound Left	Signal	101	135	101	135	110
	Eastbound Thru		159	285	159	285	
	Eastbound Right		78	132	78	132	75
	Westbound Left		331	330	362	360	75
	Westbound Thru		238	193	238	193	
	Westbound Right		99	65	99	65	205
	Northbound Left		558	252	558	252	115
	Northbound Thru		687	513	704	532	
	Southbound Left		184	632	184	632	110
	Southbound Thru		327	503	333	513	

Note: **Bold** text indicates queues that exceed available storage



Freeway and Ramp Operations

Table 13 presents a summary of the *Year 2040 Plus Project and Rancheria* ramp merge, diverge, and freeway mainline operations.

**TABLE 13
YEAR 2040 PLUS PROJECT AND RANCHERIA RAMP AND FREEWAY OPERATIONS**

#	Interchange Location	Target LOS	Segment Type	No. of Lanes	AM Peak Hour			PM Peak Hour		
					Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
<i>Interstate 5 (I-5)</i>										
1	Cypress Ave Off Ramp NB	D	Diverge	1	979	28.4	D	755	23.8	C
2	S. Bonnyview Rd to Cypress Ave NB	D	Mainline	3	3,996	23.7	C	3,232	19.1	C
3	S. Bonnyview Rd On Ramp NB	D	Merge	1	1,168	26.8	C	1,311	22.4	C
4	S. Bonnyview Rd Off Ramp NB	D	Diverge	1	1,088	26.6	C	970	20.6	C
5	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	3	3,916	23.2	C	2,891	17.1	B
6	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	2	3,916	41.3	E	2,891	26.0	D
7	Knighton Rd On Ramp NB	D	Merge	1	277	37.7	E	334	28.4	D
8	Knighton Rd Off Ramp SB	D	Diverge	1	233	23.5	C	390	40.4	E
9	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	2	2,317	20.5	C	4,024	43.7	E
10	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	3	2,317	13.7	B	4,024	23.9	C
11	S. Bonnyview Rd On Ramp SB	D	Diverge	1	705	18.0	B	1,195	27.7	C
12	S. Bonnyview Rd Off Ramp SB	D	Mainline	1	1,212	21.5	C	1,244	27.8	C
13	Cypress Ave to S. Bonnyview Rd SB	D	Mainline	3	2,824	16.7	B	4,073	24.2	C
14	Cypress Ave On Ramp SB	D	Merge	1	449	18.4	C	1,028	26.1	C

Notes:

Capacity of Upstream/Downstream Freeway segment is 7,200 pc/h or 2,400 pc/hr/ln

Bold text indicates unacceptable roadway operations.

As presented in Table 13, all study freeway segments and ramps, except the following, are projected to operate at or above the target LOS:

- Knighton Road to S. Bonnyview Road NB – Mainline (4-lane section)
- Knighton Road On Ramp NB – Merge
- Knighton Road Off Ramp SB – Diverge
- S. Bonnyview Road to Knighton Road SB – Mainline (4-lane section)

Project Impacts and Mitigation Measures

This section presents recommended project-related mitigation measures at the study intersections. These mitigation measures were developed based on the findings from the analyses presented in the prior sections of this report.

Impact Significance Criteria

In accordance with the January 2009 City of Redding TIA Guidelines, the following thresholds of significance are used to determine if the proposed project causes a significant impact and requires mitigation:

Signalized Intersections

- The project causes an acceptable LOS to decline to an unacceptable LOS, or
- The project increases the overall average delay by more than 5 seconds per vehicle at an intersection having an unacceptable LOS without project traffic

Two-Way Stop Intersections

- The project causes the following to occur for the worst-case movement:



- The LOS declines to an unacceptable LOS, and
- The volume to capacity ratio exceeds 0.75, and
- The 95th percentile queue exceeds 75 feet (3 vehicles), or
- The project causes the worst-case movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met, or
- The project increases the average delay for the worst-case movement by more than 5 seconds per vehicle at an intersection that has an unacceptable LOS without the project and the intersection also meets the peak hour volume signal warrant.

Roadways

City of Redding TIA Guidelines do not have specified significance thresholds for Roadway Segments. Therefore, consistent with past reports and industry standards the following thresholds have been established. The project is considered to have a significant impact if it would:

- Result in a roadway that will operate at an acceptable LOS in the No Project condition to deteriorate to an unacceptable LOS in the Plus Project condition; or,
- Increase the V/C ratio by more than 5% at a roadway that will operate at an unacceptable LOS in the No Project condition; or,
- Decrease the average arterial speed by more than 5% at a roadway that will operate at an unacceptable LOS in the No Project condition.

Freeway Mainline/Ramp Merge-Diverge/Weave

Caltrans TIA Guidelines do not have specified significance thresholds for Roadway Segments. Therefore, consistent with past reports and industry standards the following thresholds have been established. The project is considered to have a significant impact if it would:

- Result in a facility that will operate at an acceptable LOS in the No Project condition to deteriorate to an unacceptable LOS in the Plus Project condition; or,
- Increase the density by more than 5% at a facility that will operate at an unacceptable LOS in the No Project condition.

Year 2040 Plus Project with Rancheria Project Impacts

Table 14A presents the intersections projected to operate at unacceptable levels of service under *Year 2040 Plus Project with Rancheria* Conditions when compared to the *Year 2040 No Project with Rancheria* Conditions and determines whether a significant impact is identified.

**TABLE 14A
YEAR 2040 PLUS PROJECT WITH RANCHERIA IMPACTS AT INTERSECTIONS**

AM Peak Hour												
#	Intersection	Control Type ¹	Target LOS	Year 2040 with Rancheria LOS ²	Year 2040 Plus Project with Rancheria LOS ²	Year 2040 with Rancheria Delay (D1)	Year 2040 Plus Project with Rancheria Delay (D2)	Delay Increase (D2-D1)	Signal Warrant Met?	V/C Ratio	95% Queue (veh)	Significant Impact?
5	S. Bonnyview Rd/ Bechelli Ln	Signal	D	D	E	47.9	65.1	17.2	-	-	-	Yes
7	S. Bonnyview Rd/ I-5 SB Ramps	Signal	D	E	F	58.6	83.8	25.2	-	-	-	Yes
8	S. Bonnyview Rd/ I-5 NB Ramps	Signal	D	D	E	54.1	70.6	16.5	-	-	-	Yes
11	Churn Creek Rd/ Hartmeyer Ln	TWSC	E	F	F	55.5	67.2	11.7	No	0.44	2	No
12	Churn Creek Rd/ Huntington Dr	TWSC	D	E	E	42.1	48.8	6.7	No	0.29	1	No
13	Churn Creek Rd/ Victor Ave	TWSC	D	F	F	68.9	98.0	29.1	Yes	1.04	12	Yes
14	Churn Creek Rd/ Rancho Rd	TWSC	C	E	F	39.9	51.0	11.1	Yes	0.96	13	Yes
16	Rancho Rd/ Shasta View Dr	TWSC	C	F	F	131.3	164.1	32.8	No	1.21	15	No
17	Rancho Rd/ Airport Rd	Signal	C	D	D	39.4	42.6	3.2	-	-	-	No
21	Bechelli Ln/ Loma Vista Dr	TWSC	C	F	F	112.3	160.2	47.9	Yes	1.17	13	Yes
27	Churn Creek Rd/ Hartnell Ave	Signal	C	E	E	57.1	60.0	2.9	-	-	-	No

PM Peak Hour												
#	Intersection	Control Type ¹	Target LOS	Year 2040 with Rancheria LOS ²	Year 2040 Plus Project with Rancheria LOS ²	Year 2040 with Rancheria Delay (D1)	Year 2040 Plus Project with Rancheria Delay (D2)	Delay Increase (D2-D1)	Signal Warrant Met?	V/C Ratio	95% Queue (veh)	Significant Impact?
5	S. Bonnyview Rd/ Bechelli Ln	Signal	D	F	F	104.1	152.3	48.2	-	-	-	Yes
6A	S. Bonnyview Rd/ Texaco Dwy	TWSC	D	D	E	32.5	49.8	17.3	No	0.49	2	No
7	S. Bonnyview Rd/ I-5 SB Ramps	Signal	D	E	F	60.6	114.9	54.3	-	-	-	Yes
8	S. Bonnyview Rd/ I-5 NB Ramps	Signal	D	D	E	42.7	77.8	35.1	-	-	-	Yes
11	Churn Creek Rd/ Hartmeyer Ln	TWSC	E	F	F	94.7	125.1	30.4	Yes	0.91	6	Yes
12	Churn Creek Rd/ Huntington Dr	TWSC	D	E	E	35.2	39.5	4.3	No	0.17	1	No
13	Churn Creek Rd/ Victor Ave	TWSC	D	F	F	OVR	OVR	>5	Yes	1.98	27	Yes
14	Churn Creek Rd/ Rancho Rd	TWSC	C	F	F	62.9	90.6	27.7	Yes	1.06	15	Yes
16	Rancho Rd/ Shasta View Dr	TWSC	C	F	F	76.1	110.0	33.9	No	1.01	9	No
21	Bechelli Ln/ Loma Vista Dr	TWSC	C	F	F	OVR	OVR	>5	Yes	2.15	17	Yes
27	Churn Creek Rd/ Hartnell Ave	Signal	C	E	E	58.9	60.8	1.9	-	-	-	No

Notes:

1. TWSC = Two Way Stop Control, OVR = >300 Seconds Delay
2. LOS = Delay based on worst minor street movement for TWSC intersections, average delay for AWSC and Signal intersections.
3. V/C and 95% Queue not reported if not required to determine significance
4. **Bold** = Unacceptable Conditions
5. OVR = Delay exceeds 300 seconds

Table 14B presents the roadway segments projected to operate at unacceptable levels of service under Year 2040 Plus Project with Rancheria Conditions and determines whether a significant impact is identified.



**TABLE 14B
YEAR 2040 PLUS PROJECT WITH RANCHERIA SIGNIFICANT IMPACTS AT ROADWAY SEGMENTS**

AM Peak Hour									
#	Roadway Segment	Control Type ¹	Target LOS	Year 2040 with Rancheria LOS ²	Year 2040 Plus Project with Rancheria LOS ²	Year 2040 with Rancheria V/C Ratio (V/C ₁) or Ave. Arterial Speed (AAS ₁)	Year 2040+P with Rancheria V/C Ratio (V/C ₂) or Ave. Arterial Speed (AAS ₂)	Percentage Increase in V/C Ratio (V/C ₁ -V/C ₂) or Decrease in Ave. Arterial Speed (AAS ₁ -AAS ₂)	Significant Impact?
1	S. Bonnyview Rd between SR 273 & Churn Creek Rd	Divided Arterial	D	E	E	16.0	14.8	7.5%	Yes
2	Churn Creek Rd between S. Bonnyview Rd & Rancho Rd	Undivided Arterial	D	F	F	1.157	1.211	4.6%	No

PM Peak Hour									
#	Roadway Segment	Control Type ¹	Target LOS	Year 2040 with Rancheria LOS ²	Year 2040 Plus Project with Rancheria LOS ²	Year 2040 with Rancheria V/C Ratio (V/C ₁) or Ave. Arterial Speed (AAS ₁)	Year 2040+P with Rancheria V/C Ratio (V/C ₂) or Ave. Arterial Speed (AAS ₂)	Percentage Increase in V/C Ratio (V/C ₁ -V/C ₂) or Decrease in Ave. Arterial Speed (AAS ₁ -AAS ₂)	Significant Impact?
1	S. Bonnyview Rd between SR 273 & Churn Creek Rd	Divided Arterial	D	E	F	15.4	12.5	18.8%	Yes
2	Churn Creek Rd between S. Bonnyview Rd & Rancho Rd	Undivided Arterial	D	F	F	1.22	1.28	4.8%	No
4	Bechelli Ln between S. Bonnyview Rd & Chinook Dr	Undivided Arterial	C	C	F	0.94	1.28	35.8%	Yes
5	Bechelli Ln between Chinook Dr & 3rd St	Divided Arterial	C	E	E	1.17	1.20	2.6%	No

Notes:
1. **Bold** = Unacceptable Conditions

Table 14C presents the freeway mainline and ramp segments projected to operate at unacceptable levels of service under *Year 2040 Plus Project with Rancheria* Conditions and determines whether a significant impact is identified.

**TABLE 14C
YEAR 2040 PLUS PROJECT WITH RANCHERIA SIGNIFICANT IMPACTS AT FREEWAY MAINLINE & RAMPS**

AM Peak Hour									
#	Freeway Segment	Segment Type	Target LOS	Year 2040 with Rancheria LOS ²	Year 2040 Plus Project with Rancheria LOS ²	Year 2040 with Rancheria Density (pc/mi/ln) (D1)	Year 2040+P with Rancheria Density (pc/mi/ln) (D2)	Percentage Increase in Density (D2-D1)	Significant Impact?
6	Knighton Rd to S. Bonnyview Rd NB	Mainline	D	E	E	39.9	41.3	4%	No
7	Knighton Rd On Ramp NB	Merge	D	E	E	37.1	37.7	2%	No

PM Peak Hour									
#	Freeway Segment	Segment Type	Target LOS	Year 2040 with Rancheria LOS ²	Year 2040 Plus Project with Rancheria LOS ²	Year 2040 with Rancheria Density (pc/mi/ln) (D1)	Year 2040+P with Rancheria Density (pc/mi/ln) (D2)	Percentage Increase in Density (D2-D1)	Significant Impact?
8	Knighton Rd Off Ramp SB	Diverge	D	E	E	39.6	40.4	2%	No
9	S. Bonnyview Rd to Knighton Rd SB	Mainline	D	E	E	42.0	43.7	4%	No

Notes:
1. **Bold** = Unacceptable Conditions



Year 2040 Plus Project Mitigations

The following improvements are proposed to provide acceptable operations at intersections where a project significant impact is identified for the *Year 2040 Plus Project with Rancheria* conditions.

Intersection 5 - S. Bonnyview Road & Bechelli Lane

This signalized intersection is projected to operate at LOS E in the weekday AM peak hour scenario and at LOS F in the weekday PM peak hour scenario. The proposed project creates a significant impact at this intersection by causing the LOS to deteriorate from acceptable to unacceptable in the AM peak hour and by causing the delay to increase by more than 5 seconds per vehicle at an intersection operating unacceptably in the PM peak hour. The following improvements are proposed to mitigate the project impact to less than significant:

- Widen the southbound approach to provide:
 - Two left-turn pockets of length 325 feet.
 - One shared thru/left-turn of length 325 feet.
 - One right-turn lane of length 325 feet.
- Widen the eastbound approach to provide:
 - Two left-turn lanes of length 400 feet.
 - Three thru lanes of length 400 feet.
 - One right-turn pocket of length 350 feet.
- Widen the westbound approach to provide:
 - Two left-turn pockets of length 200 feet.

OR

- Construct a multi-lane roundabout.

After the mitigations stated above, the mitigated LOS is projected to be LOS D for the signal alternative and LOS C for the multi-lane roundabout alternative.

Intersection 7 - S. Bonnyview Road & I-5 Southbound Ramps

This signalized intersection is projected to operate at LOS F in the weekday AM and PM peak hours. The proposed project creates a significant impact at this intersection by causing the delay to increase by more than 5 seconds per vehicle at an intersection operating unacceptably in the AM and PM peak hours. The following improvements are proposed to mitigate the project impact to less than significant:

- Widen the eastbound approach to provide:
 - Two thru lanes that transition into two trap left-turn lanes at the subsequent intersection of S. Bonnyview Road & I-5 NB Ramps.
- Widen the westbound approach to provide:
 - Two left-turn lanes.
- Widen the southbound approach to provide:
 - A shared thru/left-turn pocket of length 400 feet.
 - Two right-turn lanes of length 400 feet.

OR

- Construct the intersections of S. Bonnyview Road/I-5 SB Ramps and S. Bonnyview Road/I-5 NB Ramps into a diverging diamond interchange.

After the mitigations stated above, the mitigated LOS is projected to be LOS D for the signal alternative and LOS C for the diverging diamond interchange alternative.



Intersection 8 - S. Bonnyview Road & I-5 Northbound Ramps

This signalized intersection is projected to operate at LOS E in the weekday AM and PM peak hours. The proposed project creates a significant impact at this intersection by causing the LOS to deteriorate from acceptable to unacceptable in the AM and PM peak hours. The following improvements are proposed to mitigate the project impact to less than significant:

- Widen the eastbound approach to provide:
 - An additional eastbound left-turn lane.
- Widen the northbound approach to provide:
 - One left-turn lane of length 500 feet.
 - One shared thru/left-turn lane of length 500 feet.
 - One right-turn lanes of length 500 feet.

OR

- Construct the intersections of S. Bonnyview Road/I-5 SB Ramps and S. Bonnyview Road/I-5 NB Ramps into a diverging diamond interchange.

After the mitigations stated above, the mitigated LOS is projected to be LOS D for the signal alternative and LOS C for the diverging diamond interchange alternative.

Intersection 11 - Churn Creek Road & Hartmeyer Lane

This unsignalized intersection is projected to operate at LOS F in the weekday PM peak hour. The proposed project creates a significant impact by causing the delay to increase by more than 5 seconds per vehicle at an intersection operating unacceptably, and meets the peak hour signal warrant. The following improvements are proposed to mitigate the project impact to less than significant:

- Reconstruct the intersection to achieve the following:
 - Eliminate westbound left-turn movements.
 - Provide a receiving lane on westbound Churn Creek Road for northbound left-turns.
 - Provide a northbound right-turn lane.
 - Widen the adjacent bridge to accommodate intersection improvements.

After the mitigations stated above, the mitigated LOS is projected to be LOS D.

Intersection 13 - Churn Creek Road & Victor Avenue

This unsignalized intersection is projected to operate at LOS F in the weekday AM and PM peak hours. The proposed project creates a significant impact by causing the delay to increase by more than 5 seconds per vehicle at an intersection operating at an unacceptable LOS and meets the peak hour signal warrant. The following improvements are proposed to mitigate the project impact to less than significant:

- Construct the intersections of Churn Creek Road/Victor Avenue and Churn Creek Road/Rancho Road into a 4-leg, single-lane roundabout.

After the mitigations stated above, the mitigated LOS is projected to be LOS B.

Intersection 14 - Churn Creek Road & Rancho Road

This unsignalized intersection is projected to operate at LOS F in the weekday AM and PM peak hours. The proposed project creates a significant impact by causing the delay to increase by more than 5 seconds per vehicle at an intersection operating unacceptably and meets the peak

hour signal warrant. The following improvements are proposed to mitigate the project to less than significant:

- Construct the intersections of Churn Creek Road/Victor Avenue and Churn Creek Road/Rancho Road into a 4-leg, single-lane roundabout.

After the mitigations stated above, the mitigated LOS is projected to be LOS B.

Intersection 21 - Bechelli Lane & Loma Vista Drive

This unsignalized intersection is projected to operate at LOS F in the weekday AM and PM peak hours. The proposed project creates a significant impact by causing the delay to increase by more than 5 seconds per vehicle at an intersection operating unacceptably and meets the peak hour signal warrant. The following improvements are proposed to mitigate the project to less than significant:

- Construct a traffic signal with split phasing for the eastbound and westbound approaches and protected left-turn movements on northbound and southbound approaches.

OR

- Construct a 4-leg, single-lane roundabout.

After the mitigations stated above, the mitigated LOS is projected to be LOS C for the signal alternative and LOS B for the single-lane roundabout alternative.

Roadway Segments

The following improvements are proposed to provide acceptable operations at roadways where a project significant impact is identified for the *Year 2040 Plus Project with Rancheria* conditions.

Segment 1 - S. Bonnyview Road (from SR 273 to Churn Creek Road)

This roadway segment is projected to operate at LOS E and LOS F in the weekday AM and PM peak hours. The proposed project creates a significant impact by causing the average arterial speed to decrease by more than 5% at a roadway operating unacceptably. The following improvement is proposed to mitigate the project impact to less than significant:

- Construct improvements identified for *Year 2040 Plus Project with Rancheria* at intersections of 5, 7, and 8 to provide acceptable roadway operations.

Segment 4 – Bechelli Lane (from S. Bonnyview Road to Chinook Drive)

This roadway segment is projected to operate at LOS F in the weekday PM peak hour. The proposed project creates a significant impact by causing the LOS to deteriorate from acceptable to unacceptable. The following intersection improvements are proposed to mitigate the project impact to less than significant:

- Construct a TWLTL on Bechelli Lane from Chinook Drive to Northern Driveway.

Fair Share of Improvement Cost Calculations

Fair-share calculations have been identified for all intersections, which are projected to operate at an unacceptable LOS under *No Project with Rancheria* conditions, and experience an increase in delay with the addition of project traffic. Below is a listing of each of the study intersections warranting improvements, the corresponding improvements that the proposed project would be required to pay a Fair-Share of Improvement cost towards, and the proposed project's equitable share of these improvements. The proposed project's equitable share is calculated using the method for calculating equitable mitigation measures outlined in the *Caltrans Guide for the Preparation of Traffic Impact Studies* (State of California, DOT, December 2002), which is shown below:

$$P = T / (T_B - T_E) \text{ where,}$$

P = The equitable share for the project's traffic impact.

T = The vehicle trips generated by the project during the peak hour of adjacent roadway facility in vehicles per hour (vph).

T_B = The forecasted traffic volume on an impacted roadway facility at the time of general plan build-out (e.g. 20-year model or the furthest model date feasible), vph.

T_E = The traffic volume existing on the impacted roadway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph.

Note that the percent Fair-Share calculated using the above formula is reported to the nearest whole number and the calculations are based on the highest Fair-Share percentage from both peak hour scenarios.

Year 2040 Plus Project Fair-Share

Upon the City's direction, Fair-Share cost calculations were conducted for only the Cumulative (Year 2040) conditions.

Intersections

Table 15 presents a summary of the Fair-Share cost calculations performed for intersections with significant impacts for the *Year 2040 Plus Project with Rancheria* Conditions.

**TABLE 15
SUMMARY OF FAIR SHARE CALCULATIONS FOR INTERSECTIONS**

#	Intersection Name	T	T _b	T _e	P
5	S. Bonnyview Road & Bechelli Lane	799	5567	3017	31%
7	S. Bonnyview Road & I-5 SB Ramps	774	5354	2894	31%
8	S. Bonnyview Road & I-5 NB Ramps	265	3890	2388	18%
11	Churn Creek Road & Hartmeyer Lane	80	1663	1015	12%
13	Churn Creek Road & Victor Avenue	74	1503	1003	15%
14	Churn Creek Road & Rancho Road	51	1208	823	13%
21	Bechelli Lane & Loma Vista Drive	39	1278	879	10%

Roadways

Table 16 presents a summary of the Fair-Share cost calculations performed for roadways with significant impacts for the *Year 2040 Plus Project with Rancheria* Conditions.

TABLE 16
SUMMARY OF FAIR SHARE CALCULATIONS FOR ROADWAY SEGMENTS

#	Roadway Segment Name	Begin	End	T	Tb	Te	P
1	S. Bonnyview Road	SR 273	Churn Creek	517	3328	2138	43%
4	Bechelli Lane	Bonnyview Road	Chinook Drive	341	1543	732	42%

Development Impact Fee Program

The following development impact fee programs include transportation facility improvements that may be applicable to this project:

I-5/South Bonnyview Road Interchange: Cost TBD.

Churn Creek Road/Victor Avenue/Rancho Road Roundabout: Cost TBD.

Shasta County Public Facilities Fee

- I-5/South Bonnyview Phase I: \$7,000,000.
- I-5/South Bonnyview Phase II: \$10,000,000.

Shasta County Major Road Impact Fee Program:

- South Bonnyview Road/Churn Creek Road: SR 273 to Rancho Road. Construct separation, widen, add signals. I-5 Interchange improvements including reconstruction of the overcrossing and bridge. \$20,750,000.