Dowling Associates, Inc.
Transportation Engineering • Planning • Research • Education

March 11, 2008

Mr. Douglas C. Buzbee, Vice President
Acquisitions and Forward Planning
Silverwing Development
401 Willow Pass Road, Suite 1020
Concord, CA 94520

RE: Highway 12 Retail Complex – Highway 12 Access and Operational Analysis

Dear Mr. Buzbee:

Dowling Associates was retained to evaluate the traffic impacts of the proposed Silverwing Development retail project on Highway 12 in the City of Suisun City. This letter provides an overview of our assumptions, findings and recommendations.

Setting

The project is located on Highway 12 just west of the intersection of Highway 12 at Snow Road. The next major intersection to the west is Sunset Avenue/Grizzy Island Road. Based upon 2006 Caltrans traffic data, Highway 12 near the site carries about 46,000 daily trips. Highway 12 is a four-lane facility with a divided center median area. The median is wide and does not include a formal concrete barrier. Along Highway 12 (in both directions) deceleration and acceleration lanes are provided at most intersections where side streets access the state highway. The intersections of Snow Road and the existing driveway about 773 feet to the west are stop controlled. The existing driveway on the north side of Highway 12 is located directly across the freeway from Lawler Center Drive located on the south side of Highway 12 east of Grizzy Island Road.

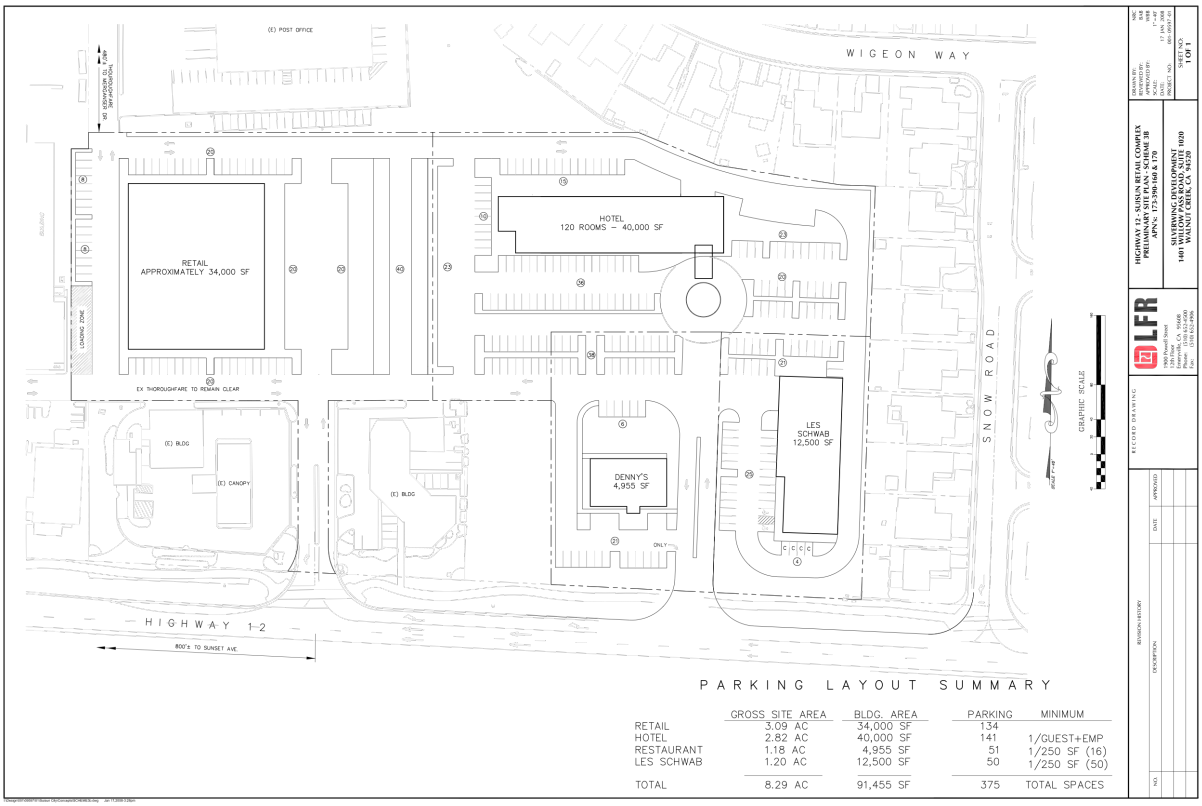
Project Description

This analysis is based upon the preliminary site plan dated January 17, 2008. The project includes a series of retail uses and includes two major access points on Highway 12 and a secondary access at the rear of the site to Merganser Drive approximately 480 feet to the north. The uses on the site include:

- A 120 room/40,000 gross square foot Hotel
- A Denny's restaurant occupying 4,955 gross square feet
- A Les Schwab tire store occupying 12,500 gross square feet, and
- A 34,000 gross square foot retail building

Figure 1 shows the proposed site plan with two access points on Highway 12 and a third to Merganser Drive. Snow Road is located to the east of the project site, which serves an existing residential area. Snow Road has direct access to Highway 12 with stop controls on the Snow Road approach and protected pavement stripping on Highway 12 to control the access and egress of vehicles from Highway 12 to Snow Road. An existing driveway located approximately 773 feet west of the centerline of Snow Road currently serves two retail uses on Highway 12. This driveway will be extended northward to provide access to the proposed site. A new access to the site is also being proposed about 341 feet west of the centerline of Snow Road, between Snow Road and the existing driveway to the west.

Figure 1 - Site Plan



Focus of This Study

This study was commissioned to address the potential weaving and intersection spacing issues to and from Highway 12 at the two proposed driveways to the site. A review of the proposed site plan would suggest that the majority of the traffic generated by project would access using the newly proposed easterly driveway. This report addresses the impacts of the traffic added by the project to the existing

condition on Highway 12 at Snow Road, the new access (341 feet to the west of Snow Road), and the existing driveway (773 feet to the west of Snow Road).

Traffic Counts

Dowling Associates hired Wiltec, an independent traffic survey company; to conduct peak hour traffic counts near the site. The counts were conduct at two locations: Snow Road at Highway 12 and the existing driveway (directly north of Lawler Center Drive on the south side of Highway 12) on the western side of the site and Highway 12 (this driveway serves two existing buildings). The Highway 12 intersection counts were conducted as follows:

- Snow Road – Thursday, September 20, 2007 – 7:00 AM to 9:00 AM, 11 AM to 1 PM, 4:00 PM to 6:00 PM, and Saturday, September 29, 2007 – 11 AM to 1 PM.
- Existing Driveway (directly north of Lawler Center Drive on the south side of Highway 12) – Thursday, September 20, 2007 – 7:00 AM to 9:00 AM, 11 AM to 1 PM, 4:00 PM to 6:00 PM, and Saturday, September 29, 2007 – 11 AM to 1 PM.

The summary traffic counts sheets are attached in the appendix of this report.

Project Trip Generation

Table 1 details the trip generation rates and vehicle trips for the AM and PM weekday peak hour and the Saturday mid-day peak hour. These three conditions were selected to determine the worse case conditions at the site. The project is estimated to generate 505 AM and 583 weekday peak hour trips and 737 mid-day peak hour trips on Saturday.

Trip Distribution

To assign traffic to the surrounding street system, the inbound and outbound traffic found at both the Snow Road and existing gas station driveways was evaluated. In addition, the distribution of the land uses on the site provided additional criteria. Specifically, all of the traffic for the site excluding the traffic to and from the 34,000 gross square foot retail building on the western side of the site was assigned to the new proposed driveway near Snow Road. The traffic to and from the 34,000 gross square foot retail building was assigned to the existing driveway.

Table 1 - Trip Generation

AM WEEKDAY PEAK HOUR						
				AM Peak Hour		
Land Use	**ITE Code**	**Quantity**	**Units**	**Inbound**	**Outbound**	**Total**
Hotel	310	120	rooms	0.39	0.28	0.67
Special Retail	814	40	KSF	1.19	1.52	2.71
Denny's	934	4.995	KSF	27.09	26.02	53.11
Les Schwab	848	12.5	KSF	2.61	1.54	4.15
Hotel	310	120	rooms	47	34	80
Special Retail	814	40	KSF	48	61	108
Denny's	934	4.995	KSF	135	130	265
Les Schwab	848	12.5	KSF	33	19	52
Totals				**263**	**244**	**505**
PM WEEKDAY PEAK HOUR						
				PM Peak Hour		
Land Use	**ITE Code**	**Quantity**	**Units**	**Inbound**	**Outbound**	**Total**
Hotel	310	120	rooms	0.34	0.36	0.7
Special Retail	814	40	KSF	3.28	3.56	6.84
Denny's	934	4.995	KSF	18.01	16.63	34.64
Les Schwab	848	12.5	KSF	1.78	2.37	4.15
Hotel	310	120	rooms	41	43	84
Special Retail	814	40	KSF	131	142	274
Denny's	934	4.995	KSF	90	83	173
Les Schwab	848	12.5	KSF	22	30	52
Totals				**284**	**298**	**583**
SATURDAY MID-DAY PEAK HOUR						
				Saturday Mid-day		
Land Use	**ITE Code**	**Quantity**	**Units**	**Inbound**	**Outbound**	**Total**
Hotel	310	120	rooms	0.43	0.44	0.87
Special Retail	814	40	KSF	3.28	3.56	6.84
Denny's	934	4.995	KSF	30.19	29.01	59.2
Les Schwab	848	12.5	KSF	2.37	2.68	5.05
Hotel	310	120	rooms	52	53	104
Special Retail	814	40	KSF	131	142	274
Denny's	934	4.995	KSF	151	145	296
Les Schwab	848	12.5	KSF	30	34	63
Totals				**364**	**374**	**737**

Figure 2 shows the existing and existing plus project traffic volumes for the AM and PM weekday peak hour and the Saturday mid-day peak hour conditions.

Figure 2 - Existing and Existing Plus Project Traffic Volumes

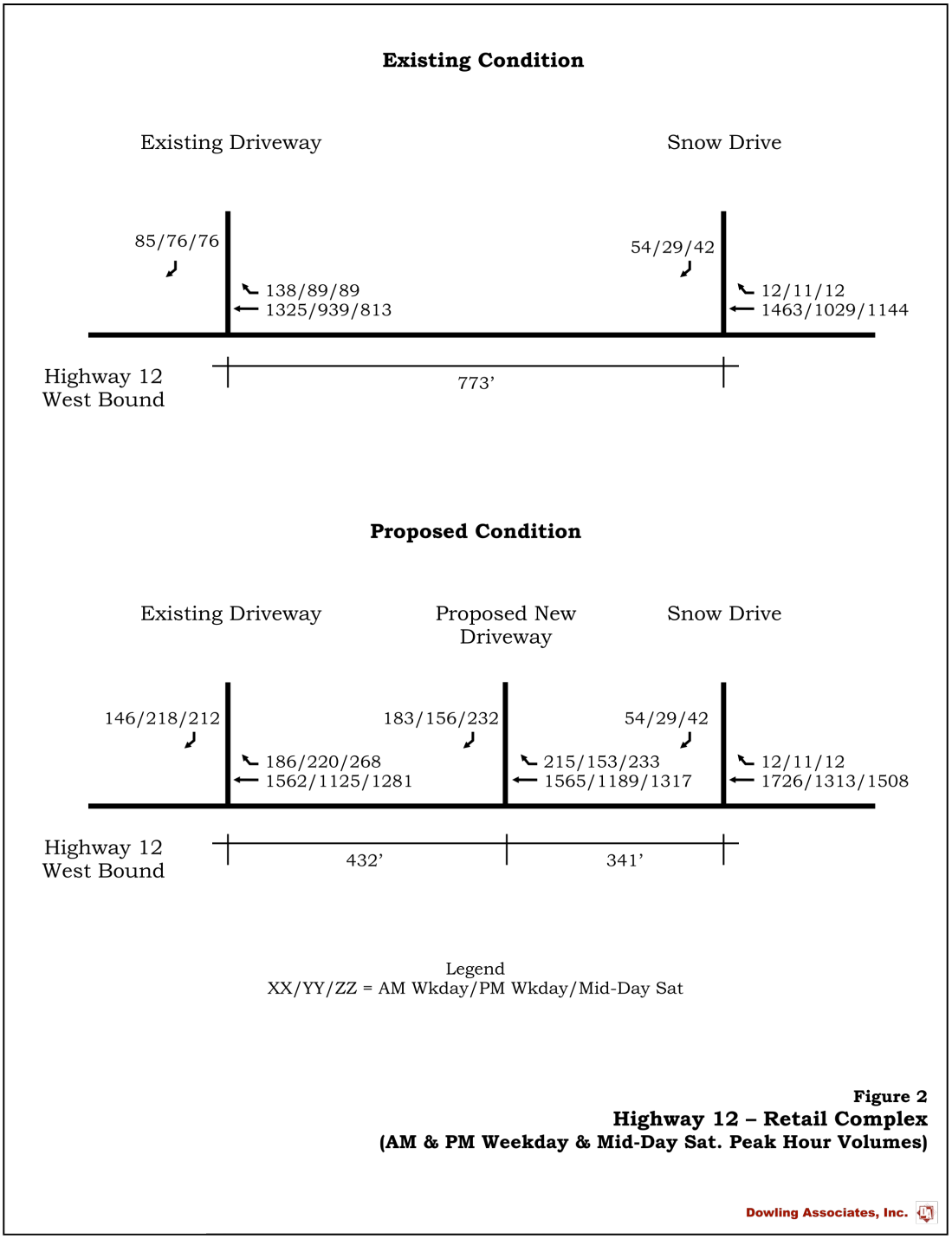


Figure 2
Highway 12 – Retail Complex
(AM & PM Weekday & Mid-Day Sat. Peak Hour Volumes)

Dowling Associates, Inc.

Synchro/SimTraffic Model Parameters

To assess the potential impacts along State Route 12 (SR 12) of the construction of a new driveway between the existing driveway adjacent to the site and the intersection of Snow Road, a brief microsimulation analysis was conducted using the microsimulation module of Synchro software, SimTraffic. SimTraffic was selected because it was believed that traditional Highway Capacity Manual methodologies would not adequately describe the lower speed (i.e., slower than on a freeway) weaving operations. The concern was that an intersection level of service calculation might show favorable results, but congestion could result from vehicles slowing to enter the driveways or accelerating to enter the SR 12 lanes. The microsimulation analysis, while brief, would likely show problems related to the weaving operation if they were likely to occur. The parameters of the model include the following:

- State Route 12 (SR 12) was coded as 55 miles per hour with two travel lanes in the westbound direction.
- A continuous lane to be used for deceleration and acceleration was assumed at the westbound exit from SR 12 to Snow Road, and at the existing driveway between the two gas stations.
- At the new entrance, acceleration and deceleration lanes were assumed.
- The exiting movements from the side streets onto SR 12 (right-out only) are coded with stop control.

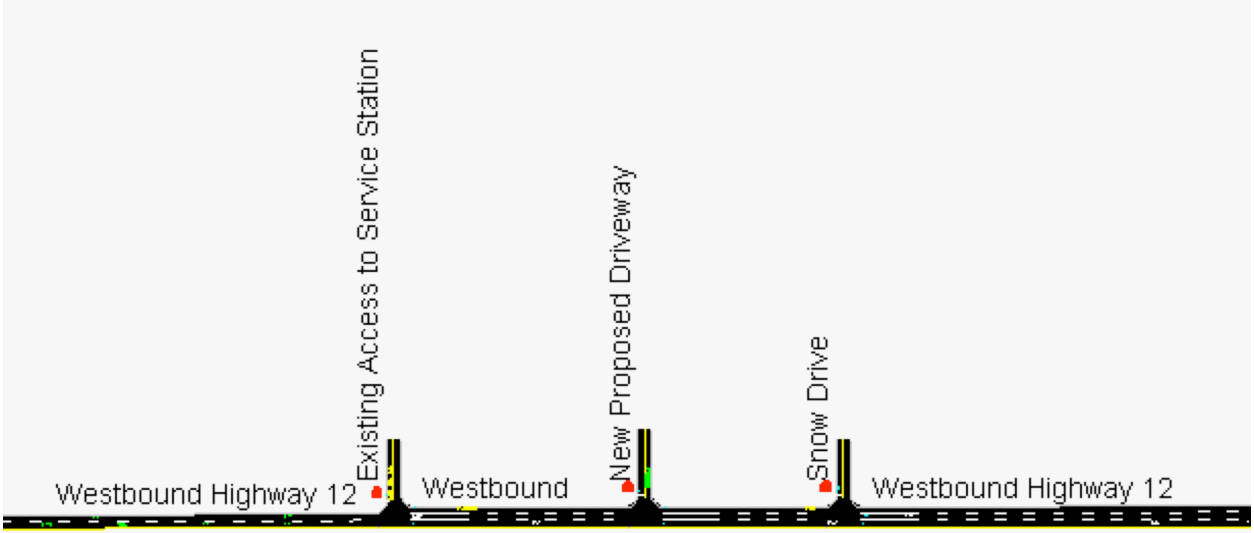
Analysis Results

Figure 3 illustrates the Synchro/SimTraffic model network. The distance between Snow Road and the new proposed driveway is 341 feet centerline to centerline. The distance between the new driveway and the existing access is 432 feet centerline to centerline.

The arterial report provided from SimTraffic provides the delay and queuing information results of the model runs. Five iterations were used when running the model. The vehicle delays leading up the Snow Road intersection are not relevant as the network coding to the east of the Snow Road/Highway 12 intersection was not required for the analysis.

Table 3 details the vehicle delay and speed information for the AM and PM weekday and Saturday mid-day conditions. Table 4 details the southbound vehicle queuing data on the side streets, which access Highway 12. The appendix to this report includes the actual SimTraffic model output reports.

Figure 3 - Synchro Network



The arterial report provided in Synchro provides the delay and queuing information results of the model runs. Five iterations were used when running the model. The vehicle delays leading up the Snow Road intersection are not accurate as the network coding to the east of the Snow Road/Highway 12 intersection were not required for the analysis. Therefore, this segment of Highway 12 is not coded accurately. However, the distances and lane configurations between Snow Road and the existing driveway to the west are accurate. Table 3 details the vehicle delay information for the AM and PM weekday and Saturday mid-day conditions. Table 4 details the southbound vehicle queuing data on the side streets, which access Highway 12. The appendix to this report includes the actual Synchro model output reports.

Table 3 – Synchro Model Results

Roadway Segment	**Delay / vehicle (sec)**	**Travel Time (sec)**	**Average Speed (Mph)**
AM Weekday Peak Hour			
Existing Condition	1.1	10.8	49
Proposed Condition			
Snow Drive			
New Proposed Driveway	1.0	5.3	44
Existing Access to Service Station	1.1	6.6	44
Totals	2.1	11.9	44
PM Weekday Peak Hour			
Existing Condition	0.9	10.7	49
Proposed Condition			

Roadway Segment	Delay / vehicle (sec)	Travel Time (sec)	Average Speed (Mph)
Snow Drive			
New Proposed Driveway	0.8	5.1	46
Existing Access to Service Station	1.0	6.4	46
Totals	1.8	11.5	46
Mid-Day Saturday Peak Hour			
Existing Condition	1.0	10.8	49
Proposed Condition			
Snow Drive			
New Proposed Driveway	1.1	5.4	43
Existing Access to Service Station	1.4	6.8	43
Totals	2.5	12.2	43

Based upon the above results, the impacts on Highway 12 are small and do not results in significant levels of delay or congestion. Vehicle queuing was not observed in the simulation model. Therefore, with the implementation of the mitigation measures suggested below, Highway 12 should operate under acceptable operational conditions with the construction of the new driveway into the project and the maintenance of the existing driveway between the two service stations.

Weaving Analysis

An LOS and weaving analysis was conducted for two segments on Highway 12. These include: 1) Snow Drive to the proposed new Driveway, and 2) the proposed new driveway to the existing driveway. HCS software was used to calculate the weaving speeds and resultant LOS. While this software is generally applied to freeway ramp conditions, it was applied here to validate the Simtraffic simulation model results.

Table 4 – Weaving Analysis and LOS Results

Roadway Segment	Weaving Speed (mph)	Weaving Density (pc/mi/ln)	LOS Segment
AM Weekday Peak Hour			
Existing Condition	45.06	22.58	B
Proposed Condition			
Snow Drive			
New Proposed Driveway	40.32	27.47	C
Existing Access to Service Station	40.18	26.72	C
PM Weekday Peak Hour			
Existing Condition	52.21	12.46	B
Proposed Condition			
Snow Drive			
New Proposed Driveway	43.75	19.29	B
Existing Access to Service Station	40.89	21.25	B
Mid-Day Saturday Peak Hour			
Existing Condition	52.15	13.57	B
Proposed Condition			

Roadway Segment	Weaving Speed (mph)	Weaving Density (pc/mi/ln)	LOS Segment
Snow Drive			
New Proposed Driveway	40.93	24.18	C
Existing Access to Service Station	38.69	25.55	C

Under existing conditions, all conditions operate at LOS B. When the new driveway is added and the site developed, the PM weekday peak hour condition remains at LOS B while all other conditions operate at LOS C. Section 504.7 of the Highway Design Manual states that weaving sections in urban areas should be designed for LOS C or D. Weaving sections in rural area should be design for LOS B or C. The results of the weaving and LOS analysis are consistent with the Simtraffic model and confirm that the proposed project will not significantly impact Highway 12 operations at the existing and proposed driveways to the site. Based upon the above results, the construction of a new driveway between Snow Drive and the existing driveway will result in acceptable operating conditions based upon the Caltrans Highway Design Manual.

Required Mitigation Measures

The project will construct a continuous acceleration/deceleration lanes from the west curb return of Snow Drive to the west curb return on the existing driveway 773 feet to the west of Snow Drive. The intersection configuration will follow Caltrans standard design requirements. Appropriate signage will be installed to warn motorist of the up-coming intersections for both the existing driveway as well as the new proposed driveway.

If you have questions, do not hesitate to call.

Sincerely,

John N. Dowden
Vice President

Attachments: - Synchro model outputs
HCS weaving analysis outputs.

Arterial Level of Service
AM Weekday Peak Hour - No Project 3/11/2008

Arterial Level of Service: WB Westbound Highway 12

Cross Street	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Snow Drive	1.2	19.7	0.3	49
Existing Access to S	1.1	10.8	0.1	49
Total	2.4	30.6	0.4	49

Arterial Level of Service
PM Weekday Peak Hour - No Project 3/11/2008

Arterial Level of Service: WB Westbound Highway 12

Cross Street	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Snow Drive	0.7	19.0	0.3	51
Existing Access to S	0.9	10.7	0.1	49
Total	1.6	29.7	0.4	50

Arterial Level of Service
Mid-day Saturday Peak Hour - No Project 3/11/2008

Arterial Level of Service: WB Westbound Highway 12

Cross Street	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Snow Drive	0.8	19.1	0.3	51
Existing Access to S	1.0	10.8	0.1	49
Total	1.8	29.9	0.4	50

Arterial Level of Service
AM Weekday Peak Hour - With Project 3/11/2008

Arterial Level of Service: WB Westbound Highway 12

Cross Street	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Snow Drive	1.8	20.3	0.3	48
New Proposed Drivewa	1.0	5.3	0.1	44
Existing Access to S	1.1	6.6	0.1	44
Total	3.9	32.2	0.4	47

Arterial Level of Service
PM Weekday Peak Hour - With Project 3/11/2008

Arterial Level of Service: WB Westbound Highway 12

Cross Street	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Snow Drive	1.0	19.2	0.3	50
New Proposed Drivewa	0.8	5.1	0.1	46
Existing Access to S	1.0	6.4	0.1	46
Total	2.7	30.7	0.4	49

Arterial Level of Service
Mid-day Weekend With Project 3/11/2008

Arterial Level of Service: WB Westbound Highway 12

Cross Street	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Snow Drive	1.9	20.3	0.3	48
New Proposed Drivewa	1.1	5.4	0.1	43
Existing Access to S	1.4	6.8	0.1	43
Total	4.3	32.5	0.4	46

HCS+: Freeway Weaving Release 5.2

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	John Dowden
Agency/Co.:	Dowling Associates, Inc.
Date Performed:	2/12/2008
Analysis Time Period:	AM Peak Hour Weekday
Freeway/Dir of Travel:	westbound
Weaving Location:	Snow to New Driveway
Jurisdiction:	Suisun City
Analysis Year:	2008
Description:	Highway 12 - Retail Complex

Inputs

Freeway free-flow speed, SFF	55	mph
Weaving number of lanes, N	2	
Weaving segment length, L	341	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.13	
Weaving ratio, R	0.20	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1726	0	215	54	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	479	0	60	15	v
Trucks and buses	0	0	0	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	1.000	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1917	0	238	60	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.67	0.66
Weaving and non-weaving speeds, Si	31.83	42.06
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.40
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	40.32	mph
Weaving segment density, D	27.47	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb		pc/h
Capacity as a 15-minute flow rate, c		pc/h
Capacity as a full-hour volume, ch		pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	298	2800	a
Average flow rate (pcphpl)	1107	2250	b
Volume ratio, VR	0.13	1.00	c
Weaving ratio, R	0.20	N/A	d
Weaving length (ft)	341	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.2

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	John Dowden
Agency/Co.:	Dowling Associates, Inc.
Date Performed:	2/12/2008
Analysis Time Period:	PM Peak Hour Weekday
Freeway/Dir of Travel:	westbound
Weaving Location:	Snow to New Driveway
Jurisdiction:	Suisun City
Analysis Year:	2008
Description:	Highway 12 - Retail Complex

Inputs

Freeway free-flow speed, SFF	55	mph
Weaving number of lanes, N	2	
Weaving segment length, L	341	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.14	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1313	0	153	54	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	365	0	43	15	v
Trucks and buses	0	0	0	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	1.000	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1458	0	170	60	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.29	0.47
Weaving and non-weaving speeds, Si	34.65	45.64
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.39
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	43.75	mph
Weaving segment density, D	19.29	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb		pc/h
Capacity as a 15-minute flow rate, c		pc/h
Capacity as a full-hour volume, ch		pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	230	2800	a
Average flow rate (pcphpl)	844	2250	b
Volume ratio, VR	0.14	1.00	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	341	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.2

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	John Dowden
Agency/Co.:	Dowling Associates, Inc.
Date Performed:	2/12/2008
Analysis Time Period:	Sat Mid-day Peak Hour Weekday
Freeway/Dir of Travel:	westbound
Weaving Location:	Snow to New Driveway
Jurisdiction:	Suisun City
Analysis Year:	2008
Description:	Highway 12 - Retail Complex

Inputs

Freeway free-flow speed, SFF	55	mph
Weaving number of lanes, N	2	
Weaving segment length, L	341	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.15	
Weaving ratio, R	0.15	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1508	0	233	42	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	419	0	65	12	v
Trucks and buses	0	0	0	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	1.000	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1675	0	258	46	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.56	0.61
Weaving and non-weaving speeds, Si	32.61	42.91
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.43
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	40.93	mph
Weaving segment density, D	24.18	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb		pc/h
Capacity as a 15-minute flow rate, c		pc/h
Capacity as a full-hour volume, ch		pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	304	2800	a
Average flow rate (pcphpl)	989	2250	b
Volume ratio, VR	0.15	1.00	c
Weaving ratio, R	0.15	N/A	d
Weaving length (ft)	341	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Phone: Fax:
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Operational Analysis

Analyst:	John Dowden
Agency/Co.:	Dowling Associates, Inc.
Date Performed:	2/12/2008
Analysis Time Period:	AM Peak Hour Weekday
Freeway/Dir of Travel:	westbound
Weaving Location:	New Driveway to Existing
Jurisdiction:	Suisun City
Analysis Year:	2008
Description:	Highway 12 - Retail Complex

Inputs

Freeway free-flow speed, SFF	55	mph
Weaving number of lanes, N	2	
Weaving segment length, L	432	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.19	
Weaving ratio, R	0.50	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1565	0	186	183	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	435	0	52	51	v
Trucks and buses	0	0	0	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	1.000	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1738	0	206	203	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.49	0.65
Weaving and non-weaving speeds, Si	33.05	42.33
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.51
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	40.18	mph
Weaving segment density, D	26.72	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb		pc/h
Capacity as a 15-minute flow rate, c		pc/h
Capacity as a full-hour volume, ch		pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	409	2800	a
Average flow rate (pcphpl)	1073	2250	b
Volume ratio, VR	0.19	1.00	c
Weaving ratio, R	0.50	N/A	d
Weaving length (ft)	432	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Operational Analysis

Analyst:	John Dowden
Agency/Co.:	Dowling Associates, Inc.
Date Performed:	2/12/2008
Analysis Time Period:	PM Peak Hour Weekday
Freeway/Dir of Travel:	westbound
Weaving Location:	New Driveway to Existing
Jurisdiction:	Suisun City
Analysis Year:	2008
Description:	Highway 12 - Retail Complex

Inputs

Freeway free-flow speed, SFF	55	mph
Weaving number of lanes, N	2	
Weaving segment length, L	432	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.24	
Weaving ratio, R	0.41	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1189	0	220	156	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	330	0	61	43	v
Trucks and buses	0	0	0	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	1.000	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1321	0	244	173	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.33	0.58
Weaving and non-weaving speeds, Si	34.31	43.52
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.58
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	40.89	mph
Weaving segment density, D	21.25	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb		pc/h
Capacity as a 15-minute flow rate, c		pc/h
Capacity as a full-hour volume, ch		pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	417	2800	a
Average flow rate (pcphpl)	869	2250	b
Volume ratio, VR	0.24	1.00	c
Weaving ratio, R	0.41	N/A	d
Weaving length (ft)	432	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Operational Analysis

Analyst:	John Dowden
Agency/Co.:	Dowling Associates, Inc.
Date Performed:	3/11/08
Analysis Time Period:	Sat Mid-day Existing Peak Hour
Freeway/Dir of Travel:	westbound
Weaving Location:	New Driveway to Existing
Jurisdiction:	Suisun City
Analysis Year:	2008
Description:	Highway 12 - Retail Complex

Inputs

Freeway free-flow speed, SFF	55	mph
Weaving number of lanes, N	2	
Weaving segment length, L	432	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.25	
Weaving ratio, R	0.49	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1329	0	220	232	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	369	0	61	64	v
Trucks and buses	0	0	0	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	1.000	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1476	0	244	257	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.54	0.71
Weaving and non-weaving speeds, Si	32.69	41.26
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.61
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	38.69	mph
Weaving segment density, D	25.55	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb		pc/h
Capacity as a 15-minute flow rate, c		pc/h
Capacity as a full-hour volume, ch		pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	501	2800	a
Average flow rate (pcphpl)	988	2250	b
Volume ratio, VR	0.25	1.00	c
Weaving ratio, R	0.49	N/A	d
Weaving length (ft)	432	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.