CHAPTER THREE: Circulation

This chapter describes the existing transportation system and traffic conditions in the Planning Area. It describes traffic characteristics, access to adjacent land uses, accident rates, pedestrian and bicycle facilities, and bus transit service.

Auburn Boulevard is one of Citrus Heights' major north-south roadways and serves as an entrance to the city from Interstate 80. It also provides connections to other major city streets including Old Auburn Road, Sylvan Road, Antelope Road, and Twin Oaks Avenue. The importance of this roadway is demonstrated by the high volume of both local and regional traffic it carries.

ROADWAY FUNCTIONAL CLASSIFICATION

Arterials emphasize high mobility for through traffic, collectors serve a balance between both mobility and access, and local streets emphasize property access.

The City of Citrus Heights General Plan (November 2000), classifies Auburn Boulevard as an arterial street with low access control (based on the high frequency of driveways that permit full access). Prior to the construction of Interstate 80, Auburn Boulevard was formerly State Highway 40, the major roadway between San Francisco and Lake Tahoe.

As this sign indicates, Auburn Boulevard was formerly State Highway 40.

ROADWAY CONFIGURATION AND TRAFFIC CONTROL

The 1.5-mile long Planning Area study segment of Auburn Boulevard between Sylvan Corners and Interstate 80 has four travel lanes (two in each direction), with a two-way center left-turn lane that forms left-turn pockets at key intersections.

There are currently (2003) traffic signals at the following six intersections along Auburn Boulevard within the Planning Area:

1. Auburn Boulevard/Twin Oaks Avenue
2. Auburn Boulevard/Rollingwood Drive

3. Auburn Boulevard/Grand Oaks Avenue
4. Auburn Boulevard/Antelope Road
5. Auburn Boulevard/Kanai Avenue
6. Auburn Boulevard/Pedestrian crossing signal adjacent to Sylvan Middle School

Intersections 1, 4, and 5 were selected for detailed analysis based on the existing levels of congestion and/or other operational issues. The intersection of Auburn Boulevard/Old Auburn Road/Sylvan Road was not analyzed because this intersection was studied in 2002 as part of the Sylvan Corners improvement project.

GENERAL PLAN TRANSPORTATION POLICIES

Level of service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and described on a scale from LOS A to LOS F, with LOS A being the best (i.e., free-flow conditions) and LOS F being the worst (i.e., substantial congestion and delay).

Policy 29.1 in the City of Citrus Heights General Plan (November, 2000) states that the City intends to: "Develop and manage the roadway system to obtain LOS D or better for all roadways and intersections in the City."

ROADWAY SEGMENT OPERATIONS

Auburn Boulevard near Cripple Creek.

On Tuesday, October 1, 2002, Fehr & Peers conducted daily traffic counts at the following four locations on Auburn Boulevard:

1. At North City limit
2. North of Antelope Road (near Rusch Park)
3. North of Kanai Avenue
4. North of Old Auburn Road (near Sylvan Middle School)

As shown on Figures 3-1 and 3-2, the Average Daily Traffic (ADT) along Auburn Boulevard ranged from 32,000 to 34,300 vehicles. The existing traffic counts were compared to daily traffic counts conducted in 1998 for the City of Citrus Heights General Plan. This comparison revealed that traffic has increased approximately 17 percent on Auburn Boulevard north of Antelope Road and approximately 33 percent south of Antelope Road. This growth is attributable to both local trips and regional trips passing through the city.

According to the City of Citrus Heights General Plan (November 2000), the maximum ADT on Auburn Boulevard to maintain acceptable (i.e., LOS D) operations is 27,000 vehicles. Operations are considered to be at LOS F when the ADT reaches 30,000. In other words, Auburn Boulevard operates at LOS F.

The segment of Auburn Boulevard between Whyte Avenue and Linden Avenue is characterized by substantial levels of through traffic and poor access to adjacent land uses. This segment is adjacent to the K-Mart store and frequently experiences conflicts between vehicles in the center left-turn lane creating vehicle congestion, driver confusion, and the potential for traffic accidents.

INTERSECTION OPERATIONS

On Tuesday, October 1, 2002, Fehr & Peers conducted morning (7:00 a.m. – 9:00 a.m.) and evening (4:00 p.m. – 6:00 p.m.) peak period traffic counts at the following three signalized intersections on Auburn Boulevard:

1. Auburn Boulevard/Twin Oaks Avenue
2. Auburn Boulevard/Antelope Road
3. Auburn Boulevard/Kanai Avenue

In general, the a.m. peak hour occurred from 7:30 to 8:30 a.m. and the p.m. peak hour occurred from 4:45 to 5:45 p.m.

Intersection operations were evaluated at each intersection based on the methodology contained in the Highway Capacity Manual (Transportation Research Board, 2000). Table 3-1 relates the average delay thresholds associated with each level of service category for signalized intersections.

TABLE 3-1

LEVEL OF SERVICE THRESHOLDS

Level of Service	Average Control Delay (seconds/vehicle) for Signalized Intersections
A	< 10.1
B	10.1 – 20.0
C	20.1 – 35.0
D	35.1 – 55.0
E	55.1 – 80.0
F	> 80.0

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

Table 3-2 shows the existing a.m. and p.m. peak hour operations for the three study intersections, including average delay and level of service.

TABLE 3-2

INTERSECTION LEVELS OF SERVICE – EXISTING CONDITIONS

Intersection	Control	A.M. Peak Hour		P.M. Peak Hour	
		Delay (sec/veh)	LOS[2]	Delay (sec/veh)	LOS[2]
Auburn Boulevard/Twin Oaks Avenue	Traffic Signal	19.2	B	23.7	C
Auburn Boulevard/Antelope Road	Traffic Signal[1]	45.8	D	67.5	E
Auburn Boulevard/Kanai Avenue	Traffic Signal	13.1	B	11.3	B

Notes: [1]This intersection has extensive vehicle queues and a long cycle
[2]LOS = Level of Service
Source: Fehr & Peers Associates, 2002.

The Auburn Boulevard/Twin Oaks Avenue and Auburn Boulevard/Kanai Avenue intersections operate at LOS C or better. The Auburn Boulevard/Antelope Road intersection operates at LOS D during the a.m. peak hour but LOS E during the p.m. peak hour. Field observations indicate that this intersection has extensive vehicle queues and a long cycle length (approximately three minutes) during peak hours.

DRIVEWAYS

A residential driveway directly on Auburn Boulevard.

Auburn Boulevard has numerous driveways that serve adjacent businesses and residential areas. There is a total of 120 unsignalized driveways along Auburn Boulevard, including 92 full access driveways, 27 right-turn only driveways, and one driveway permitting left-turn ingress and right-turns. Three additional driveways are configured as the fourth (east) leg to the signalized intersections at Rollingwood Drive, Grand Oaks Drive, and Kanai Avenue.

The study segment of Auburn Boulevard between Sylvan Corners and Interstate 80 has an average of 32 driveways per mile (for one side of the street). This translates into an average spacing of 160 feet between driveways. However, many unsignalized driveways are spaced only 25 to 100 feet apart. Neighboring jurisdictions (e.g., Roseville, Sacramento County) typically require between 150 feet and 250 feet of spacing between driveways on arterial streets.

Fehr & Peers collected relevant driveway data for several major arterials in the Sacramento region including access restrictions at unsignalized driveways. Table 3-3 summarizes the driveway data on six comparable arterial street segments. As shown, the density

of driveways on Auburn Boulevard is far greater than any of the other roadways studied.

Deceleration lanes are not provided at any of the driveways along Auburn Boulevard. Deceleration lanes can reduce impacts and delays to through traffic on Auburn Boulevard and reduce the potential for rear-end accidents.

TABLE 3-3

DRIVEWAY DENSITIES FOR ARTERIAL STREETS

Roadway Segment (Jurisdiction)	Length (miles)	Number of Signalized Driveways	Number of Unsignalized Driveways				Number of Driveways per Mile
			Full Access	LT in[1] & RIRO[2]	RIRO[2]	Total	
Sunrise Avenue – Frances Drive to Cirby Way (Roseville)	0.75	0	20	0	5	25	16.7
Douglas Boulevard – Eureka Road to Sunrise Avenue (Roseville)	1.00	2	1	4	21	26	14.0
Howe Avenue – Arden Way to Fair Oaks Boulevard (Sacramento)	1.50	3	0	6	56	62	21.7
Arden Way – Point West Way to Ethan Way (Sacramento)	0.60	3	0	2	13	15	15.0
Watt Avenue – Auburn Boulevard to El Camino Avenue (Sacramento Co.)	1.70	1	0	5	62	67	20.0
Sunrise Avenue – Madison Avenue to Greenback Lane (Citrus Heights)	1.00	3	0	2	14	16	9.5
Auburn Boulevard – Whyte Avenue to Sylvan Road (Citrus Heights)	1.90	3	92	1	27	120	32.4

Notes: [1]LT in = Left-turn ingress access
[2]RIRO = Right-turn in/right-turn out access
Source: Fehr & Peers, 2002

TRAVEL SPEEDS

Fehr & Peers conducted traffic speed surveys at the following two locations on Auburn Boulevard:

1. North of Antelope Road (between Baird Way and Cedar Drive)
2. South of Antelope Road (between Ramona Lane and Willow Way)

As prescribed in the Traffic Manual (Caltrans, 1996), the speed surveys were conducted during off-peak hours (i.e.,

10:00 a.m. to 10:30 a.m.) to obtain a reasonable depiction of free-flow travel speeds on Auburn Boulevard. At least 100 vehicles were surveyed at each location. Table 3-4 summarizes the speed survey data.

TABLE 3-4

TRAVEL SPEEDS – EXISTING CONDITIONS

Roadway	Segment	North of Antelope Road		South of Antelope Road	
		Northbound	Southbound	Northbound	Southbound
Auburn Boulevard	Posted Speed Limit	40 MPH	40 MPH	40 MPH	40 MPH
	Median Speed (50th Percentile)	34 MPH	37 MPH	37 MPH	38 MPH
	85th Percentile Speed	38 MPH	42 MPH	43 MPH	42 MPH

Source: Fehr & Peers, 2002

The Traffic Manual indicates that the speed limit is normally established at the first five mile per hour increment below the 85th percentile speed. Accordingly, the posted speed limit of 40 mph for the study segment of Auburn Boulevard within the Planning Area is consistent with this guideline.

BICYCLE AND PEDESTRIAN FACILITIES

The west side of Auburn Blvd. has a continuous sidewalk, while the east side has several segements that are not yet improved.

Auburn Boulevard has a continuous sidewalk on the west side of the street between the Sylvan Corners intersection and Interstate 80. On the east side of the street sidewalks are absent on segments between Watson Way and Cripple Creek Road, and between Sun Avenue and Whyte Avenue. The frequency of driveways on Auburn Boulevard creates numerous areas of potential conflict between vehicles and pedestrians.

Crosswalks are provided at the following intersections along Auburn Boulevard:

1. Auburn Boulevard/Twin Oaks Avenue (three-way crosswalk)
2. Auburn Boulevard/Rollingwood Drive (single crosswalk)
3. Auburn Boulevard/Grand Oaks Avenue (two-way crosswalk)
4. Auburn Boulevard/Antelope Road (four-way crosswalk)
5. Auburn Boulevard/Kanai Avenue (two-way crosswalk)
6. Auburn Boulevard//Pedestrian crossing adjacent to Sylvan Middle School

Fehr & Peers observed pedestrian travel in the vicinity of Sylvan Middle School before and after school hours (i.e., between 7:30 and 8:00 a.m. and between 2:45 and 3:15 p.m.). Many students used the signalized pedestrian crossing adjacent to the school since they are picked up or dropped off at the commercial parking lot on the east side of Auburn Boulevard.

Many bicyclists were also observed using the signalized pedestrian crossing before and after school hours. Since there are no on-street bicycle lanes along Auburn Boulevard, students often ride their bicycles on the sidewalk.

TRANSIT SERVICE AND FACILITIES

Five Sacramento Regional Transit (RT) bus transit routes operate along Auburn Boulevard. Four of these routes provide regular bus service (i.e., throughout the day) while one provides 'peak only' service as summarized in Table 3-5. Figure 3-3 shows the existing transit routes.

TABLE 3-5

EXISTING TRANSIT ROUTES ON STUDY SEGMENT OF AUBURN BOULEVARD

Route Number	Hours of Operation	Headways
91	7 a.m. to 10 p.m. Monday – Friday 10 a.m. to 6:30 p.m. Saturdays, Sundays and Holidays	Every 30 minutes until 6:00 p.m. Every 60 minutes thereafter and on Sat./Sun./Holidays
93	5:40 a.m. to 11 p.m. Monday – Friday 8 a.m. to 7 p.m. Saturdays, Sundays and Holidays	Every 30 minutes until 6:00 p.m. Every 60 minutes thereafter and on Sat./Sun./Holidays
94	6 a.m. to 6 p.m. Monday – Friday	Every 60 minutes
95	6:40 a.m. to 5:30 p.m. Monday – Friday	Every 60 minutes
103	6 a.m. to 7:30 a.m. Monday – Friday 4:30 p.m. to 6:20 p.m. Monday – Friday	Every 15 minutes - AM peak Every 30 minutes - PM peak

Source: Sacramento Regional Transit, 2002

There is a total of 18 bus stops along Auburn Boulevard. Each bus stop is designated by a street sign that indicates the routes serviced. Twelve of those bus stops are equipped with benches, but none has a shelter.

Routes 91, 93, 94, and 103 service the bus stop located on Orlando Avenue at Louis Lane (just south of Interstate 80). This bus stop

provides connections with Roseville Urban Shuttle and Placer County Transit.

Bus turnouts allow transit vehicles to load/unload passengers while minimizing impacts to the flow of traffic in the adjacent travel lane. Turnouts are provided at the following four locations on Auburn Boulevard:

1. South of Whyte Avenue (southbound)
2. North of Twin Oaks Avenue (southbound)
3. North of Twin Oaks Avenue (northbound)
4. North of Watson Way (northbound)

ACCIDENT RATES

In the last three years there have been a total of 160 accidents along Auburn Boulevard.

Fehr & Peers collected accident data from the Citrus Heights Police Department for Auburn Boulevard for a three-year period between October 1999 and October 2002.

The data revealed a total of 260 collisions over the three-year period, including 123 collisions north of Antelope Road and 137 collisions south of Antelope Road. One accident involving a vehicle-pedestrian collision resulted in a fatality at the intersection of Auburn Boulevard/Antelope Road. Injuries occurred in 66 percent of the accidents. Five accidents involved pedestrians and nine involved bicyclists.

The accident rate for Auburn Boulevard is 2.99 accidents per million vehicle miles north of Antelope Road and 4.85 accidents per million vehicle miles south of Antelope Road (based on total number of accidents, ADT, and length of roadway segment). This data indicates that the accident rate for the segment of Auburn Boulevard south of Antelope Road is higher than the statewide average rate of 3.35 accidents per million vehicles for similar facilities (per 1999 Caltrans Accident Data on California State Highways). Although the number of accidents on Auburn Boulevard south of Antelope Road is comparable to the number of accidents north of Antelope Road, the rate of accidents is 62 percent higher due to the shorter length of this segment (0.8 miles versus 1.1 miles).

Table 3-6 shows a summary of traffic accident data at signalized intersections along Auburn Boulevard. The data indicates that the accident rate at the Antelope Road and Kanai Avenue intersections are higher than the statewide average rate for similar facilities.

TABLE 3-6

AUBURN BOULEVARD ACCIDENT HISTORY
OCTOBER 1999 THROUGH OCTOBER 2002

Location	Average Accidents Per Year [1]	Total Fatalities (3 Year Period)	Actual Accident Rate[2]	Average Accident Rate[4]
Auburn Boulevard/Twin Oaks Avenue	2.33	0	0.20 per MV[3]	0.43 per MV
Auburn Boulevard/Rollingwood Drive	0.67	0	N/A	0.43 per MV
Auburn Boulevard/Grand Oaks Drive	2.67	0	N/A	0.43 per MV
Auburn Boulevard/Antelope Road	16.67	1	0.84 per MV[3]	0.43 per MV
Auburn Boulevard/Kanai Avenue	6.63	0	0.56 per MV[3]	0.43 per MV

Notes: [1]Accidents at intersections defined as any collision occurring within 250 feet of intersection.
[2] Actual accident rate for intersections at Rollingwood Drive and Grand Oaks Boulevard not calculated because ADT at these intersections were not available.
[3]MV = Million vehicles entering the intersection.
[4]Based on statewide average for urban intersections with signalized control (1999 Caltrans Accident Data on California State Highways).

Source: Citrus Heights Police Department – Traffic Division, 2002

Approximately 40 percent of the accidents occurring along the study segment of Auburn Boulevard involved rear-end collisions. Another 30 percent of the accidents involved broadside collisions. Improvements in access control on Auburn Boulevard (e.g., consolidation of driveways, turning movement restrictions, provision of deceleration lanes) may reduce these types of collisions.

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