3.12

TRAFFIC AND CIRCULATION

3.12 Transportation and Circulation

This section of the Draft EIR analyzes the existing transportation system in the area and addresses the potential transportation and circulation impacts resulting from development of the Knighton and Churn Creek Commons Retail Center. Fehr & Peers completed a traffic analysis for the proposed project. Technical data sheets utilized for analysis are included in Appendix O of this Draft EIR.

During the Notice of Preparation period, comments were received concerning the following:

- Circulation issues at the Knighton Road/I-5 interchange and the stated inadequacy of the overpass.
- Traffic generated by both customers and employees.
- Potential traffic impacts to Interstate 5.
- Potential traffic impacts on Pacheco School.

3.12.1 SETTING

Environmental Setting

EXISTING TRANSPORTATION SYSTEM

The proposed project site is located in southern Shasta County, equidistant from the city limits of Anderson and Redding. The project site is generally bound by Knighton Road to the south, Interstate 5 (I-5) to the west, E. Niles lane to the north, and Churn Creek Road to the east. Regional access to the site is provided by I-5 from its existing interchange with Knighton Road. Knighton Road will also provide direct access to the project site.

The traffic report analyzes the operation of the roadway system in the project study area for existing conditions. The area is primarily categorized as agricultural and rural residential, with automobiles as the primary means of travel. Limited bus transit service and bicycle and pedestrian facilities exist in the immediate vicinity of the project site. An existing truck services facility is located opposite the project site on Knighton Road with four access driveways directly to Knighton Road.

TRAFFIC OPERATIONS

The operations of roadway facilities are described in terms of "level of service." Level of service (LOS) is a qualitative description of traffic flow based on factors such as speed, travel time, delay, freedom to maneuver, traffic volume, and the capacity of the roadway. Six levels are defined from LOS A, as the least congested operating conditions, to LOS F, or the most congested operating conditions. LOS E represents "at-capacity" operations. When volumes exceed capacity, stop-and-go conditions result and operations are designated as LOS F.

Consistent with the Circulation Element of the Shasta County General Plan, LOS E is considered the minimum acceptable operating level for existing facilities and LOS C for new facilities.

Roadway Network

A brief description of key roadway facilities in the vicinity of the proposed project is provided below. See Figure 3.12-1 for the existing roadway network within the project area.

Interstate 5 (I-5). Interstate 5 (I-5) is the main north-south facility through Shasta County. It extends the entire length of Shasta County, from its southern border with Tehama County to its northern border with Siskiyou County. I-5 is a four-lane divided freeway from the Tehama County line to the Siskiyou County line.

Knighton Road. Knighton Road is a two-lane minor collector that connects to the Redding Municipal Airport and Airport Road to the east and extends westward beyond I-5 to Riverland Drive. Its overcrossing of I-5 has up-to an eleven (11) percent grades. The ramp terminal intersections are stop-controlled.

The truck stop on the south side of Knighton Road, opposite the proposed project site, has four driveways between the I-5 ramps and Churn Creek Road.

The main access to the proposed project site is planned off Knighton Road.

Airport Road. Airport Road is a two-lane collector between the City of Redding to the north and the City of Anderson to the south. The City of Redding has identified this roadway corridor as a major north-south connector and has designated it as a potential expressway facility within its General Plan. It should be noted that sections of this roadway are outside the jurisdiction of the City of Redding and are within Shasta County.

Churn Creek Road. Churn Creek Road is a two-lane north-south minor collector that connects to SR 299 on the north and to Airport Road on the south. Access to the project is planned off Churn Creek Road at four locations.

Rail Service

Union Pacific Railroad provides rail service through Shasta County. The primary rail corridor through Shasta County is west of the study area.

Traffic Study Area

The following study locations were included in the assessment. The study area was identified based on discussions with County Staff and input received on the Notice of Preparation (NOP).

- **Roadway Segments**

  - Knighton Road – I-5 Southbound Ramps to I-5 Northbound Ramps
  - Knighton Road – I-5 Northbound Ramps to Churn Creek Road (North)
  - Knighton Road – Churn Creek Road (South) to Airport Road
  - Churn Creek Road – Knighton Road to E. Niles Lane
  - Churn Creek Road – E. Niles Lane to Rancho Road
  - Churn Creek Road – Rancho Road to I-5

- **Intersections**

  - Cypress Avenue / I-5 Southbound Ramps
  - Cypress Avenue / I-5 Northbound Ramps
  - Bonnyview Road / I-5 Southbound Ramps
  - Bonnyview Road / I-5 Northbound Ramps
  - Churn Creek Road / Rancho Road
  - Churn Creek Road / E. Niles Lane
  - Knighton Road/ Airport Road
  - Knighton Road / Churn Creek Road
  - Knighton Road / Churn Creek Road / Pacheco Road
  - Knighton Road / I-5 Northbound Ramps
  - Knighton Road / I-5 Southbound Ramps
  - Knighton Road / Riverland Drive
  - Riverside Avenue / I-5 Southbound Ramps
  - Riverside Avenue / I-5 Northbound Ramps

- **Highway Segments**

  - I-5 – North of SR 299
  - I-5 – SR 299 to SR 44
  - I-5 – SR 44 to Cypress Avenue
  - I-5 – Cypress Avenue to Bonnyview Road (Churn Creek Road)
  - I-5 – Bonnyview Road (Churn Creek Road) and Knighton Road
  - I-5 – Knighton Road to Riverside Avenue
  - I-5 – Riverside Avenue to North Street / Balls Ferry Road
  - I-5 – North Street / Balls Ferry Road to SR 273
  - I-5 – South of SR 273

- **Interchanges**

  - I-5 / Cypress Avenue
  - I-5 / Bonnyview Road
  - I-5 / Knighton Road
  - I-5 / Riverside Avenue

Existing Traffic Volumes

Fehr & Peers obtained existing traffic counts from several sources, including Caltrans District 2; the *Shastina Ranch Traffic Impact Study (2004)*; the *Cypress Avenue Bridge Widening Project Draft Environmental Impact Report (2005)*; *North Fork Ranch (2006);* traffic counts conducted by Omni-Means in May 2005; traffic counts conducted by DKS Associates in 2002; and traffic counts conducted by Fehr & Peers in March 2006, February 2009, and June 2009. The counts were taken for the following intervals:

- Daily
  - Weekday
  - Saturday

- Peak Hour
  - Evening (PM)
  - Saturday Mid-day (MD)

The PM peak hour is defined as the one hour of peak traffic flow counted between 4:00 PM and 6:00 PM on a typical weekday. The mid-day (MD) peak hour is defined as the one hour of peak traffic flow counted between 11:00 AM and 1:00 PM on a typical Saturday. Figure 3.12-2 shows PM and MD peak hour intersection turning movement volumes. Figure 3.12-3 shows existing daily roadway segment traffic volumes.

Existing Traffic Conditions

Roadway Segments. Roadway segments were analyzed by comparing the average daily traffic (ADT) volume to daily volume thresholds. Table 3.12-1 displays the daily volume thresholds for roadway segments. These thresholds are used as guidelines to identify the need for new or upgraded facilities. In general, intersection operations analysis provides a more realistic assessment of traffic conditions on a road than the roadway segment analysis.

Table 3.12-1
Roadway Segment Daily Volume Thresholds

Facility Type	Daily Volume Threshold (Two Way Volume)				
	LOS A	LOS B	LOS C	LOS D	LOS E
Freeway (4 Lanes)	28,000	43,200	61,600	74,400	80,000
Arterial (6 lanes)	33,000	37,500	43,500	48,500	54,000
Minor Arterial (4 lanes)	22,000	25,000	29,000	32,500	36,000
Major Collector (2 lanes)	11,000	12,500	14,500	16,000	18,000
Minor Collector (2 lanes)	9,000	10,500	12,000	13,500	15,000
Local Street (2 lanes)	2,200	2,600	3,000	3,400	3,800
Note: All volume thresholds are approximate and assume ideal roadway characteristics. Actual thresholds for each LOS listed above may vary depending on a variety of factors including (but not limited to) roadway curvature and grade, intersection or interchange spacing, driveway spacing, percentage of trucks and other heavy vehicles, lane widths, signal timing, on-street parking, volume of cross traffic and pedestrians, etc.					

Source: *Highway Capacity Manual*, Transportation Research Board, 2000

Table 3.12-2 presents the existing conditions analysis for roadway segments. All the study roadway segments operate at an acceptable LOS E or better during the weekday and weekend.

Table 3.12-2
Roadway Level of Service (LOS) – Existing Conditions

Roadway Segment	Existing Conditions			
	Lanes	Volume	V/C	LOS
Knighton Road – I-5 Southbound Ramps to I-5 Northbound Ramps[1]	2	5,572 (4,466)	0.31 (0.25)	A (A)
Knighton Road- I-5 Northbound Ramps to Churn Creek Road[1]	2	6,705 (4,772)	0.37 (0.27)	A (A)
Knighton Road- Churn Creek Road to Airport Road[1]	2	3,756 (2,379)	0.21 (0.13)	A (A)
Churn Creek Road- Knighton Road to E. Niles Lane[1]	2	2,753 (1,946)	0.15 (0.11)	A (A)
Churn Creek Road- E. Niles Lane to Rancho Road[1]	2	4,100 (3,336)	0.23 (0.19)	A (A)
Churn Creek Road- Rancho Road to I-5[1]	2	15,296 (12,824)	0.85 (0.71)	D (C)

Notes:
XX (YY) = Weekday (Weekend)
Volume to capacity ratio (V/C) measures the actual volume of vehicles observed or counted on any street segment in relation to the throughput capacity of the facility.
[1] = Major Collector
Bold text indicates deficiency.

Source: Fehr & Peers, 2009

Intersections. Both signalized and unsignalized intersections were analyzed using the methodology contained in Chapter 17 of the *Highway Capacity Manual – Special Report 209* (Transportation Research Board, 2000). The LOS is based on the average control delay expressed in seconds per vehicle. At two-way stop-controlled intersections, level of service is calculated for each movement, not for the intersection as a whole. At all-way stop-controlled intersections, LOS is based on the average delay experienced on all approaches. Table 3.12-3 summarizes the relationship between delay and LOS for signalized and unsignalized intersections.

Table 3.12-3
Intersection Level of Service Definitions

Level of Service	Description	Average Control Delay (seconds/vehicle)	
		Signalized Intersections	Unsignalized Intersections
A	Represents free flow. Individual users are virtually unaffected by others in the traffic stream.	≤ 10.0	≤10.0
B	Stable flow, but the presence of other users in the traffic stream begins to be noticeable	10.1 – 20.0	10.1 – 15.0
C	Stable flow, but the beginning of the range of flow in which the operation of individual users becomes significantly affected by	20.1 – 35.0	15.1 – 25.0

Level of Service	Description	Average Control Delay (seconds/vehicle)	
		Signalized Intersections	Unsignalized Intersections
	interactions with others in the traffic stream.		
D	Represents high-density, but stable flow.	35.1 – 55.0	25.1 – 35.0
E	Represents operating conditions at or near the capacity level.	55.1 – 80.0	35.1 – 50.0
F	Represents forced or breakdown flow.	> 80.0	> 50.0

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

The Synchro/SimTraffic micro-simulation software was used to evaluate the project site. This software accounts for spill-back between closely spaced intersections and for slow heavy vehicle speeds due to the grade on the freeway overcrossing and the presence of heavy vehicles in the study area.

The existing peak hour traffic volumes, traffic control, and intersection lane configurations (see Figure 3.12-2) were used to calculate LOS at the study intersections. Table 3.12-4 summarizes intersection LOS under existing conditions. The results indicate that all of the study intersections are operating at an acceptable LOS E or better during the PM and MD peak hours.

Table 3.12-4
Intersection Level of Service – Existing Conditions

Intersection	Control	PM Peak		MD Peak	
		Delay	LOS	Delay	LOS
Cypress Avenue / I-5 SB Ramps	Signal	32	C	14	B
Cypress Avenue / I-5 NB Ramps	Signal	29	C	62	E
Bonnyview Road / I-5 SB Ramps	Signal	15	B	12	B
Bonnyview Road / I-5 NB Ramps	Signal	18	B	15	B
Churn Creek Road / Rancho Road	Side-street Stop	14	B	12	B
Churn Creek Road / E Niles Lane	Side-street Stop	10	A	9	A
Knighton Road/ Airport Road	Signal	13	B	17	B
Knighton Road / Churn Creek Road	Signal	6	A	8	A
Knighton Rd / Churn Creek Rd / Pacheco Rd	Signal	15	B	15	B
Knighton Road / I-5 NB Ramps	Side-street Stop	13	B	12	B
Knighton Road / I-5 SB Ramps	Side-street Stop	16	C	12	B
Knighton Road / Riverland Drive	All-way Stop	8	A	8	A
Riverside Avenue / I-5 SB Ramps	Side-street Stop	21	C	19	C
Riverside Avenue / I-5 NB Ramps	Side-street Stop	17	C	15	C

Notes:
Delay measured in seconds per vehicle.
Delay for side-street stop unsignalized intersections reported for worst-case approach. Delay for all-way stop intersections reported for the average of all approaches.
LOS = Level of Service
Bold text indicates deficiency.

Source: Fehr & Peers, 2009

Table 3.12-5 shows the Level of Service definitions for merge/diverge on freeway ramps. The results of the freeway ramp merge/diverge analysis are summarized in Table 3.12-6. The results

indicate that the Cypress Avenue northbound on-ramp merge to I-5 (Saturday mid-day peak hour) operates at an unacceptable LOS. All other study area ramps operate at an acceptable LOS D or better during all analysis periods.

Table 3.12-5
Freeway Ramp Merge/Diverge Level of Service Definitions

Level of Service	Density (pc/mi/in)*
A	≤ 10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 28.0
D	> 28.0 and ≤ 35.0
E	> 35.0
F	Demand Exceeds Capacity
* Density measured in passenger cars per mile per lane.	

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

Table 3.12-6
Freeway Ramp Merge/Diverge – Existing Conditions

Location	Merge or Diverge	PM Peak		MD Peak	
		Density[1]	LOS[2]	Density[1]	LOS[2]
Riverside Ave/I-5 Northbound off-ramp	Diverge	22.8	C	21.0	C
Riverside Ave/I-5 Northbound on-ramp	Merge	23.1	C	23.0	C
Riverside Ave/I-5 Southbound off-ramp	Diverge	27.0	C	17.6	B
Riverside Ave/I-5 Southbound on-ramp	Merge	26.0	C	16.8	B
Knighton Road/I-5 Northbound off-ramp	Diverge	23.1	C	21.2	C
Knighton Road/I-5 Northbound on-ramp	Merge	23.0	C	22.9	C
Knighton Road/I-5 Southbound off-ramp	Diverge	27.9	C	19.0	B
Knighton Road/I-5 Southbound on-ramp	Merge	26.2	C	17.7	B
Bonnyview Road/I-5 Northbound off-ramp	Diverge	23.6	C	23.4	C
Bonnyview Road/I-5 Northbound on-ramp	Merge	24.7	C	24.0	C
Bonnyview Road/I-5 Southbound off-ramp	Diverge	25.3	C	24.4	C
Bonnyview Road/I-5 Southbound on-ramp	Merge	24.1	C	22.6	C
Cypress Ave/I-5 Northbound off-ramp	Diverge	23.5	C	26.9	C
Cypress Ave/I-5 Northbound on-ramp	Merge	29.8	D	**36.6**	**E**
Cypress Ave/I-5 Southbound off-ramp	Diverge	28.8	D	20.0	C
Cypress Ave/I-5 Southbound on-ramp	Merge	25.9	C	16.6	B

Notes:
[1] Density in passenger cars per mile per lane.
[2] LOS = Level of Service. LOS computed using HCS 2000 software for the merge/diverge analysis consistent with HCM 2000 methodologies.
Bold text indicates deficiency.

Source: Fehr & Peers, 2009

The daily, PM, and MD peak hour traffic volume forecasts for the following scenarios were developed.

- **Proposed Project.** Trip generation and distribution information for the proposed project is based on the trip generation rates in the *ITE Trip Generation 8th Edition*. Assignment of project traffic to roadways was estimated based on general locations of population centers in Shasta and Tehama Counties.

- **Existing Plus Project.** Existing Conditions plus traffic from the proposed project.

- **Cumulative (2030) No Project.** Year 2030 conditions were developed using the Shasta County Travel Demand Forecasting model updated May 2008. Land use and roadway network assumptions were updated to account for pending projects in the area and roadway improvements identified by the RTPA. The RTPA recently published the *Shasta County Regional Improvement Program Impact Fee Nexus Study*, (April 2009). The study identifies funding for local and regional transportation projects. In the Knighton Road area, the study identifies the following improvement projects:

    - Ox Yoke Street – Riverside Avenue/I-5 interchange
    - Knighton Road/I-5 interchange
    - South Bonnyview Road/I-5 interchange
    - Airport Road – SR 44 to Dersch Road widening
    - I-5 – Riverside Avenue to South Bonnyview Road widening
    - I-5 – South Bonnyview Road to Cypress Avenue widening

- **Cumulative Plus Project.** Cumulative (Year 2030) No Project conditions plus traffic from the proposed project.

Project Trip Estimates

Trip generation for the proposed project was estimated using the trip generation rates found in the *ITE Trip Generation 8th Edition*. Project trip distribution for the project site was estimated using population data and the Shasta County Travel Demand Forecasting Model (see Appendix O for complete assumptions and methodology). Figure 3.12-4 presents the assumed trip distribution of the proposed project. Table 3.12-7 shows a summary of the vehicle trip generation.

Table 3.12-7
Vehicle Trip Generation Summary

Land Use	Weekday				Saturday			
	Daily	PM Peak Hour			Daily	Mid-Day Peak Hour		
		Total	In	Out		Total	In	Out
158,700 sf Discount Club	6,634	755	378	377	10,100	1,087	533	554
425,496 sf Shopping Center	17,407	1,679	823	856	22,000	2,196	1,098	1,098
18,863 sf High-Turnover Restaurant	2,398	210	124	86	2,700	265	140	125
3,600 sf Fast Food Restaurant	1,786	122	63	59	2,100	214	109	105
3,500 sf Drive In Bank	519	93	47	46	600	93	48	45
130,501 sf Home Improvement Store	3,889	309	148	161	5,900	589	300	289
Sub-Total	32,633	3,168	1,583	1,585	43,400	4,444	2,228	2,216
Internalization	7,832	729	364	365	10,400	1,289	646	643
Total	24,801	2,439	1,219	1,220	33,000	3,155	1,582	1,573

Source: Trip Generation 8th Edition 2008, Institute of Transportation Engineers, and Fehr & Peers, 2009

Using the trip generation and trip distribution estimates described above, project trips were assigned to the surrounding roadway network. Access to the project is planned via a signalized access off Knighton Road and four unsignalized accesses off Churn Creek Road.

Regulatory Setting

FEDERAL

There are no specific federal regulations applicable to transportation and circulation.

STATE

California Department of Transportation (Caltrans)

Caltrans policies are applicable to I-5, and are summarized in the Caltrans' Guide for the Preparation of Traffic Impact Studies (State of California Department of Transportation, December 2002). These guidelines identify when a traffic impact study is required, what should be included in the study, analysis scenarios, and guidance on acceptable analysis methodologies. Caltrans endeavors to maintain a target service level of LOS C on State highway facilities. However, this may not always be feasible and a lower service level may be acceptable.

LOCAL

Shasta County General Plan

The Shasta County General Plan Circulation Element sets forth future plans for the transportation system in the County. Policies and implementation programs pertaining to transportation are shown below:

Policy C-6a: Future road and street development including future right-of-way shall comply with the adopted County Development Standards.

Policy C-6d: New commercial and industrial development accessing arterials and collectors shall provide access controls for public safety by means such as limiting the location and number of driveway access points and controlling ingress and egress turning movements.

Policy C-6j: New development shall provide circulation improvements for emergency access by police, fire, and medical vehicles; and shall provide for escape by residents/occupants in accordance with the Fire Safety Standards.

Policy C-6k: Shasta County shall adopt the following Level of Service (LOS) standards for considering any new roads:

- Rural arterials and collectors – LOS C
- Urban/suburban arterials and collectors – LOS C

For the purposes of this analysis, LOS C is considered the minimum acceptable level of service standard for roadways and intersections.

Policy C-6l: 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 be 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.

Policy-C8: To ensure that adequate provision for expanding opportunities for rail transport and trucking service are accommodated in the County's overall transportation plans.

Policy-C8b: Working in conjunction with Caltrans the County shall designate and provide signed truck routes; ensure that adequate pavement depth, lane widths, loading areas, bridge capacities, vertical height of overpasses and utility lines, and turn radii are maintained on the designated truck routes; and prohibit commercial truck traffic from non-truck routes except for deliveries.

Policy-C8c: Adequate truck access to off-street loading areas in commercial and industrial areas shall be provided in all new development applications.

Based on these policies (and Caltrans policies), LOS C is considered the minimum acceptable operating LOS for roadway segment and intersection analysis.

Table 3.12-8 provides a discussion of the proposed project's consistency with applicable portions of *Shasta County General Plan* Policies related to transportation and circulation.

Table 3.12-8
General Plan Consistency – Transportation and Circulation

Policy No.	Finding	Discussion
General Plan Circulation Map (no associated policy number)	Potentially Inconsistent	Churn Creek Road is shown as a two lane collector in the vicinity of the study area (on the Circulation Map), but is identified in this study as requiring four lanes with development of future projects to maintain acceptable levels of service. Since the need for additional lanes has been identified, and the proposed project will add traffic to this section, the project has the potential to be inconsistent with this policy. However, the final interpretation on consistency/inconsistency will be determined by the Shasta County Board of Supervisors.
C-6a	Consistent	Future road and street development for the project will comply with the adopted County Development Standards.

Policy No.	Finding	Discussion
C-6d	Consistent	Access to the project site is consolidated to limited points. Additionally, appropriate controls will be provided at those locations.
C-6j	Consistent	The proposed project will provide circulation improvements for emergency access by police, fire, and medical vehicles; and will provide for escape by occupants in accordance with the Fire Safety Standards.
C8b	Consistent	Truck traffic generated by the project will be accommodated on designated truck routes, except for local access.
C-8c	Consistent	The proposed project will provide adequate truck access to off-street loading areas.

Shasta County 2004 Regional Transportation Plan (RTP) – Non-Motorized Transportation

Plans, policies, and programs identified for non-motorized transportation are described below.

- P-1 – Encourage each city and the County to maintain an updated bikeway plan.

- P-2 – Implement the Shasta County Regional Bikeway Plan including, where appropriate, street and highway improvements that accommodate non-motorized traffic by utilizing widened shoulders, bike paths, or lanes that serve non-motorized transportation. It should be noted that the Shasta County Regional Bikeway Plan does not identify any facilities in the study area.

- P-3 – Provide bicycle lanes and pedestrian walkways on the Sacramento River bridges in Redding and Anderson to allow for better non-motorized traffic flow.

- P-4 – Support the continued development of the Sacramento River Trail and feeder trails.

- P-5 – Encourage pedestrian and bicycle transportation as mitigation for regional transportation impacts.

- P-6 – Encourage the inclusion of bike lanes and pedestrian facilities in road construction and improvement projects where appropriate.

- P-7 – Eliminate non-motorized barriers to comply with the American Disabilities Act.

- P-8 – Encourage sweeping of shoulders on all feeder and arterial routes on a frequent schedule to improve conditions for bicyclists.

- P-9 – Identify traffic signal detectors for bicycle placement with use of standard (T) road markings.

- P-10 – Provide automatic walk signals at fixed-time signalized intersections equipped with Walk/Don't Walk signals, where feasible.

- P-11 – Use the TE funding available within Shasta County for development of non-motorized projects.

The plan does not specifically identify any routes for non-motorized travel near the project site.

3.12.2 THRESHOLDS OF SIGNIFICANCE

Consistent with Appendix G of the CEQA Guidelines, the proposed project is considered to have a significant impact on the environment if it will:

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicles trips, the volume to capacity ratio on roads, or congestion at intersections)

- Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways

- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks

- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)

- Result in inadequate emergency access

- Result in inadequate parking capacity

- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)

Operational Impacts

For this study, the following significance criteria were identified:

ROADWAY SEGMENTS

- An existing roadway segment that operates acceptably (LOS A, B, C, D, or E) without the project is degraded to an unacceptable LOS F due to the additional traffic from the project. (General Plan Policy C-61)

- A roadway segment that operates unacceptably experiences an increase in its daily volume to capacity ratio (V/C) of 0.05 or greater due to the addition of project traffic.

INTERSECTIONS

- An intersection that operates acceptably (LOS A, B, C, D, or E) without the project is degraded to an unacceptable LOS F due to the additional traffic from the project. (General Plan Policy C-61)

- An intersection that operates at an unacceptable LOS without the project, experiences an increase of 5 or more seconds of control delay due to the addition of project traffic.

FREEWAY RAMP MERGE, DIVERGE

- A freeway ramp that operates at an acceptable level (LOS A, B, C, or D) deteriorates to an unacceptable level (LOS E, or F) due to the addition of project traffic.

- A freeway ramp that operates at an unacceptable level experiences an increase of 10 or more passenger car equivalents (PCEs).

ACCESS, DESIGN & PARKING

- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

- Result in inadequate emergency access.

- Result in inadequate parking capacity.

- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

3.12.3 IMPACTS AND MITIGATION MEASURES

The following sections identify impacts attributable to the project based on full project build out, on roadway segments, intersections, freeway merge and diverge ramps, access design and parking, and the improvements recommended to mitigate the impacts. Some of the improvements, such as those recommended for Knighton Road between the I-5 southbound and I-5 northbound ramps, and Knighton Road from I-5 to Churn Creek Road, were included, at least in part, in studies completed by Shasta County prior to and independent of the current development proposal, with funding anticipated to be generated from the Public Facilities Impact Fees adopted by the Board of Supervisors in May, 2008 (*Shasta County and City of Redding Public Facilities Impact Fee Study, March 2008)*, and the Major Road Impact Fees Program adopted by the Board of Supervisors in June 1991 (*Resolution 91-115, A Resolution Establishing Major Road Impact Fees for the South Central Regional Area)*. The current project will be subject to both fee programs. Other improvements, such as those identified for the I-5/Cypress Road interchange are within the jurisdiction of other public agencies including the City of Redding, City of Anderson and California Department of Transportation, and are outside the jurisdiction of the lead agency for this project.

Existing Conditions Plus Project Scenario

Traffic estimates for the proposed project, described above, were added to existing traffic on the roadway network. Operations of the transportation system under Existing Plus Project Conditions are described below.

Impact #3.12-1: Impacts to roadway segments under Existing Plus Project conditions

Discussion/Conclusion: The existing daily roadway segment traffic volumes shown on Figure 3.12-5 were compared to the roadway segment thresholds summarized in Table 3.12-1 to analyze traffic operations on the study area roadway segments. Table 3.12-9 presents the roadway segment operations with and without the proposed project.

Table 3.12-9
Roadway Level of Service – Existing Plus Project Conditions

Roadway Segment	Lanes	Existing No Project			Existing Plus Project			V/C Difference
		Volume	V/C	LOS	Volume	V/C	LOS	
Knighton Rd – I-5 SB Ramps to I-5 NB Ramps[1]	2	5,572 (4,466)	0.37 (0.30)	A (A)	**15,492 (17,086)**	**1.03 (1.14)**	**F (F)**	0.66 (0.74)
Knighton Rd – I-5 NB Ramps to Churn Creek Rd[1]	2	6,705 (4,772)	0.45 (0.32)	A (A)	**26,298 (29,697)**	**1.75 (1.98)**	**F (F)**	1.30 (1.66)
Knighton Rd – Churn Creek Rd to Airport Rd[1]	2	3,756 (2,379)	0.25 (0.16)	A (A)	6,980 (6,481)	0.47 (0.43)	A (A)	0.22 (0.27)
Churn Creek Rd – Knighton Rd to E. Niles Ln[1]	2	2,753 (1,946)	0.18 (0.13)	A (A)	4,489 (4,155)	0.30 (0.28)	A (A)	0.12 (0.15)
Churn Creek Rd – E. Niles Ln to Rancho Rd[1]	2	4,100 (3,336)	0.27 (0.22)	A (A)	5,588 (5,229)	0.37 (0.35)	A (A)	0.10 (0.13)
Churn Creek Rd – Rancho Rd to I-5[1]	2	15,296 (12,824)	0.85 (0.71)	D (C)	15,544 (13,140)	0.86 (0.73)	D (C)	0.01 (0.02)

Notes: XX (YY) = Weekday (Weekend)
Volume to capacity ratio (V/C) measures the actual volume of vehicles observed or counted on any street segment in relation to the throughput capacity of the facility. Any measure higher than about 0.80 indicates congestion. The number can exceed 1.00, indicating an overloaded situation with stop and go traffic.
V/C Difference = Near-term Future Plus Project V/C – Near-term Future V/C
Shaded areas indicate deficiency. Bold type indicates impact.
[1] Minor Collector

Source: Fehr & Peers, 2009

The results indicate that the following roadway segments will operate at an unacceptable level under Existing Plus Project Conditions:

- **Knighton Road, between the I-5 Southbound Ramps and I-5 Northbound Ramps** – The addition of project traffic will degrade operations from an acceptable LOS E or better to an unacceptable LOS F during both the weekday (PM) and Saturday (mid-day) peak hours, respectively. This impact is ***significant***.

- **Knighton Road, between the I-5 Northbound Ramps and Churn Creek Road** – The addition of project traffic will degrade operations from an acceptable LOS E or better to an unacceptable LOS F during both the weekday (PM) and Saturday (mid-day) peak hours, respectively. This impact is ***significant***.

Mitigation Measures

Because the project may increase traffic counts, reducing the Level of Service at some locations to unacceptable levels, and because full funding for the required improvements is not currently available through the established fee programs, these impacts are considered to be ***significant and unavoidable***. When fully funded, implementation of the following mitigation measures will reduce the impacts to a less-than-significant level.

Knighton Road – I-5 Southbound Ramps to I-5 Northbound Ramps: Widening Knighton Road between the I-5 southbound ramps and I-5 northbound ramps to a four-lane arterial will result in the segment operating at an acceptable level of service. This improvement is consistent with the Public Facilities Impact Fee program adopted by the Board of Supervisors in May 2008.

Mitigation Measure #3.12-1a:

Widen Knighton Road to a four-lane arterial between the I-5 southbound ramps and I-5 northbound ramps. This improvement will result in LOS A operations during both the Weekday PM peak hour and Saturday mid-day peak hour.

Knighton Road – I-5 Northbound Ramps to Churn Creek Road: Widening Knighton Road between the I-5 northbound ramps and Churn Creek Road to a six-lane arterial will result in the segment operating at an acceptable level of service.

Mitigation Measure #3.12-1b:

Widen Knighton Road to a six-lane arterial between the I-5 northbound ramps and Churn Creek Road. This improvement will result in LOS A operations during both the weekday PM peak hour and Saturday mid-day peak hour.

Impact #3.12-2: Impacts to intersections under Existing Plus Project conditions

Discussion/Conclusion: The intersection traffic volumes shown on Figure 3.12-6 were used to evaluate level of service at the study intersections. Table 3.12-10 presents the intersection operations with the proposed project.

Table 3.12-10
Intersection Level of Service – Existing Plus Project Conditions

Intersection	Control	PM Peak		MD Peak	
		Delay	LOS	Delay	LOS
Cypress Ave / I-5 SB Ramps	Signal	35	C	16	B
Cypress Ave / I-5 NB Ramps	Signal	33	C	65	E
Bonnyview Rd / I-5 SB Ramps	Signal	16	B	13	B

Intersection	Control	PM Peak		MD Peak	
		Delay	LOS	Delay	LOS
Bonnyview Rd / I-5 NB Ramps	Signal	27	C	28	C
Churn Creek Rd / Rancho Rd	Side-street Stop	34	D	23	C
Churn Creek Rd / E Niles Lane	Side-street Stop	10	B	10	B
Knighton Rd/ Airport Road	Signal	15	B	15	B
Knighton Rd / Churn Creek Rd	Signal	6	A	7	A
Knighton Rd / Churn Creek Rd / Pacheco Rd	Signal	13	B	14	B
Knighton Road / I-5 NB Ramps	Side-street Stop	**895**	**F**	--	**F**
Knighton Road / I-5 SB Ramps	Side-street Stop	--	**F**	--	**F**
Knighton Road / Riverland Drive	All-way Stop	8	A	8	A
Riverside Avenue / I-5 SB Ramps	Side-street Stop	26	D	24	C
Riverside Avenue / I-5 NB Ramps	Side-street Stop	18	C	16	C
Knighton Rd/Project Access	Signal	30	C	38	D
Churn Creek Rd/ Project Access (1)	Side-Street Stop	13	B	13	B
Churn Creek Rd/ Project Access (2)	Side-Street Stop	13	B	12	B
Churn Creek Rd/ Project Access (3)	Side-Street Stop	12	B	12	B
Churn Creek Rd/ Project Access (4)	Side-Street Stop	12	B	11	B

Notes:
Delay measured in seconds per vehicle.
Delay for side-street stop unsignalized intersections reported for worst-case approach. Delay for all-way stop intersections reported for the average of all approaches.
Shaded areas indicate deficiency. Bold type indicates impact.
LOS = Level of Service

Source: Fehr & Peers, 2009

The results indicate that the following intersections will operate at an unacceptable level:

- **Knighton Road/I-5 Southbound Ramps** – The intersection will operate at acceptable levels without the proposed project. The addition of project-generated traffic will degrade operations to LOS F during both the weekday PM peak hour and Saturday MD peak hour. This impact is ***significant***.

- **Knighton Road/I-5 Northbound Ramps** – The intersection will operate at acceptable levels without the proposed project. The addition of project-generated traffic will degrade operations to LOS F during the weekday PM peak hour and Saturday mid-day peak hour. This impact is ***significant***.

Mitigation Measures

The project will be subject to the Public Facilities Impact Fee program, which includes improvements to the Knighton Road/I-5 southbound and northbound ramps to accommodate the wider overpass (previously cited), however, because full funding for the identified improvements has not been secured, this impact is considered ***significant and unavoidable***. When funded, implementation of the following mitigation measures will reduce the impacts to a less-than-significant level.

Table 3.12-11a and Table 3.12-11b presents the results of the intersection and roadway level of service evaluation with the identified mitigations in-place. Figure 3.12-7 presents the recommended Existing Plus Project Condition mitigation measures.

Knighton Road/I-5 Southbound Ramps: Improve the intersection by adding a traffic signal and travel lanes.

Mitigation Measure #3.12-2a:

Install a traffic signal and add the following lanes to the intersection.

Southbound Approach – A left-turn lane and right-turn lane for a total of two left and one right-turn lane
Westbound Approach – A left-turn lane and a through lane

This improvement will result in LOS C operations during the weekday PM peak hour and LOS C conditions during the Saturday mid-day peak hour at the intersection.

Knighton Road/I-5 Northbound Ramps: Improve the intersection by adding a traffic signal and travel lanes.

Mitigation Measure #3.12-2b:

Install a traffic signal and add the following lanes to the intersection.

Northbound Approach – A right-turn lane
Eastbound Approach – Two through lanes and one left-turn lane
Westbound Approach – Two through lanes and a right-turn lane

This improvement will result in LOS B operations during the weekday PM peak hour and LOS B conditions during the Saturday mid-day peak hour at the intersection.

Table 3.12-11a
Existing Plus Project Conditions

Intersections													
Location	Existing Conditions				Existing Plus Project Conditions				Existing Plus Project (Mitigated)				Mitigations
	PM Peak		MD Peak		PM Peak		MD Peak		PM Peak		MD Peak		
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	
Cypress Avenue / I-5 SB Ramps	32	C	14	B	35	C	16	B					
Cypress Avenue / I-5 NB Ramps	29	C	62	E	33	C	65	E					
Bonnyview Road / I-5 SB Ramps	15	B	12	B	16	B	13	B					
Bonnyview Road / I-5 NB Ramps	18	B	15	B	27	C	28	C					
Churn Creek Road / Rancho Road	14	B	12	B	34	D	23	C					
Churn Creek Road / E Niles Lane	10	A	9	A	10	B	10	B					
Knighton Road / Airport Road	13	B	17	B	15	B	15	B					
Knighton Road / Churn Creek Road	6	A	8	A	6	A	7	A					
Knighton Rd / Churn Creek Rd / Pacheco Rd	15	B	15	B	13	B	14	B					
Knighton Road / I-5 NB Ramps	13	B	12	B	**895**	**F**	--	**F**	16	B	14	B	(3.12-2b) Install traffic signal and improve intersection
Knighton Road / I-5 SB Ramps	16	C	12	B	--	**F**	--	**F**	21	C	27	C	(3.12-2a) Install traffic signal and improve intersection
Knighton Road / Riverland Drive	8	A	8	A	8	A	8	A					
Riverside Avenue / I-5 SB Ramps	21	C	19	C	26	D	24	C					
Riverside Avenue / I-5 NB Ramps	17	C	15	C	18	C	16	C					
Knighton Rd / Project Access	--	--	--	--	30	C	38	D					
Churn Creek Rd / Project Access (1)	--	--	--	--	13	B	13	B					
Churn Creek Rd / Project Access (2)	--	--	--	--	13	B	12	B					
Churn Creek Rd / Project Access (3)	--	--	--	--	12	B	12	B					
Churn Creek Rd / Project Access (4)	--	--	--	--	12	B	11	B					

Notes: Shaded areas indicate unacceptable operations.
Shaded and bold areas indicate project significant impact.

Source: Fehr & Peers, August 2009.

Table 3.12-11b
Existing Plus Project Conditions

ROADWAYS																	
Location	Existing Conditions						Existing Plus Project Conditions						Existing Plus Project (Mitigated)				Mitigations
	PM Peak			MD Peak			PM Peak			MD Peak			PM Peak		MD Peak		
	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS	
Knighton Road – I-5 Southbound Ramps to I-5 Northbound Ramps	5,572	0.37	A	4,466	0.30	A	15,492	1.03	F	17,086	1.14	F	0.29	A	0.32	A	(3.12-1a) Widen to 6 lanes
Knighton Road – I-5 Northbound Ramps to Churn Creek Road	6,705	0.45	A	4,772	0.32	A	26,298	1.75	F	29,697	1.98	F	0.49	A	0.55	A	(3.12-1b) Widen to 6 lanes
Knighton Road – Churn Creek Road to Airport Road	3,756	0.25	A	2,379	0.16	A	6,980	0.47	A	6,481	0.43	A					
Churn Creek Road – Knighton Road to E. Niles Lane	2,753	0.18	A	1,946	0.13	A	4,489	0.30	A	4,155	0.28	A					
Churn Creek Road – E. Niles Lane to Rancho Road	4,100	0.27	A	3,336	0.22	A	5,588	0.37	A	5,229	0.35	A					
Churn Creek Road – Rancho Road to I-5	15,296	0.85	D	12,824	0.71	C	15,544	0.86	D	13,140	0.73	C					
Notes: Shaded areas indicate unacceptable operations. Shaded and bold areas indicate project significant impact.																	

Source: Fehr & Peers, August 2009.

Impact #3.12-3: Impacts to the I-5 merge/diverge ramp under Existing Plus Project conditions.

Discussion/Conclusion: The Existing Plus Project traffic volumes were used to conduct the freeway ramp merge/diverge analysis. The results of the analysis are summarized in Table 3.12-12.

Table 3.12-12
Freeway Ramp Merge/Diverge – Existing Plus Project Conditions

Direction	Merge or Diverge	PM Peak		MD Peak	
		Density[1]	LOS[2]	Density[1]	LOS[2]
Riverside Ave/I-5 NB off-ramp	Diverge	25.8	C	24.9	C
Riverside Ave/I-5 NB on-ramp	Merge	26.7	C	27.7	C
Riverside Ave/I-5 SB off-ramp	Diverge	31.2	D	23.0	C
Riverside Ave/I-5 SB on-ramp	Merge	28.7	D	20.3	C
Knighton Road/I-5 NB off-ramp	Diverge	27.3	C	26.7	C
Knighton Road/I-5 NB on-ramp	Merge	26.2	C	28.3	D
Knighton Road/I-5 SB off-ramp	Diverge	32.8	D	25.3	C
Knighton Road/I-5 SB on-ramp	Merge	30.8	D	22.3	C
Bonnyview Road/I-5 NB off-ramp	Diverge	28.5	D	29.8	D
Bonnyview Road/I-5 NB on-ramp	Merge	27.4	C	27.5	C
Bonnyview Road/I-5 SB off-ramp	Diverge	28.3	D	28.2	D
Bonnyview Road/I-5 SB on-ramp	Merge	28.5	D	28.2	D
Cypress Ave/I-5 NB off-ramp	Diverge	26.5	C	30.7	D
Cypress Ave/I-5 NB on-ramp	Merge	31.7	D	**39.1**	**E**
Cypress Ave/I-5 SB off-ramp	Diverge	31.8	D	23.9	C
Cypress Ave/I-5 SB on-ramp	Merge	29.3	D	21.0	C

Notes: [1] Density in passenger cars per mile per lane.
[2] LOS = Level of Service. LOS computed using HCS 2000 software for the merge/diverge analysis consistent with HCM 2000 methodologies.
Shaded area indicates deficiency. Bold type indicates impact.

Source: Fehr & Peers, 2009

The following merge/diverge segments are expected to operate at an unacceptable level:

- **Cypress Avenue/I-5 Northbound Merge** – The addition of project-related traffic results in unacceptable LOS E during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the ramp during peak periods. This impact is ***significant***.

Mitigation Measures

The I-5/Cypress Avenue northbound merge ramp is within the incorporated City of Redding, and outside the jurisdiction of the lead agency. Any improvements to mainline I-5, as recommended below, are the jurisdiction of the California Department of Transportation. Nevertheless, because a guaranteed funding source for the identified improvements has not been identified or secured, this impact is considered ***significant and unavoidable***. When funded, implementation of the following mitigation measures will reduce the impacts to a less-than-significant level.

Implementation of the following mitigation measure will allow the freeway on- and off-ramp merge and diverge area to operate at an acceptable level of service. Table 3.12-13 presents the freeway on- and off-ramp merge and diverge area operating conditions with mitigation.

Table 3.12-13
Freeway Ramp Merge/Diverge – Existing Plus Project Conditions Mitigated

Direction	Merge or Diverge	PM Peak		MD Peak	
		Density[1]	LOS[2]	Density[1]	LOS[2]
Cypress Ave/I-5 NB on-ramp	Merge	24.7	C	29.5	D

Notes:
[1] Density in passenger cars per mile per lane.
[2] LOS = Level of Service. LOS computed using HCS 2000 software for the merge/diverge analysis consistent with HCM 2000 methodologies.
Shaded area indicates deficiency.

Source: Fehr & Peers, 2009

Cypress Avenue/I-5 Northbound On-Ramp Merge: Improve the merge operation by adding an additional northbound travel lane on I-5. This improvement is within the jurisdiction of the California Department of Transportation and outside the jurisdiction of the lead agency.

Mitigation Measure #3.12-3:

Add a third northbound travel lane to I-5. This improvement will result in LOS C operations during the weekday PM peak hour and LOS D operations during the Saturday mid-day peak hour at the merge to I-5 to from the northbound Cypress Avenue on-ramp.

CUMULATIVE IMPACTS

This section describes the results of the cumulative assessment. Cumulative Conditions are defined as Year 2030 Conditions in the study area. Traffic forecasts were developed using the Shasta County Travel Demand Forecasting model after updating the model to include reasonably foreseeable projects in the study area. Additionally, roadway improvements that were identified to have full funding prior to Year 2030 were also incorporated into the assessment.

Impact #3.12-4: Roadway Segments

Discussion/Conclusion: The daily roadway segment traffic volumes shown on Figure 3.12-8 and Figure 3.12-9 were compared to the roadway segment thresholds summarized in Table 3.12-1 to analyze traffic operations on the study area roadway segments. Table 3.12-14 presents the Cumulative Conditions roadway segment operations with and without the proposed project.

Table 3.12-14
Roadway Level of Service – Cumulative Conditions

Roadway Segment	Lanes	Cumulative No Project			Cumulative Plus Project			V/C Difference
		Volume	V/C	LOS	Volume	V/C	LOS	
Knighton Road – I-5 SB Ramps to I-5 NB Ramps[1]	2	7,500 (6,300)	0.50 (0.42)	A (A)	**17,420 (18,920)**	**1.16 (1.26)**	**F (F)**	0.66 (0.73)

Roadway Segment	Lanes	Cumulative No Project			Cumulative Plus Project			V/C Difference
		Volume	V/C	LOS	Volume	V/C	LOS	
Knighton Road – I-5 NB Ramps to Churn Creek Rd[1]	2	11,100 (9,200)	0.74 (0.61)	C (B)	**30,693 (34,125)**	**2.05 (2.27)**	**F (F)**	1.31 (1.66)
Knighton Road – Churn Creek Rd to Airport Rd[1]	2	5,600 (4,500)	0.37 (0.30)	A (A)	8,824 (8,602)	0.59 (0.57)	A (A)	0.12 (0.17)
Churn Creek Road – Knighton Rd to E. Niles Ln[1]	2	4,800 (3,900)	0.32 (0.26)	A (A)	6,536 (6,109)	0.44 (0.41)	A (A)	0.12 (0.15)
Churn Creek Road – E. Niles Ln to Rancho Rd[1]	2	5,000 (4,300)	0.33 (0.29)	A (A)	6,488 (6,193)	0.43 (0.41)	A (A)	0.10 (0.12)
Churn Creek Road – Rancho Rd to I-5[1]	2	17,000 (13,300)	1.13 (0.89)	F (D)	17,248 (13,616)	1.15 (0.91)	F (E)	0.02 (0.02)

Notes: XX (YY) = Weekday (Weekend)
Volume to capacity ratio (V/C) measures the actual volume of vehicles observed or counted on any street segment in relation to the throughput capacity of the facility. Any measure higher than about 0.80 indicates congestion. The number can exceed 1.00, indicating an over-capacity situation with stop and go traffic.
V/C Difference = Near-term Future Plus Project V/C – Near-term Future V/C
Shaded indicates deficiency.
Bold type indicates impact.
[1] Minor Collector

Source: Fehr & Peers, 2009

The results indicate that the following roadway segments will operate at an unacceptable level under Cumulative Plus Project Conditions:

- **Knighton Road, between the I-5 Southbound Ramps and I-5 Northbound Ramps.** The addition of project traffic will degrade operations from an acceptable LOS E or better to an unacceptable LOS F during both the weekday and weekend, respectively. The project will increase the volume-to-capacity ratio by more than 0.05. This impact is ***significant***.

- **Knighton Road, between the I-5 Northbound Ramps and Churn Creek Road.** The addition of project traffic will degrade operations from an acceptable LOS E or better to an unacceptable LOS F during both the weekday and weekend, respectively. The project will increase the volume-to-capacity ratio by more than 0.05. This impact is ***significant***.

- **Churn Creek Road, between Rancho Road and I-5.** The segment is projected to operate at an unacceptable LOS F during the weekday and weekend with or without the proposed project. The project will increase the volume-to-capacity ratio by less than 0.05; therefore, the project's contribution to this cumulative impact would be ***less than significant***.

Mitigation Measures

Because a guaranteed funding source for the identified improvements has not been secured, this impact is considered ***significant and unavoidable***. When funded, implementation of the following mitigation measures will reduce the impacts to a less-than-significant level.

Knighton Road – I-5 southbound ramps to I-5 northbound ramps: Widening Knighton Road between the I-5 southbound ramps and I-5 northbound ramps to a four-lane arterial will result in the segment operating at an acceptable level of service and would reduce the impact to a less-than-significant level. The improvement is consistent with the Public Facilities Impact Fee program adopted by Shasta County.

Mitigation Measure #3.12-4a:

Widen Knighton Road to a four-lane arterial between the I-5 southbound ramps and I-5 northbound ramps. This improvement will result in LOS A operations during both the weekday PM peak hour and Saturday mid-day peak hour. Payment of fees defined in the Public Facilities Impact Fee program adopted by Shasta County would cover the project's "fair share" of this cumulative impact.

Knighton Road – I-5 northbound ramps to Churn Creek Road: Widening Knighton Road between the I-5 northbound ramps and Churn Creek Road to a six-lane arterial will result in the segment operating at an acceptable level of service and would reduce the impact to a less-than-significant level.

Mitigation Measure #3.12-4b:

Widen Knighton Road to a six-lane arterial between the I-5 northbound ramps and Churn Creek Road. This improvement will result in LOS A operations during both the weekday PM peak hour and Saturday mid-day peak hour. Payment of fees defined in the Major Road Impact Fees for the South Central Regional Area, would cover the project's "fair share" of this cumulative impact.

Impact #3.12-5: Intersections

Discussion/Conclusion: The PM and MD peak hour intersection turning movement forecasts shown on Figure 3.12-10 and Figure 3.12-11 were used to analyze traffic operations at the study intersections under Cumulative conditions. Table 3.12-15 and Table 3.12-16 present cumulative intersection operation with and without traffic from the proposed project.

Table 3.12-15
Intersection Level of Service – Cumulative No Project Conditions

Intersection	Control	PM Peak		MD Peak	
		Delay	LOS	Delay	LOS
Cypress Ave / I-5 SB Ramps	Signal	**88**	**F**	23	C
Cypress Ave / I-5 NB Ramps	Signal	**75**	**F**	**141**	**F**
Bonnyview Rd / I-5 SB Ramps	Signal	42	D	46	D
Bonnyview Rd / I-5 NB Ramps	Signal	66	E	48	D

Intersection	Control	PM Peak		MD Peak	
		Delay	LOS	Delay	LOS
Churn Creek Rd / Rancho Rd	Side-street Stop	**203**	**F**	24	C
Churn Creek Rd / E Niles Ln	Side-street Stop	10	B	10	B
Knighton Rd/ Airport Rd	Signal	18	B	13	B
Knighton Rd / Churn Creek Rd	Signal	7	A	7	A
Knighton Rd / Churn Creek Rd / Pacheco Rd	Signal	15	B	10	B
Knighton Rd / I-5 NB Ramps	Side-street Stop	24	C	15	B
Knighton Rd / I-5 SB Ramps	Side-street Stop	**63**	**F**	16	C
Knighton Rd / Riverland Dr	All-way Stop	8	A	8	A
Riverside Ave / I-5 SB Ramps	Side-street Stop	**--**	**F**	**447**	**F**
Riverside Ave / I-5 NB Ramps	Side-street Stop	**52**	**F**	43	E

Notes: Delay measured in seconds per vehicle.
Delay for side-street stop unsignalized intersections reported for worst-case approach. Delay for all-way stop intersections reported for the average of all approaches.
LOS = Level of Service
Shaded areas indicate deficiency.

Source: Fehr & Peers, 2009

Table 3.12-16
Intersection Level of Service – Cumulative Plus Project Conditions

Intersection	Control	PM Peak		MD Peak	
		Delay	LOS	Delay	LOS
Cypress Ave / I-5 SB Ramps	Signal	**97**	**F**	25	C
Cypress Ave / I-5 NB Ramps	Signal	**87**	**F**	**130**	**F**
Bonnyview Rd / I-5 SB Ramps	Signal	49	D	53	D
Bonnyview Rd / I-5 NB Ramps	Signal	**111**	**F**	**104**	**F**
Churn Creek Rd / Rancho Rd	Side-street Stop	**697**	**F**	**218**	**F**
Churn Creek Rd / E Niles Ln	Side-street Stop	11	B	12	B
Knighton Rd/ Airport Rd	Signal	26	C	18	B
Knighton Rd / Churn Creek Rd	Signal	7	A	7	A
Knighton Rd / Churn Creek Rd / Pacheco Rd	Signal	19	B	13	B
Knighton Rd / I-5 SB Ramps	Side-street Stop	**--**	**F**	**--**	**F**
Knighton Rd / I-5 NB Ramps	Side-street Stop	**--**	**F**	**--**	**F**
Knighton Rd / Riverland Dr	All-way Stop	8	A	8	A
Riverside Ave / I-5 SB Ramps	Side-street Stop	**--**	**F**	**858**	**F**
Riverside Ave / I-5 NB Ramps	Side-street Stop	**97**	**F**	**52**	**F**
Knighton Rd/Project Access	Signal	32	C	38	D
Churn Creek Rd/ Project Access (1)	Side-Street Stop	15	C	14	B
Churn Creek Rd/ Project Access (2)	Side-Street Stop	15	B	14	B
Churn Creek Rd/ Project Access (3)	Side-Street Stop	14	B	13	B
Churn Creek Rd/ Project Access (4)	Side-Street Stop	13	B	12	B

Notes:
Delay measured in seconds per vehicle.
Delay for side-street stop unsignalized intersections reported for worst-case approach. Delay for all-way stop intersections reported for the average of all approaches.
LOS = Level of Service
Change in delay is the change between Existing Conditions and Existing Plus Project Conditions.
Shaded areas indicate deficiency.
Bold type indicates impact.

Source: Fehr & Peers, 2009

The results indicate that the following intersections will operate at an unacceptable level:

- **Cypress Avenue/I-5 Southbound Ramps** – The intersection LOS F conditions during the weekday PM peak hour will be exacerbated with the addition of project related traffic. The project will add more than 5 seconds of delay to the intersection during the weekday PM peak hour. This impact is ***significant***.

- **Cypress Avenue/I-5 Northbound Ramps** – The intersection will exacerbate LOS F conditions during both the weekday PM peak hour and Saturday mid-day peak hour with the addition of project-generated traffic. The project will add more than 5 seconds of delay to the intersection. This impact is ***significant***.

- **Bonnyview Road/I-5 Northbound Ramps** – The intersection will degrade from LOS E to LOS F during the weekday PM peak hour with the addition of project-generated traffic. During the Saturday mid-day peak hour the intersection will degrade from LOS D to LOS F. The project will add more than 5 seconds of delay to the intersection. This impact is ***significant***.

- **Churn Creek Road/Rancho Road** – The intersection LOS F conditions during the weekday PM peak hour will be exacerbated with the addition of project-related traffic. The intersection will degrade from an acceptable LOS C or better to an unacceptable LOS F during the Saturday mid-day peak hour with the addition of project-generated traffic. The project will add more than 5 seconds of delay to the intersection during the weekday PM peak hour. This impact is ***significant***.

- **Knighton Road/I-5 Northbound Ramps** – The intersection will operate at acceptable levels without the proposed project. The addition of project-generated traffic will degrade operations from an acceptable LOS C or better to an unacceptable LOS F during both the weekday PM peak hour and Saturday mid-day peak hour. This impact is ***significant***.

- **Knighton Road/I-5 Southbound Ramps** – The intersection LOS F conditions during the weekday PM peak hour will be exacerbated with the addition of project related traffic. The intersection will degrade from an acceptable LOS C or better to an unacceptable LOS F during the Saturday mid-day peak hour with the addition of project-generated traffic. The project will add more than 5 seconds of delay to the intersection during the weekday PM peak hour. This impact is ***significant***.

- **Riverside Avenue/I-5 Southbound Ramps** – The addition of project-generated traffic will exacerbate LOS F operations during both the weekday PM peak hour and Saturday mid-day peak hour. This impact is ***significant***.

- **Riverside Avenue/I-5 Northbound Ramps** – The intersection LOS F conditions during the weekday PM peak hour will be exacerbated with the addition of project-related traffic. The LOS E conditions during the Saturday mid-day peak hour will be degraded to LOS F with the addition of project-generated traffic. Because the project will add less than 5 seconds of

delay to the intersection during both the weekday PM peak hour and Saturday mid-day peak hour this impact is ***less than significant***.

Mitigation Measures

Because a guaranteed funding source for the identified improvements has not been secured, this impact is considered ***significant and unavoidable***. When funded, implementation of the following mitigation measures will reduce the majority of the impacts to a less-than-significant level. The following intersections are within the incorporated City of Redding and outside the jurisdiction of the lead agency: Cypress Avenue/I-5 Southbound Ramps, Cypress Avenue/I-5 Northbound Ramps, Bonnyview Road/I-5 Northbound Ramps, Churn Creek Road/Rancho Road.[1] The following intersections are wholly or partly within the incorporated City of Anderson, and therefore wholly or partly outside the jurisdiction of the lead agency: Riverside Avenue/I-5 Northbound Ramps. Many of the mitigation measures identified below for cumulative impacts assign a "fair share" attributable to the project, based on cost and demand data derived from the *Shasta County Regional Improvement Program Impact Fee Nexus Study, April 6, 2009*. That study provides a basis for analysis, but has not been adopted by any agency with jurisdiction by law.

Table 3.12-17a and Table 3.12-17b presents the results of the intersection and roadway level of service evaluation with the identified mitigations in-place. Figure 3.12-12 presents the Cumulative Plus Project Conditions recommended mitigation measures.

Cypress Avenue/I-5 Southbound Ramps: Improve the intersection by adding travel lanes.

Mitigation Measure #3.12-5a:

Add a left-turn lane to the southbound intersection approach to make two left-turn and two right-turn lanes. This improvement will result in LOS E operations during the weekday PM peak hour and LOS B operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 12%.

[1] Portions of Churn Creek and Rancho Roads within the City of Redding may be eligible for funds included in the scope of the Major Roads Impact Fee program.

Table 3.12-17a
Cumulative Plus Project Conditions

INTERSECTIONS														
Location	Cumulative Conditions				Cumulative Plus Project Conditions				Cumulative Plus Project (Mitigated)				Mitigations	Fair Share
	PM Peak		MD Peak		PM Peak		MD Peak		PM Peak		MD Peak			
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS		
Cypress Avenue / I-5 SB Ramps	**88**	**F**	23	C	**97**	**F**	25	C	76	E	22	B	(3.12-5a) Add left-turn lane to SB approach	12%
Cypress Avenue / I-5 NB Ramps	**75**	**F**	**141**	**F**	**87**	**F**	**130**	**F**	78	E	**116**	**F**	(3.12-5b) Add left-turn lane to NB approach	12%
Bonnyview Road / I-5 SB Ramps	42	D	46	D	49	D	53	D						
Bonnyview Road / I-5 NB Ramps	66	E	48	D	**111**	**F**	**104**	**F**	55	E	45	D	(3.12-5c) Add left-turn lane to NB approach	16%
Churn Creek Road / Rancho Road	**203**	**F**	24	C	**697**	**F**	**218**	**F**	20	C	17	B	(3.12-5d) Install traffic signal	18%
Churn Creek Road / E Niles Lane	10	B	10	B	11	B	12	B						
Knighton Road / Airport Road	18	B	13	B	26	C	18	B						
Knighton Road / Churn Creek Road	7	A	7	A	7	A	7	A						
Knighton Rd / Churn Creek Rd / Pacheco Rd	15	B	10	B	19	B	13	B					(3.12-5i) Improve Intersection	47%
Knighton Road / I-5 NB Ramps	24	C	15	B	--	**F**	--	**F**	34	C	23	C	(3.12-5f) Improve Intersection	79%
Knighton Road / I-5 SB Ramps	**63**	**F**	16	C	--	**F**	--	**F**	27	C	30	C	(3.12-5e) Improve Intersection	83%
Knighton Road / Riverland Drive	8	A	8	A	8	A	8	A						
Riverside Avenue / I-5 SB Ramps	--	**F**	**447**	**F**	--	**F**	**858**	**F**	46	D	22	C	(3.12-5g) Install traffic signal	22%
Riverside Avenue / I-5 NB Ramps	**52**	**F**	43	E	**97**	**F**	**52**	**F**	15	B	28	C	(3.12-5h) Install traffic signal	13%
Knighton Rd / Project Access	--	--	--	--	32	C	38	D						
Churn Creek Rd / Project Access (1)	--	--	--	--	15	C	14	B						
Churn Creek Rd / Project Access (2)	--	--	--	--	15	B	14	B						

INTERSECTIONS														
Location	Cumulative Conditions				Cumulative Plus Project Conditions				Cumulative Plus Project (Mitigated)				Mitigations	Fair Share
	PM Peak		MD Peak		PM Peak		MD Peak		PM Peak		MD Peak			
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS		
Churn Creek Rd / Project Access (3)	--	--	--	--	14	B	13	B						
Churn Creek Rd / Project Access (4)	--	--	--	--	13	B	12	B						
Notes: Shaded areas indicate unacceptable operations. Shaded and bold areas indicate project significant impact.														

Source: Fehr & Peers, August 2009.

Table 3.12-17b
Cumulative Plus Project Conditions

ROADWAYS																		
Location	Cumulative Conditions						Cumulative Plus Project Conditions						Cumulative Plus Project (Mitigated)				Mitigations	Fair Share
	PM Peak			MD Peak			PM Peak			MD Peak			PM Peak		MD Peak			
	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS		
Knighton Road – I-5 Southbound Ramps to I-5 Northbound Ramps	7,500	0.50	A	6,300	0.42	A	**17,420**	**1.16**	**F**	**18,920**	**1.26**	**F**	0.32	A	0.35	A	(3.12-4a) Widen to 6 lanes	84%
Knighton Road – I-5 Northbound Ramps to Churn Creek Road	11,100	0.74	C	9,200	0.61	B	**30,693**	**2.05**	**F**	**34,125**	**2.27**	**F**	0.57	A	0.63	B	(3.12-4b) Widen to 6 lanes	82%
Knighton Road – Churn Creek Road to Airport Road	5,600	0.37	A	4,500	0.30	A	8,824	0.59	A	8,602	0.57	A						

ROADWAYS																		
Location	Cumulative Conditions						Cumulative Plus Project Conditions						Cumulative Plus Project (Mitigated)				Mitigations	Fair Share
	PM Peak			MD Peak			PM Peak			MD Peak			PM Peak		MD Peak			
	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS		
Churn Creek Road – Knighton Road to E. Niles Lane	4,800	0.32	A	3,900	0.26	A	6,536	0.44	A	6,109	0.41	A						
Churn Creek Road – E. Niles Lane to Rancho Road	5,000	0.33	A	4,300	0.29	A	6,488	0.43	A	6,193	0.41	A						
Churn Creek Road – Rancho Road to I-5	**17,000**	**1.13**	**F**	13,300	0.89	D	**17,248**	**1.15**	**F**	13,616	0.91	E						
Notes: Shaded areas indicate unacceptable operations. Shaded and bold areas indicate project significant impact.																		

Source: Fehr & Peers, August 2009.

Cypress Avenue/I-5 Northbound Ramps: Improve the intersection by adding travel lanes.

Mitigation Measure #3.12-5b:

Add a left-turn lane to the northbound intersection approach for a total of two left-turn and two right-turn lanes. This improvement will result in LOS E operations during the weekday PM peak hour and LOS F operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 12%.

Bonnyview Road/I-5 Northbound Ramps: Improve the intersection by adding travel lanes. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-5c:

Add an additional northbound left-turn lane for a total of two left-turn and one right-turn lane. This improvement will result in LOS E operations during the weekday PM peak hour and LOS D operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 16%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Churn Creek Road/Rancho Road: Improve the intersection to add a traffic signal.

Mitigation Measure #3.12-5d:

Install a traffic signal to the intersection. This improvement will result in LOS C operations during the weekday PM peak hour and LOS B operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 18%.

Knighton Road/I-5 Southbound Ramps: Improve the intersection by adding a traffic signal and travel lanes. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-5e:

Install a traffic signal and add the following lanes to the intersection.

Southbound Approach – Two left-turn lane and a right-turn lane
Westbound Approach – Two left-turn lanes and a through lane

This improvement will result in LOS C operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the intersection. The

project's "fair share" of the improvement is 83%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Knighton Road/I-5 Northbound Ramps: Improve the intersection by adding a traffic signal and travel lanes. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-5f:

Install a traffic signal and add the following lanes to the intersection.

Northbound Approach – A left-turn lane for a left and right-turn lane configuration
Eastbound Approach – Two through lanes and one left-turn lane
Westbound Approach – Two through lanes and a free right-turn lane

This improvement will result in LOS C operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 79%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Riverside Avenue/I-5 Southbound Ramps: Improve the intersection by adding a traffic signal. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-5g:

Install a traffic signal to the intersection. This improvement will result in LOS D operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 22%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Riverside Avenue/I-5 Northbound Ramps: Improve the intersection by adding a traffic signal. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-5h:

Install a traffic signal to the intersection. This improvement will result in LOS B operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is

13%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Secondary Mitigation Measure

Simulation analysis indicated that the following intersections would be impacted and would need to be mitigated.

Knighton Road/Churn Creek Road/ Pacheco Road: Improve the intersection by adding travel lanes and modifying the traffic signal.

Mitigation Measure #3.12-5i:

Configure the intersection as listed below.

Southbound Approach – Left-turn lane, through lane, and a channelized right-turn lane
Westbound Approach – Two through lanes, channelized right-turn lane, and a left-turn lane
Northbound Approach – Left-turn lane and a through/right-turn lane
Eastbound Approach – Two Left-turn lanes, one through lane, and a right turn lane

This improvement will result in LOS C operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the intersection. The project's "fair share" of the improvement is 47%.

Impact #3.12-6: Freeway Ramp Merge/Diverge

Discussion/Conclusion: Table 3.12-18 presents freeway ramp merge/diverge operating conditions for the Cumulative Conditions scenario with and without the project.

Table 3.12-18
Freeway Ramp Merge/Diverge – Cumulative Conditions

Direction	Merge or Diverge	Cumulative No Project				Cumulative Plus Project			
		PM Peak		MD Peak		PM Peak		MD Peak	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
Riverside Ave/I-5 NB off-ramp	Diverge	--	**F**	--	**F**	--	**F**	--	**F**
Riverside Ave/I-5 NB on-ramp	Merge	**38.9**	**E**	--	**F**	--	**F**	--	**F**
Riverside Ave/I-5 SB off-ramp	Diverge	--	**F**	26.1	C	--	**F**	31.5	D
Riverside Ave/I-5 SB on-ramp	Merge	--	**F**	24.0	C	--	**F**	27.5	C
Knighton Rd/I-5 NB off-ramp	Diverge	26.1	C	27.4	C	30.3	D	32.8	D
Knighton Rd/I-5 NB on-ramp	Merge	27.2	C	29.1	D	31.4	D	34.5	D

Direction	Merge or Diverge	Cumulative No Project				Cumulative Plus Project			
		PM Peak		MD Peak		PM Peak		MD Peak	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
Knighton Rd/I-5 SB off-ramp	Diverge	**38.8**	**E**	26.7	C	--	**F**	33.1	D
Knighton Rd/I-5 SB on-ramp	Merge	**37.4**	**E**	24.4	C	--	**F**	28.9	D
Bonnyview Rd/I-5 NB off-ramp	Diverge	28.9	D	30.5	D	33.8	D	**36.9**	**E**
Bonnyview Rd/I-5 NB on-ramp	Merge	30.2	D	31.3	D	32.9	D	34.8	D
Bonnyview Rd/I-5 SB off-ramp	Diverge	--	**F**	**35.7**	**E**	--	**F**	**39.6**	**E**
Bonnyview Road/I-5 SB on-ramp	Merge	--	**F**	31.8	D	--	**F**	**37.5**	**E**
Cypress Ave/I-5 NB off-ramp	Diverge	--	**F**	--	**F**	--	**F**	--	**F**
Cypress Ave/I-5 NB on-ramp	Merge	--	**F**	--	**F**	--	**F**	--	**F**
Cypress Ave/I-5 SB off-ramp	Diverge	--	**F**	**37.7**	**E**	--	**F**	--	**F**
Cypress Ave/I-5 SB on-ramp	Merge	--	**F**	31.9	D	--	**F**	**36.4**	**E**

Notes:
[1] Density in passenger cars per mile per lane.
[2] LOS = Level of Service. LOS computed using HCS 2000 software for the merge/diverge analysis consistent with HCM 2000 methodology.
Shaded areas indicate deficiency.
Bold type indicates impact.

Source: Fehr & Peers, 2009

The following merge/diverge segments are expected to operate at an unacceptable level:

- **Riverside Avenue/I-5 Southbound Diverge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during the weekday PM peak hour. The proposed project will add more than 10 trips to the freeway mainline during the weekday PM peak hour. This impact is ***significant.***

- **Riverside Avenue/I-5 Southbound Merge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during the weekday PM peak hour. The proposed project will add more than 10 trips to the ramp mainline during the weekday PM peak hour. This impact is ***significant.***

- **Riverside Avenue/I-5 Northbound Diverge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during both the weekday PM peak hour and Saturday mid-day peak hour. The proposed project will add more than 10 trips to the ramp during peak periods. This impact is ***significant.***

- **Riverside Avenue/I-5 Northbound Merge** – The addition of project-related traffic degrades unacceptable LOS E operations to LOS F conditions during the weekday PM peak hour and exacerbates unacceptable LOS F conditions during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the freeway mainline during peak periods. This impact is ***significant.***

- **Knighton Road/I-5 Southbound Diverge** – The addition of project-related traffic degrades unacceptable LOS E operations to LOS F during the weekday PM peak hour. The proposed project will add more than 10 trips to the ramp during the weekday PM peak hour. This impact is ***significant.***

- **Knighton Road/I-5 Southbound Merge** – The addition of project-related traffic degrades unacceptable LOS E operations to LOS F during the weekday PM peak hour. The proposed project will add more than 10 trips to the ramp during the weekday PM peak hour. This impact is ***significant.***

- **Bonnyview Road/I-5 Northbound Diverge** – The addition of project related traffic degrades unacceptable LOS D operations to LOS E during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the ramp during the weekday PM peak hour and Saturday mid-day peak hour. This impact is ***significant.***

- **Bonnyview Road/I-5 Southbound Diverge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during the weekday PM peak hour and unacceptable LOS E conditions during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the freeway mainline during peak periods. This impact is ***significant.***

- **Bonnyview Road/I-5 Southbound Merge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during the weekday PM peak hour and degrades LOS D operations to LOS E operations during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the ramp during the weekday PM peak hour and Saturday mid-day peak hour. This impact is ***significant.***

- **Cypress Avenue/I-5 Northbound Diverge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during both the weekday PM peak hour and Saturday mid-day peak hour. The proposed project will add more than 10 trips to the ramp during the weekday PM peak hour and Saturday mid-day peak hour. This impact is ***significant.***

- **Cypress Avenue/I-5 Northbound Merge** – The addition of project-related traffic degrades unacceptable LOS F operations during both the weekday PM peak hour and Saturday mid-day peak hour. The proposed project will add more than 10 trips to the freeway mainline during peak periods. This impact is ***significant.***

- **Cypress Avenue/I-5 Southbound Diverge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during the weekday PM peak hour and degrades LOS E operations to LOS F operation during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the freeway mainline during peak periods. This impact is ***significant.***

- **Cypress Avenue/I-5 Southbound Merge** – The addition of project-related traffic exacerbates unacceptable LOS F operations during the weekday PM peak hour and degrades LOS D operations to LOS E operation during the Saturday mid-day peak hour. The proposed project will add more than 10 trips to the ramp during peak periods. This impact is ***significant.***

Mitigation Measures

Because a guaranteed funding source for the identified improvements has not been secured, this impact is considered ***significant and unavoidable***. When funded, implementation of the following mitigation measures will reduce the impacts to a less-than-significant level.

Implementation of the following mitigation measures will allow the freeway on- and off-ramp merge and diverge areas to operate at an acceptable level of service. Table 3.12-19 presents the freeway on and off-ramp merge and diverge areas' operating conditions with mitigation. The following on-and off-ramp merge and diverge areas are wholly or partly within the incorporated City of Redding, incorporated City of Anderson, or within the jurisdiction of the California Department of Transportation, and are wholly or partly outside the jurisdiction of the lead agency: Riverside Avenue/I-5 Southbound Diverge, Riverside Avenue/I-5 Southbound Merge, Riverside Avenue/I-5 Northbound Diverge, Riverside Avenue/I-5 Northbound Diverge, Riverside Avenue/I-5 Northbound Merge Riverside Avenue/I-5 Northbound Merge, Bonnyview Road/I-5 Northbound Diverge, Bonnyview Road/I-5 Southbound Diverge, Bonnyview Road/I-5 Southbound Merge, Cypress Avenue/I-5 Northbound Diverge, Cypress Avenue/I-5 Northbound Merge, Cypress Avenue/I-5 Southbound Diverge, Cypress Avenue/I-5 Southbound Merge. Many of the mitigation measures identified below for cumulative impacts assign a "fair share" attributable to the project, based on cost and demand data derived from the *Shasta County Regional Improvement Program Impact Fee Nexus Study, April 6, 2009*. That study provides a basis for analysis, but has not been adopted by any agency with jurisdiction by law.

Table 3.12-19
Freeway Ramp Merge/Diverge – Cumulative Conditions Mitigated

Direction	Merge or Diverge	Cumulative Plus Project				Cumulative Plus Project Mitigated			
		PM Peak		MD Peak		PM Peak		MD Peak	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
Riverside Ave / I-5 NB off-ramp	Diverge	--	**F**	--	**F**	30.4	D	31.9	D
Riverside Ave / I-5 NB on-ramp	Merge	--	**F**	--	**F**	28.3	D	**37.8**	**E**
Riverside Ave / I-5 SB off-ramp	Diverge	--	**F**	31.5	D	30.4	D	23.5	C
Riverside Ave / I-5 SB on-ramp	Merge	--	**F**	27.5	C	29.1	D	18.7	B
Knighton Rd / I-5 SB off-ramp	Diverge	--	**F**	33.1	D	30.6	D	25.3	C
Knighton Rd / I-5 SB on-ramp	Merge	--	**F**	28.9	D	28.4	D	21.0	C
Bonnyview Rd / I-5 NB off-ramp	Diverge	33.8	D	**36.9**	**E**	25.6	C	27.4	C

Direction	Merge or Diverge	Cumulative Plus Project				Cumulative Plus Project Mitigated			
		PM Peak		MD Peak		PM Peak		MD Peak	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
Bonnyview Rd / I-5 SB off-ramp	Diverge	--	**F**	**39.6**	**E**	**35.5**	**E**	28.8	D
Bonnyview Road / I-5 SB on-ramp	Merge	--	**F**	**37.5**	**E**	**36.5**	**E**	26.9	C
Cypress Ave / I-5 NB off-ramp	Diverge	--	**F**	--	**F**	33.8	D	**35.3**	**E**
Cypress Ave / I-5 NB on-ramp	Merge	--	**F**	--	**F**	**37.1**	**E**	--	**F**
Cypress Ave / I-5 SB off-ramp	Diverge	--	**F**	--	**F**	**37.6**	**E**	29.5	D
Cypress Ave / I-5 SB on-ramp	Merge	--	**F**	**36.4**	**E**	**35.7**	**E**	24.5	C

Notes:
[1] Density in passenger cars per mile per lane.
[2] LOS = Level of Service. LOS computed using HCS 2000 software for the merge/diverge analysis consistent with HCM 2000 methodology.
Shaded areas indicate deficiency.
Bold type indicates impact.

Source: Fehr & Peers, 2009

Riverside Avenue/I-5 Southbound Off-Ramp Diverge: Improve the diverge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6a:

Add a third southbound travel lane to I-5. This improvement will result in LOS D operations during the weekday PM peak hour at the diverge from I-5 to the southbound off-ramp to Riverside Avenue. The project's "fair share" of the improvement is 50%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Riverside Avenue/I-5 Southbound On-Ramp Merge: Improve the merge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6b:

Add a third southbound travel lane to I-5. This improvement will result in LOS D operations during the weekday PM peak hour and LOS B operations during the Saturday mid-day peak hour at the merge to I-5 to from the southbound Riverside Avenue on-ramp. The project's "fair share" of the improvement is 32%. Payment of fees defined in the

Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Riverside Avenue/I-5 Northbound Off-Ramp Diverge: Improve the diverge operation by adding an additional northbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009 established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6c:

Add a third northbound travel lane to I-5. This improvement will result in LOS D operations during both the weekday PM peak hour and Saturday mid-day peak hour at the diverge from I-5 to the northbound off-ramp to Riverside Avenue. The project's "fair share" of the improvement is 42%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Riverside Avenue/I-5 Northbound On-Ramp Merge: Improve the merge operation by adding an additional northbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6d:

Add a third northbound travel lane to I-5. This improvement will result in LOS D operations during the weekday PM peak hour and LOS E operations during the Saturday mid-day peak hour at the merge to I-5 to from the northbound Riverside Avenue on-ramp. The project's "fair share" of the improvement is 60%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Knighton Road/I-5 Southbound Off-Ramp Diverge: Improve the diverge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6e:

Add a third southbound travel lane to I-5. This improvement will result in LOS D operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the diverge from I-5 to the southbound off-ramp to Knighton Road. The project's "fair share" of the improvement is 98%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Knighton Road/I-5 Southbound On-Ramp Merge: Improve the merge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6f:

Add a third southbound travel lane to I-5. This improvement will result in LOS D operations during the weekday PM peak hour at the merge to I-5 from the southbound Knighton Road on-ramp. The project's "fair share" of the improvement is 72%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Bonnyview Road/I-5 Northbound Off-Ramp Diverge: Improve the diverge operation by adding an additional northbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6g:

Add a third northbound travel lane to I-5. This improvement will result in LOS C operations during the Saturday mid-day peak hour at the diverge from I-5 to the northbound off-ramp to Bonnyview Road. The project's "fair share" of the improvement is 42%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Bonnyview Road/I-5 Southbound Off-Ramp Diverge: Improve the diverge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6h:

Add a third southbound travel lane to I-5. This improvement will result in LOS E operations during the weekday PM peak hour and LOS D operations during the Saturday mid-day peak hour at the diverge from I-5 to the southbound off-ramp to Bonnyview Road. The project's "fair share" of the improvement is 45%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Bonnyview Road/I-5 Southbound On-Ramp Merge: Improve the merge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6i:

Add a third southbound travel lane to I-5. This improvement will result in LOS E operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the merge to I-5 to from the southbound Bonnyview Road on-ramp. The project's "fair share" of the improvement is 34%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Cypress Avenue/I-5 Northbound Off-Ramp Diverge: Improve the diverge operation by adding an additional northbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6j:

Add a third northbound travel lane to I-5. This improvement will result in LOS D operations during the weekday PM peak hour and LOS E operations during the Saturday mid-day peak hour at the diverge from I-5 to the northbound off-ramp to Cypress Avenue. The project's "fair share" of the improvement is 21%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Cypress Avenue/I-5 Northbound On-Ramp Merge: Improve the merge operation by adding an additional northbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6k

Add a third northbound travel lane to I-5. This improvement will result in LOS E operations during the weekday PM peak hour and LOS F operations during the Saturday mid-day peak hour at the merge to I-5 to from the northbound Cypress Avenue on-ramp. The project's "fair share" of the improvement is 40%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Cypress Avenue/I-5 Southbound Off-Ramp Diverge: Improve the diverge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6l:

Add a third southbound travel lane to I-5. This improvement will result in LOS E operations during the weekday PM peak hour and LOS D operations during the Saturday

mid-day peak hour at the diverge from I-5 to the southbound off-ramp to Cypress Avenue. The project's "fair share" of the improvement is 41%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Cypress Avenue/I-5 Southbound On-Ramp Merge: Improve the merge operation by adding an additional southbound travel lane on I-5. The improvement is consistent with the *Shasta County Regional Improvement Program Impact Fee Nexus Study,* April 6, 2009, established by the Shasta County Regional Transportation Planning Agency.

Mitigation Measure #3.12-6m:

Add a third southbound travel lane to I-5. This improvement will result in LOS E operations during the weekday PM peak hour and LOS C operations during the Saturday mid-day peak hour at the merge to I-5 to from the southbound Cypress Avenue on-ramp. The project's "fair share" of the improvement is 27%. Payment of fees defined in the Shasta County Regional Improvement Program Impact Fee Nexus Study would cover the project's "fair share."

Impact #3.12-7: Potential increase in hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Discussion/Conclusion: The proposed roadways within the project site and roadways connecting to the regional transportation system may increase hazards due to design features or incompatible land uses. This impact is ***potentially significant***.

Mitigation Measures

Since the Shasta County improvement standards are developed to minimize hazards due to design features or incompatible uses, implementation of the following mitigation measure would reduce the impact to ***less than significant.***

Mitigation Measure #3.12-7:

All roadways and access points shall be designed according to current Shasta County roadway improvement standards, to the satisfaction of the County's Public Works Department.

Impact #3.12-8: Potential inadequate emergency access.

Discussion/Conclusion: The proposed site plan has not been reviewed by the local fire and police departments to ensure adequate emergency access. This impact is ***potentially significant***.

Mitigation Measures

The following mitigation measure would reduce the impact to a level that is ***less than significant.***

Mitigation Measure #3.12-8:

The site plan shall be reviewed by the local fire and police departments to ensure adequate emergency access, to the satisfaction of the County's Public Works Department.

Impact #3.12-9: Potential inadequate parking supply.

Discussion/Conclusion: The proposed site plan does not identify parking supply and it may be inadequate. This impact is ***potentially significant***.

Mitigation Measures

The following mitigation measure would reduce the impact to a level that is ***less than significant***.

Mitigation Measure #3.12-9:

Parking supply shall be consistent with County zoning requirements and/or standard industry parking ratios for commercial retail centers, to the satisfaction of the County's Public Works Division and Planning Department.

Impact #3.12-10: Potential conflict with adopted policies, plans or programs supporting alternative transportation.

Discussion/Conclusion: The Shasta County Regional Bikeway Plan does not identify any facilities in the study area. The applicant will be subject to all County regulations regarding inclusion of bike lanes and other facilities to support alternatives to automotive travel. Therefore, the proposed project does not conflict with adopted policies, plans or programs supporting alternative transportation. This impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.12-11: Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks

Discussion/Conclusion: The project will not result in a change in air traffic patters and is not near a public airport or private airstrip. There will be no tall structures or buildings constructed as a result of the project. There is ***no impact***.

Mitigation Measures

No mitigation measures are required.