Appendix G

Traffic Analysis Technical Calculations, and Parking Analysis

Traffic Analysis Technical Calculations

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Existing Conditions
Winter AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	121	419	148	138	30	131	39	95	40	64	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3379	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.98	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3379	
Peak-hour factor, PHF	0.86	0.86	0.86	0.79	0.79	0.79	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	30	141	487	187	175	38	146	43	106	43	69	29
RTOR Reduction (vph)	0	0	294	0	0	25	0	0	85	0	16	0
Lane Group Flow (vph)	30	141	193	187	175	13	146	43	21	0	125	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	2.5	14.7	28.8	12.5	25.2	25.2	14.1	14.1	14.1		10.3	
Effective Green, g (s)	2.5	14.7	28.8	12.5	25.2	25.2	14.1	14.1	14.1		10.3	
Actuated g/C Ratio	0.03	0.20	0.40	0.17	0.35	0.35	0.19	0.19	0.19		0.14	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	60	377	627	304	646	549	343	361	307		479	
v/s Ratio Prot	0.02	c0.08	0.06	c0.11	0.09		c0.08	0.02			c0.04	
v/s Ratio Perm			0.06			0.01			0.01			
v/c Ratio	0.50	0.37	0.31	0.62	0.27	0.02	0.43	0.12	0.07		0.26	
Uniform Delay, d1	34.4	25.0	15.1	27.8	17.1	15.6	25.7	24.1	23.9		27.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	2.4	0.2	0.1	2.6	0.1	0.0	0.3	0.1	0.0		0.1	
Delay (s)	36.8	25.2	15.2	30.4	17.2	15.6	26.0	24.2	23.9		27.9	
Level of Service	D	C	B	C	B	B	C	C	C		C	
Approach Delay (s)		18.3			23.2			25.0			27.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	72.6	Sum of lost time (s)	21.0
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_Existing_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	133	3.0	0.164	4.7	LOS A	0.0	0.0	0.00	0.75	27.9
8	T	227	3.0	0.164	4.7	LOS A	0.0	0.0	0.00	0.34	32.0
Approach		360	3.0	0.164	4.7	LOS A	0.0	0.0	0.00	0.49	30.3
East: I-80 WB off-ramp											
1	L	147	3.0	0.185	6.4	LOS A	0.5	12.3	0.34	0.75	24.8
6	T	3	3.0	0.185	6.4	LOS A	0.5	12.3	0.34	0.48	27.2
16	R	67	3.0	0.085	5.4	LOS A	0.2	5.5	0.33	0.57	27.5
Approach		217	3.0	0.185	6.1	LOS A	0.5	12.3	0.34	0.69	25.6
North: HWY 89											
4	T	511	3.0	0.365	8.7	LOS A	1.6	40.7	0.48	0.59	26.3
14	R	87	3.0	0.365	8.7	LOS A	1.6	40.7	0.48	0.67	25.9
Approach		598	3.0	0.365	8.7	LOS A	1.6	40.7	0.48	0.60	26.3
All Vehicles		1175	3.0	0.365	7.0	LOS A	1.6	40.7	0.31	0.58	27.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_Existing_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	342	3.0	0.386	9.2	LOS A	1.7	43.7	0.50	0.64	27.9
18	R	283	3.0	0.386	9.2	LOS A	1.7	43.7	0.50	0.69	27.2
Approach		625	3.0	0.386	9.2	LOS A	1.7	43.7	0.50	0.66	27.6
North: HWY 89											
7	L	155	3.0	0.352	6.8	LOS A	0.0	0.0	0.00	0.86	27.9
4	T	616	3.0	0.352	6.8	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		772	3.0	0.352	6.8	LOS A	0.0	0.0	0.00	0.48	31.2
West: I-80 EB off-ramp											
5	L	139	3.0	0.499	14.4	LOS B	1.9	49.3	0.62	0.96	21.9
2	T	1	3.0	0.499	14.4	LOS B	1.9	49.3	0.62	0.78	23.2
12	R	467	3.0	0.499	14.1	LOS B	1.9	49.3	0.60	0.85	23.6
Approach		608	3.0	0.499	14.1	LOS B	1.9	49.3	0.61	0.87	23.1
All Vehicles		2004	3.0	0.499	9.8	LOS A	1.9	49.3	0.34	0.65	27.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

Existing Conditions
Winter AM

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	156	40	56	257	10	751	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.81	0.81	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	193	49	62	286	11	808	202
RTOR Reduction (vph)	0	39	0	0	0	0	51
Lane Group Flow (vph)	193	10	62	286	11	808	151
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	9.2	16.5	7.3	60.3	1.5	54.5	63.7
Effective Green, g (s)	9.2	16.5	7.3	60.3	1.5	54.5	63.7
Actuated g/C Ratio	0.11	0.19	0.09	0.71	0.02	0.64	0.75
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	371	307	152	2510	31	1839	1186
v/s Ratio Prot	c0.06	0.00	c0.04	0.08	0.01	c0.28	0.01
v/s Ratio Perm		0.00					0.08
v/c Ratio	0.52	0.03	0.41	0.11	0.35	0.44	0.13
Uniform Delay, d1	35.8	27.8	36.8	3.9	41.3	7.6	3.0
Progression Factor	1.00	1.00	1.17	0.79	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.0	1.8	0.1	6.9	0.8	0.0
Delay (s)	36.4	27.8	44.7	3.2	48.1	8.4	3.0
Level of Service	D	C	D	A	D	A	A
Approach Delay (s)	34.7			10.6		7.7	
Approach LOS	C			B		A	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	216	122	191	41	8	783
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.93	0.93
Adj. Flow (vph)	257	145	212	46	9	842
RTOR Reduction (vph)	0	108	0	10	0	0
Lane Group Flow (vph)	257	37	212	36	9	842
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	16.7	21.7	49.0	65.7	5.0	57.5
Effective Green, g (s)	16.7	21.7	49.0	65.7	5.0	57.5
Actuated g/C Ratio	0.20	0.26	0.58	0.77	0.06	0.68
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	347	404	1653	1223	104	1260
v/s Ratio Prot	c0.15	0.01	0.07	0.01	0.01	c0.45
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.74	0.09	0.13	0.03	0.09	0.67
Uniform Delay, d1	32.1	24.1	8.2	2.2	37.8	8.1
Progression Factor	1.00	1.00	1.00	1.00	1.36	0.76
Incremental Delay, d2	7.3	0.0	0.2	0.0	0.1	2.6
Delay (s)	39.4	24.2	8.4	2.2	51.5	8.8
Level of Service	D	C	A	A	D	A
Approach Delay (s)	33.9		7.3			9.3
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	62.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	6	43	218	74	11	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	76	76	93	93	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	57	234	80	17	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	234	0	-	0	306	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1333	-	-	-	686	805
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	951	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1333	-	-	-	682	805
Mov Cap-2 Maneuver	-	-	-	-	682	-
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	945	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1333	-	-	-	748
HCM Lane V/C Ratio	0.006	-	-	-	0.053
HCM Control Delay (s)	7.7	0	-	-	10.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	5.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	48	15	388	311	13	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	93	93	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	69	21	417	334	16	71

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	1248	79
Stage 1	-	-	-	-	79	-
Stage 2	-	-	-	-	1169	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1505	-	191	981
Stage 1	-	-	-	-	944	-
Stage 2	-	-	-	-	295	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1505	-	138	981
Mov Cap-2 Maneuver	-	-	-	-	138	-
Stage 1	-	-	-	-	944	-
Stage 2	-	-	-	-	213	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.6	14.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	466	-	-	1505	-
HCM Lane V/C Ratio	0.186	-	-	0.277	-
HCM Control Delay (s)	14.5	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.7	-	-	1.1	-

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	1	99	0	468	687	2	1	5	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	93	93	93	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	141	0	503	739	2	1	6	83

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	741	0	0	141	0	0	1914	1891	141
Stage 1	-	-	-	-	-	-	144	144	-
Stage 2	-	-	-	-	-	-	1770	1747	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	866	-	-	1442	-	-	51	70	907
Stage 1	-	-	-	-	-	-	859	778	-
Stage 2	-	-	-	-	-	-	106	140	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	866	-	-	1442	-	-	23	46	907
Mov Cap-2 Maneuver	-	-	-	-	-	-	23	46	-
Stage 1	-	-	-	-	-	-	858	777	-
Stage 2	-	-	-	-	-	-	49	91	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	3.6	21.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	314	866	-	-	1442	-	-	30	88
HCM Lane V/C Ratio	0.29	0.002	-	-	0.349	-	-	0.222	0.53
HCM Control Delay (s)	21.1	9.2	-	-	8.8	-	-	156.5	84.9
HCM Lane LOS	C	A	-	-	A	-	-	F	F
HCM 95th %tile Q(veh)	1.2	0	-	-	1.6	-	-	0.7	2.3

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	4	13	15
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	7	22	25

Major/Minor	Minor2		
Conflicting Flow All	1935	1890	740
Stage 1	1746	1746	-
Stage 2	189	144	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	50	70	417
Stage 1	110	140	-
Stage 2	813	778	-
Platoon blocked, %			
Mov Cap-1 Maneuver	30	46	417
Mov Cap-2 Maneuver	30	46	-
Stage 1	110	91	-
Stage 2	731	777	-

Approach	SB
HCM Control Delay, s	93.9
HCM LOS	F

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	168	1115	8	8	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	93	93	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	240	1199	9	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1208	0	-	0	1452	1203
Stage 1	-	-	-	-	1203	-
Stage 2	-	-	-	-	249	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	578	-	-	-	144	225
Stage 1	-	-	-	-	284	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	578	-	-	-	143	225
Mov Cap-2 Maneuver	-	-	-	-	143	-
Stage 1	-	-	-	-	284	-
Stage 2	-	-	-	-	786	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	29.2
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	578	-	-	-	190
HCM Lane V/C Ratio	0.007	-	-	-	0.219
HCM Control Delay (s)	11.3	0	-	-	29.2
HCM Lane LOS	B	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	142	34	20	1035	45	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	93	93	69	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	203	49	22	1113	65	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	251	0	1383	227
Stage 1	-	-	-	-	227	-
Stage 2	-	-	-	-	1156	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1314	-	158	812
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	300	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1314	-	155	812
Mov Cap-2 Maneuver	-	-	-	-	155	-
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	295	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	39.4
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	155	812	-	-	1314	-
HCM Lane V/C Ratio	0.421	0.012	-	-	0.016	-
HCM Control Delay (s)	44.1	9.5	-	-	7.8	-
HCM Lane LOS	E	A	-	-	A	-
HCM 95th %tile Q(veh)	1.9	0	-	-	0.1	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Saturday Existing AM
AM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	504	507	100.6%	16.2	2.1	B
	Through	172	167	97.0%	2.4	0.7	A
	Right Turn						
	Subtotal	**676**	**674**	**99.6%**	**12.7**	**1.8**	**B**
SB	Left Turn						
	Through	492	454	92.3%	18.7	3.0	B
	Right Turn	620	602	97.1%	4.0	0.6	A
	Subtotal	**1,112**	**1,056**	**95.0%**	**10.3**	**1.6**	**B**
EB	Left Turn	88	111	126.4%	23.1	3.4	C
	Through						
	Right Turn	84	133	158.6%	2.5	0.3	A
	Subtotal	**172**	**244**	**142.1%**	**11.7**	**1.1**	**B**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**1,960**	**1,974**	**100.7%**	**11.3**	**1.2**	**B**

Intersection	
Int Delay, s/veh	12

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	78	44	334	543	191	328
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	360	-	-	220
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	90	90	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	52	371	603	208	357

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1554	208	208	0	-	0
Stage 1	208	-	-	-	-	-
Stage 2	1346	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	125	832	1363	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	242	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 91	832	1363	-	-	-
Mov Cap-2 Maneuver	~ 91	-	-	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	176	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	118.8	3.3	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1363	-	91	832	-	-
HCM Lane V/C Ratio	0.272	-	1.008	0.062	-	-
HCM Control Delay (s)	8.6	-	180.4	9.6	-	-
HCM Lane LOS	A	-	F	A	-	-
HCM 95th %tile Q(veh)	1.1	-	5.9	0.2	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	157	105	202	584	8	415	71	254	10	32	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3531		1681	1709	1560		1813	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3531		1681	1709	1560		1813	
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.87	0.87	0.87	0.75	0.75	0.75
Adj. Flow (vph)	16	180	121	227	656	9	477	82	292	13	43	8
RTOR Reduction (vph)	0	0	92	0	1	0	0	0	0	0	6	0
Lane Group Flow (vph)	16	180	29	227	664	0	277	282	292	0	58	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	0.8	13.8	13.8	9.3	22.1		15.7	15.7	58.4		4.2	
Effective Green, g (s)	0.8	13.8	13.8	9.3	22.1		15.7	15.7	58.4		4.2	
Actuated g/C Ratio	0.01	0.24	0.24	0.16	0.38		0.27	0.27	1.00		0.07	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	24	836	369	546	1336		451	459	1560		130	
v/s Ratio Prot	0.01	0.05		c0.07	c0.19		0.16	c0.17			c0.03	
v/s Ratio Perm			0.02						c0.19			
v/c Ratio	0.67	0.22	0.08	0.42	0.50		0.61	0.61	0.19		0.45	
Uniform Delay, d1	28.7	17.9	17.3	22.1	13.9		18.7	18.7	0.0		26.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	42.9	0.0	0.0	0.2	0.1		2.1	2.1	0.3		1.8	
Delay (s)	71.6	18.0	17.4	22.3	14.0		20.8	20.8	0.3		27.8	
Level of Service	E	B	B	C	B		C	C	A		C	
Approach Delay (s)		20.5			16.1			13.8			27.8	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	58.4	Sum of lost time (s)	15.6
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	239	151	122	230	58	332	123	182	46	110	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3321	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3321	
Peak-hour factor, PHF	0.85	0.85	0.85	0.80	0.80	0.80	0.89	0.89	0.89	0.83	0.83	0.83
Adj. Flow (vph)	120	281	178	152	288	72	373	138	204	55	133	102
RTOR Reduction (vph)	0	0	86	0	0	56	0	0	139	0	52	0
Lane Group Flow (vph)	120	281	92	152	288	16	373	138	65	0	238	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	11.2	19.3	49.8	13.3	21.9	21.9	30.5	30.5	30.5		12.3	
Effective Green, g (s)	11.2	19.3	49.8	13.3	21.9	21.9	30.5	30.5	30.5		12.3	
Actuated g/C Ratio	0.12	0.20	0.52	0.14	0.23	0.23	0.32	0.32	0.32		0.13	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	205	372	817	244	423	359	560	589	500		423	
v/s Ratio Prot	0.07	0.15	0.04	c0.09	c0.15		c0.21	0.07			c0.07	
v/s Ratio Perm			0.02			0.01			0.04			
v/c Ratio	0.59	0.76	0.11	0.62	0.68	0.05	0.67	0.23	0.13		0.56	
Uniform Delay, d1	40.4	36.3	12.0	39.2	34.1	29.1	28.5	24.3	23.5		39.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	2.7	7.6	0.0	3.5	3.6	0.0	2.3	0.1	0.0		1.0	
Delay (s)	43.1	43.9	12.0	42.7	37.6	29.1	30.9	24.4	23.5		40.5	
Level of Service	D	D	B	D	D	C	C	C	C		D	
Approach Delay (s)		33.9			37.9			27.5			40.5	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	96.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_Existing_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	380	3.0	0.458	8.3	LOS A	0.0	0.0	0.00	0.75	27.9
8	T	625	3.0	0.458	8.3	LOS A	0.0	0.0	0.00	0.34	32.0
Approach		1005	3.0	0.458	8.3	LOS A	0.0	0.0	0.00	0.49	30.2
East: I-80 WB off-ramp											
1	L	146	3.0	0.278	10.7	LOS B	0.8	20.0	0.59	0.88	23.0
6	T	2	3.0	0.278	10.7	LOS B	0.8	20.0	0.59	0.72	24.6
16	R	128	3.0	0.254	10.8	LOS B	0.7	18.5	0.61	0.79	24.6
Approach		276	3.0	0.278	10.8	LOS B	0.8	20.0	0.60	0.84	23.7
North: HWY 89											
4	T	251	3.0	0.357	10.5	LOS B	1.4	37.1	0.60	0.75	25.4
14	R	203	3.0	0.357	10.5	LOS B	1.4	37.1	0.60	0.80	24.8
Approach		454	3.0	0.357	10.5	LOS B	1.4	37.1	0.60	0.77	25.1
All Vehicles		1736	3.0	0.458	9.3	LOS A	1.4	37.1	0.25	0.62	27.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_Existing_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	933	3.0	0.813	22.9	LOS C	10.2	260.3	0.83	0.83	21.5
18	R	527	3.0	0.813	22.9	LOS C	10.2	260.3	0.83	0.85	21.2
Approach		1460	3.0	0.813	22.9	LOS C	10.2	260.3	0.83	0.84	21.4
North: HWY 89											
7	L	161	3.0	0.220	5.3	LOS A	0.0	0.0	0.00	0.78	27.9
4	T	323	3.0	0.220	5.3	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		484	3.0	0.220	5.3	LOS A	0.0	0.0	0.00	0.51	30.6
West: I-80 EB off-ramp											
5	L	33	3.0	0.104	6.0	LOS A	0.3	6.9	0.39	0.82	25.1
2	T	1	3.0	0.104	6.0	LOS A	0.3	6.9	0.39	0.54	27.5
12	R	120	3.0	0.104	5.9	LOS A	0.3	6.9	0.38	0.64	27.4
Approach		153	3.0	0.104	6.0	LOS A	0.3	6.9	0.38	0.68	26.9
All Vehicles		2097	3.0	0.813	17.6	LOS C	10.2	260.3	0.60	0.75	23.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

Existing Conditions
Winter PM

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	334	48	142	1075	10	236	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.88	0.88	0.89	0.89	0.83	0.83	0.83
Adj. Flow (vph)	380	55	160	1208	12	284	265
RTOR Reduction (vph)	0	38	0	0	0	0	84
Lane Group Flow (vph)	380	17	160	1208	12	284	181
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	13.8	26.7	12.9	55.7	1.5	44.3	58.1
Effective Green, g (s)	13.8	26.7	12.9	55.7	1.5	44.3	58.1
Actuated g/C Ratio	0.16	0.31	0.15	0.66	0.02	0.52	0.68
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	557	497	268	2319	31	1495	1082
v/s Ratio Prot	c0.11	0.01	c0.09	c0.34	0.01	0.10	0.03
v/s Ratio Perm		0.01					0.09
v/c Ratio	0.68	0.03	0.60	0.52	0.39	0.19	0.17
Uniform Delay, d1	33.5	20.2	33.6	7.7	41.3	10.8	4.8
Progression Factor	1.00	1.00	1.39	0.51	1.00	1.00	1.00
Incremental Delay, d2	2.8	0.0	2.4	0.6	7.8	0.3	0.0
Delay (s)	36.3	20.2	49.1	4.5	49.1	11.1	4.8
Level of Service	D	C	D	A	D	B	A
Approach Delay (s)	34.3			9.7		9.0	
Approach LOS	C			A		A	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	59	80	1137	155	154	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.76	0.76	0.89	0.89	0.83	0.83
Adj. Flow (vph)	78	105	1278	174	186	157
RTOR Reduction (vph)	0	6	0	56	0	0
Lane Group Flow (vph)	78	99	1278	118	186	157
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	8.2	21.4	49.3	57.5	13.2	66.0
Effective Green, g (s)	8.2	21.4	49.3	57.5	13.2	66.0
Actuated g/C Ratio	0.10	0.25	0.58	0.68	0.16	0.78
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	170	398	1664	1070	274	1446
v/s Ratio Prot	c0.04	0.04	c0.45	0.01	c0.11	0.08
v/s Ratio Perm		0.02		0.06		
v/c Ratio	0.46	0.25	0.77	0.11	0.68	0.11
Uniform Delay, d1	36.3	25.4	13.5	4.8	33.9	2.3
Progression Factor	1.00	1.00	1.00	1.00	1.24	0.80
Incremental Delay, d2	0.7	0.1	3.5	0.0	5.1	0.2
Delay (s)	37.0	25.5	17.0	4.8	47.2	2.0
Level of Service	D	C	B	A	D	A
Approach Delay (s)	30.4		15.5			26.5
Approach LOS	C		B			C

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	12	132	113	27	147	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	82	82	72	72
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	176	138	33	204	40

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	138	0	-	0	346	138
Stage 1	-	-	-	-	138	-
Stage 2	-	-	-	-	208	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1446	-	-	-	651	910
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	827	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1446	-	-	-	643	910
Mov Cap-2 Maneuver	-	-	-	-	643	-
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	817	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1446	-	-	-	676
HCM Lane V/C Ratio	0.011	-	-	-	0.362
HCM Control Delay (s)	7.5	0	-	-	13.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.6

Intersection	
Int Delay, s/veh	22.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	262	17	72	95	45	469
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	72	72	85	85	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	364	24	85	112	51	527

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	388	0	657	376
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	281	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1170	-	430	670
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	767	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1170	-	399	670
Mov Cap-2 Maneuver	-	-	-	-	399	-
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	711	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	43.4
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	632	-	-	1170	-
HCM Lane V/C Ratio	0.914	-	-	0.072	-
HCM Control Delay (s)	43.4	-	-	8.3	-
HCM Lane LOS	E	-	-	A	-
HCM 95th %tile Q(veh)	11.7	-	-	0.2	-

Intersection	
Int Delay, s/veh	38.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	21	705	5	14	140	9	8	9	363
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	85	85	85	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	810	6	16	165	11	9	10	408

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	175	0	0	816	0	0	1082	1069	813
Stage 1	-	-	-	-	-	-	861	861	-
Stage 2	-	-	-	-	-	-	221	208	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1401	-	-	812	-	-	195	221	~ 378
Stage 1	-	-	-	-	-	-	350	372	-
Stage 2	-	-	-	-	-	-	781	730	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1401	-	-	812	-	-	179	213	~ 378
Mov Cap-2 Maneuver	-	-	-	-	-	-	179	213	-
Stage 1	-	-	-	-	-	-	344	366	-
Stage 2	-	-	-	-	-	-	733	716	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	0.8	137.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	363	1401	-	-	812	-	-	-	615
HCM Lane V/C Ratio	1.176	0.017	-	-	0.02	-	-	-	0.06
HCM Control Delay (s)	137.2	7.6	-	-	9.5	-	-	-	11.2
HCM Lane LOS	F	A	-	-	A	-	-	-	B
HCM 95th %tile Q(veh)	17.3	0.1	-	-	0.1	-	-	-	0.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	17	3	19
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	28	5	32

Major/Minor	Minor2		
Conflicting Flow All	1273	1067	170
Stage 1	203	203	-
Stage 2	1070	864	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	144	222	874
Stage 1	799	733	-
Stage 2	268	371	-
Platoon blocked, %			
Mov Cap-1 Maneuver	-	214	874
Mov Cap-2 Maneuver	-	214	-
Stage 1	785	719	-
Stage 2	-	365	-

Approach	SB
HCM Control Delay, s	
HCM LOS	-

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	7	1078	151	13	14	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	85	85	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	1239	178	15	23	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	193	0	-	0	1440	185
Stage 1	-	-	-	-	185	-
Stage 2	-	-	-	-	1255	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1380	-	-	-	146	857
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	268	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1380	-	-	-	143	857
Mov Cap-2 Maneuver	-	-	-	-	143	-
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	263	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1380	-	-	-	232
HCM Lane V/C Ratio	0.006	-	-	-	0.187
HCM Control Delay (s)	7.6	0	-	-	24
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1071	41	31	165	14	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	85	85	69	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1231	47	36	194	20	64

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1278	0	1522	1255
Stage 1	-	-	-	-	1255	-
Stage 2	-	-	-	-	267	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	543	-	130	209
Stage 1	-	-	-	-	268	-
Stage 2	-	-	-	-	778	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	543	-	121	209
Mov Cap-2 Maneuver	-	-	-	-	121	-
Stage 1	-	-	-	-	268	-
Stage 2	-	-	-	-	726	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.9	32.3
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	121	209	-	-	543	-
HCM Lane V/C Ratio	0.168	0.305	-	-	0.067	-
HCM Control Delay (s)	40.7	29.6	-	-	12.1	-
HCM Lane LOS	E	D	-	-	B	-
HCM 95th %tile Q(veh)	0.6	1.2	-	-	0.2	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Sunday PM Existing
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	104	97	93.1%	42.9	7.9	D
	Through	664	595	89.6%	51.2	19.4	D
	Right Turn						
	Subtotal	**768**	**692**	**90.1%**	**50.2**	**17.5**	**D**
SB	Left Turn						
	Through	96	94	98.3%	24.4	5.5	C
	Right Turn	116	120	103.1%	2.5	0.5	A
	Subtotal	**212**	**214**	**100.9%**	**12.0**	**2.4**	**B**
EB	Left Turn	788	745	94.6%	54.7	26.6	D
	Through	4	2	50.0%	21.4	39.4	C
	Right Turn	480	473	98.6%	8.6	1.5	A
	Subtotal	**1,272**	**1,220**	**95.9%**	**36.7**	**16.0**	**D**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,252**	**2,126**	**94.4%**	**38.5**	**14.3**	**D**

Intersection	
Int Delay, s/veh	112.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	409	335	60	275	457	56
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	360	-	-	220
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	91	91	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	481	394	66	302	525	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	959	525	525	0	-	0
Stage 1	525	-	-	-	-	-
Stage 2	434	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 285	552	1042	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 267	552	1042	-	-	-
Mov Cap-2 Maneuver	~ 267	-	-	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	612	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	235.8	1.6	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1042	-	267	552	-	-
HCM Lane V/C Ratio	0.063	-	1.802	0.714	-	-
HCM Control Delay (s)	8.7	-	$ 407.6	26.1	-	-
HCM Lane LOS	A	-	F	D	-	-
HCM 95th %tile Q(veh)	0.2	-	32.4	5.8	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	529	231	256	159	21	155	58	240	21	60	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3468		1681	1730	1560		1794	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3468		1681	1730	1560		1794	
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.84	0.84	0.84	0.78	0.78	0.78
Adj. Flow (vph)	35	575	251	301	187	25	185	69	286	27	77	26
RTOR Reduction (vph)	0	0	177	0	8	0	0	0	0	0	10	0
Lane Group Flow (vph)	35	575	74	301	204	0	126	128	286	0	120	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	2.4	19.4	19.4	10.9	27.7		12.1	12.1	65.8		8.0	
Effective Green, g (s)	2.4	19.4	19.4	10.9	27.7		12.1	12.1	65.8		8.0	
Actuated g/C Ratio	0.04	0.29	0.29	0.17	0.42		0.18	0.18	1.00		0.12	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	64	1043	460	568	1459		309	318	1560		218	
v/s Ratio Prot	0.02	c0.16		c0.09	0.06		c0.07	0.07			c0.07	
v/s Ratio Perm			0.05						0.18			
v/c Ratio	0.55	0.55	0.16	0.53	0.14		0.41	0.40	0.18		0.55	
Uniform Delay, d1	31.2	19.5	17.2	25.1	11.7		23.7	23.7	0.0		27.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	5.0	0.4	0.1	0.4	0.0		0.6	0.6	0.3		2.4	
Delay (s)	36.2	19.9	17.2	25.5	11.7		24.3	24.3	0.3		29.6	
Level of Service	D	B	B	C	B		C	C	A		C	
Approach Delay (s)		19.8			19.8			11.6			29.6	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	65.8	Sum of lost time (s)	15.6
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Existing Conditions
Summer PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	86	314	280	234	359	70	270	107	107	67	154	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.96	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1566	1770	1863	1521	1770	1863	1583		3400	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1566	1770	1863	1521	1770	1863	1583		3400	
Peak-hour factor, PHF	0.88	0.88	0.88	0.84	0.84	0.84	0.90	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	98	357	318	279	427	83	300	119	119	77	177	57
RTOR Reduction (vph)	0	0	139	0	0	54	0	0	92	0	14	0
Lane Group Flow (vph)	98	357	179	279	427	29	300	119	27	0	297	0
Confl. Peds. (#/hr)			5			5						
Confl. Bikes (#/hr)			5			5						
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	10.8	26.6	51.5	23.1	39.4	39.4	24.9	24.9	24.9		15.8	
Effective Green, g (s)	10.8	26.6	51.5	23.1	39.4	39.4	24.9	24.9	24.9		15.8	
Actuated g/C Ratio	0.10	0.24	0.46	0.21	0.35	0.35	0.22	0.22	0.22		0.14	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	171	444	723	367	658	537	395	416	353		482	
v/s Ratio Prot	0.06	c0.19	0.06	c0.16	0.23		c0.17	0.06			c0.09	
v/s Ratio Perm			0.06			0.02			0.02			
v/c Ratio	0.57	0.80	0.25	0.76	0.65	0.05	0.76	0.29	0.08		0.62	
Uniform Delay, d1	48.1	39.9	18.2	41.5	30.2	23.7	40.4	35.9	34.2		45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	2.9	9.6	0.1	8.1	1.7	0.0	7.3	0.1	0.0		1.7	
Delay (s)	51.0	49.5	18.2	49.6	31.9	23.7	47.7	36.0	34.2		46.6	
Level of Service	D	D	B	D	C	C	D	D	C		D	
Approach Delay (s)		36.9			37.3			42.1			46.6	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	39.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_Existing_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	135	3.0	0.277	5.9	LOS A	0.0	0.0	0.00	0.85	27.9
8	T	473	3.0	0.277	5.9	LOS A	0.0	0.0	0.00	0.33	32.0
Approach		608	3.0	0.277	5.9	LOS A	0.0	0.0	0.00	0.45	30.9
East: I-80 WB off-ramp											
1	L	174	3.0	0.260	8.3	LOS A	0.7	18.3	0.46	0.83	24.0
6	T	5	3.0	0.260	8.3	LOS A	0.7	18.3	0.46	0.61	26.0
16	R	136	3.0	0.203	7.8	LOS A	0.6	14.4	0.46	0.71	26.1
Approach		315	3.0	0.260	8.1	LOS A	0.7	18.3	0.46	0.77	24.9
North: HWY 89											
4	T	750	3.0	0.563	13.0	LOS B	3.4	87.7	0.62	0.75	24.2
14	R	143	3.0	0.563	13.0	LOS B	3.4	87.7	0.62	0.81	23.9
Approach		893	3.0	0.563	13.0	LOS B	3.4	87.7	0.62	0.76	24.2
All Vehicles		1816	3.0	0.563	9.8	LOS A	3.4	87.7	0.39	0.66	26.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_Existing_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	533	3.0	0.567	13.5	LOS B	3.4	88.1	0.64	0.80	25.5
18	R	337	3.0	0.567	13.5	LOS B	3.4	88.1	0.64	0.84	25.0
Approach		870	3.0	0.567	13.5	LOS B	3.4	88.1	0.64	0.82	25.3
North: HWY 89											
7	L	296	3.0	0.447	8.1	LOS A	0.0	0.0	0.00	0.79	27.9
4	T	685	3.0	0.447	8.1	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		980	3.0	0.447	8.1	LOS A	0.0	0.0	0.00	0.50	30.8
West: I-80 EB off-ramp											
5	L	51	3.0	0.295	11.4	LOS B	0.9	22.5	0.61	0.93	23.0
2	T	1	3.0	0.295	11.4	LOS B	0.9	22.5	0.61	0.74	24.6
12	R	259	3.0	0.295	11.1	LOS B	0.9	22.5	0.60	0.81	24.9
Approach		311	3.0	0.295	11.1	LOS B	0.9	22.5	0.60	0.83	24.5
All Vehicles		2161	3.0	0.567	10.7	LOS B	3.4	88.1	0.34	0.68	27.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	245	38	117	573	10	638	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1572	1770	3374	1770	2735	1556
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1572	1770	3374	1770	2735	1556
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	292	45	130	637	11	733	301
RTOR Reduction (vph)	0	32	0	0	0	0	94
Lane Group Flow (vph)	292	13	130	637	11	733	207
Confl. Peds. (#/hr)		2					2
Heavy Vehicles (%)	2%	2%	2%	7%	2%	7%	2%
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	11.5	20.9	9.4	48.1	1.4	40.1	51.6
Effective Green, g (s)	11.5	20.9	9.4	48.1	1.4	40.1	51.6
Actuated g/C Ratio	0.15	0.28	0.13	0.64	0.02	0.53	0.69
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	526	438	221	2163	33	1462	1070
v/s Ratio Prot	c0.09	0.00	c0.07	0.19	0.01	c0.27	0.03
v/s Ratio Perm		0.00					0.10
v/c Ratio	0.56	0.03	0.59	0.29	0.33	0.50	0.19
Uniform Delay, d1	29.4	19.7	31.0	5.9	36.3	11.1	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.0	4.0	0.3	5.9	1.2	0.0
Delay (s)	30.1	19.7	34.9	6.3	42.2	12.3	4.2
Level of Service	C	B	C	A	D	B	A
Approach Delay (s)	28.7			11.1		10.3	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	47.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	88	148	542	148	105	571
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1527	2735	1517	1719	1776
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1527	2735	1517	1719	1776
Peak-hour factor, PHF	0.80	0.80	0.90	0.90	0.87	0.87
Adj. Flow (vph)	110	185	602	164	121	656
RTOR Reduction (vph)	0	114	0	75	0	0
Lane Group Flow (vph)	110	71	602	89	121	656
Confl. Peds. (#/hr)		2		2		
Heavy Vehicles (%)	5%	5%	7%	5%	5%	7%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	10.4	19.5	17.3	27.7	9.1	29.9
Effective Green, g (s)	10.4	19.5	17.3	27.7	9.1	29.9
Actuated g/C Ratio	0.20	0.38	0.34	0.54	0.18	0.59
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	349	582	925	822	306	1039
v/s Ratio Prot	c0.06	0.02	0.22	0.02	0.07	c0.37
v/s Ratio Perm		0.02		0.04		
v/c Ratio	0.32	0.12	0.65	0.11	0.40	0.63
Uniform Delay, d1	17.3	10.2	14.3	5.7	18.6	7.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	1.3	0.0	0.3	0.9
Delay (s)	17.5	10.3	15.6	5.7	18.9	7.9
Level of Service	B	B	B	A	B	A
Approach Delay (s)	13.0		13.5			9.6
Approach LOS	B		B			A

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	51.1	Sum of lost time (s)	14.3
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	15	108	105	29	44	19
Conflicting Peds, #/hr	10	0	0	10	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	79	79	65	65	79	79
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	137	162	45	56	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	172	0	-	0	347	182
Stage 1	-	-	-	-	172	-
Stage 2	-	-	-	-	175	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1405	-	-	-	650	861
Stage 1	-	-	-	-	858	-
Stage 2	-	-	-	-	855	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1393	-	-	-	630	847
Mov Cap-2 Maneuver	-	-	-	-	630	-
Stage 1	-	-	-	-	851	-
Stage 2	-	-	-	-	835	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1393	-	-	-	683
HCM Lane V/C Ratio	0.014	-	-	-	0.117
HCM Control Delay (s)	7.6	0	-	-	11
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	3.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	142	9	64	130	6	78
Conflicting Peds, #/hr	0	10	10	0	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	72	72	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	165	10	89	181	8	100

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	186	0	538	190
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	358	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1388	-	504	852
Stage 1	-	-	-	-	851	-
Stage 2	-	-	-	-	707	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1376	-	464	838
Mov Cap-2 Maneuver	-	-	-	-	464	-
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	656	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	792	-	-	1376	-
HCM Lane V/C Ratio	0.136	-	-	0.065	-
HCM Control Delay (s)	10.3	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0.2	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	10	199	1	15	181	19	0	0	26
Conflicting Peds, #/hr	2	0	2	2	0	2	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	72	72	72	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	231	1	21	251	26	0	0	36

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	278	0	0	233	0	0	569	574	234
Stage 1	-	-	-	-	-	-	255	255	-
Stage 2	-	-	-	-	-	-	314	319	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1335	-	-	433	429	805
Stage 1	-	-	-	-	-	-	749	696	-
Stage 2	-	-	-	-	-	-	697	653	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1283	-	-	1333	-	-	416	418	804
Mov Cap-2 Maneuver	-	-	-	-	-	-	416	418	-
Stage 1	-	-	-	-	-	-	742	689	-
Stage 2	-	-	-	-	-	-	672	643	-

Approach	EB	WB	NB
HCM Control Delay, s	0.4	0.5	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	804	1283	-	-	1333	-	-	398	771
HCM Lane V/C Ratio	0.045	0.009	-	-	0.016	-	-	0.11	0.019
HCM Control Delay (s)	9.7	7.8	-	-	7.7	-	-	15.2	9.8
HCM Lane LOS	A	A	-	-	A	-	-	C	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4	0.1

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	24	0	8
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	55	55	55
Heavy Vehicles, %	2	2	2
Mvmt Flow	44	0	15

Major/Minor	Minor2		
Conflicting Flow All	579	562	267
Stage 1	306	306	-
Stage 2	273	256	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	426	436	772
Stage 1	704	662	-
Stage 2	733	696	-
Platoon blocked, %			
Mov Cap-1 Maneuver	398	425	771
Mov Cap-2 Maneuver	398	425	-
Stage 1	697	652	-
Stage 2	692	689	-

Approach	SB
HCM Control Delay, s	13.9
HCM LOS	B

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	244	195	11	12	10
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	86	86	72	72	55	55
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	284	271	15	22	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	286	0	-	0	573	280
Stage 1	-	-	-	-	278	-
Stage 2	-	-	-	-	295	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1276	-	-	-	481	759
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	755	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1274	-	-	-	478	758
Mov Cap-2 Maneuver	-	-	-	-	478	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	750	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1274	-	-	-	574
HCM Lane V/C Ratio	0.005	-	-	-	0.07
HCM Control Delay (s)	7.8	0	-	-	11.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	276	22	78	232	16	54
Conflicting Peds, #/hr	0	2	2	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	72	72	70	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	321	26	108	322	23	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	347	0	873	336
Stage 1	-	-	-	-	334	-
Stage 2	-	-	-	-	539	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1212	-	321	706
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	585	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1210	-	292	705
Mov Cap-2 Maneuver	-	-	-	-	292	-
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	532	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	292	705	-	-	1210	-
HCM Lane V/C Ratio	0.078	0.109	-	-	0.09	-
HCM Control Delay (s)	18.4	10.7	-	-	8.3	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0.4	-	-	0.3	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Friday PM Existing
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	176	164	93.4%	17.1	1.8	B
	Through	548	550	100.4%	5.2	1.3	A
	Right Turn						
	Subtotal	**724**	**715**	**98.7%**	**7.9**	**1.2**	**A**
SB	Left Turn	4	2	50.0%	9.8	15.8	A
	Through	548	540	98.5%	15.9	2.2	B
	Right Turn	156	160	102.3%	2.4	0.5	A
	Subtotal	**708**	**702**	**99.1%**	**12.9**	**2.2**	**B**
EB	Left Turn	192	193	100.4%	15.1	1.8	B
	Through	4	1	20.0%	2.0	4.8	A
	Right Turn	160	171	106.8%	2.7	0.4	A
	Subtotal	**356**	**364**	**102.4%**	**9.2**	**1.0**	**A**
WB	Left Turn						
	Through	4	6	160.0%	23.3	10.6	C
	Right Turn						
	Subtotal	**4**	**6**	**160.0%**	**23.3**	**10.6**	**C**
Total		**1,792**	**1,787**	**99.7%**	**10.2**	**0.9**	**B**

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	62	72	58	613	616	45
Conflicting Peds, #/hr	0	0	14	0	0	14
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	360	-	-	220
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	93	93	93	93
Heavy Vehicles, %	2	2	2	7	7	2
Mvmt Flow	83	96	62	659	662	48

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1446	676	662	0	-	0
Stage 1	662	-	-	-	-	-
Stage 2	784	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	145	453	927	-	-	-
Stage 1	513	-	-	-	-	-
Stage 2	450	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	135	448	916	-	-	-
Mov Cap-2 Maneuver	135	-	-	-	-	-
Stage 1	513	-	-	-	-	-
Stage 2	420	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	39	0.8	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	916	-	135	448	-	-
HCM Lane V/C Ratio	0.068	-	0.612	0.214	-	-
HCM Control Delay (s)	9.2	-	66.7	15.2	-	-
HCM Lane LOS	A	-	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	3.2	0.8	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	353	396	398	324	40	237	67	412	32	92	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85		0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1687	3374	1484	3273	3302		1603	1640	1480		1727	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1687	3374	1484	3273	3302		1603	1640	1480		1727	
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.89	0.89	0.87	0.87	0.87	0.81	0.81	0.81
Adj. Flow (vph)	36	384	430	447	364	45	272	77	474	40	114	19
RTOR Reduction (vph)	0	0	333	0	8	0	0	0	0	0	4	0
Lane Group Flow (vph)	36	384	97	447	401	0	171	178	474	0	169	0
Confl. Peds. (#/hr)			5			1			23			
Confl. Bikes (#/hr)						22			2			2
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	2.5	16.9	16.9	14.4	28.6		16.1	16.1	74.8		12.0	
Effective Green, g (s)	2.5	16.9	16.9	14.4	28.6		16.1	16.1	74.8		12.0	
Actuated g/C Ratio	0.03	0.23	0.23	0.19	0.38		0.22	0.22	1.00		0.16	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	56	762	335	630	1262		345	352	1480		277	
v/s Ratio Prot	0.02	c0.11		c0.14	0.12		0.11	c0.11			c0.10	
v/s Ratio Perm			0.07						0.32			
v/c Ratio	0.64	0.50	0.29	0.71	0.32		0.50	0.51	0.32		0.61	
Uniform Delay, d1	35.7	25.3	24.0	28.2	16.2		25.8	25.8	0.0		29.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	17.3	0.2	0.2	3.0	0.1		0.8	0.8	0.6		3.2	
Delay (s)	53.0	25.5	24.2	31.2	16.3		26.6	26.7	0.6		32.4	
Level of Service	D	C	C	C	B		C	C	A		C	
Approach Delay (s)		26.0			24.1			11.6			32.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	74.8	Sum of lost time (s)	15.6
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter AM
Highway	SR-89 SB
From/To	Deerfield Dr to W River St
Jurisdiction	Nevada/Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.93	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 791 veh/h
Opposing direction volume, Vo 313 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.4	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.992	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	851	pc/h	339	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	3.1	mi/h
Average travel speed, ATSd	31.4	mi/h
Percent Free Flow Speed, PFFS	71.8	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.998	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	851	pc/h	337	pc/h
Base percent time-spent-following,(note-4) BPTSFd	65.7	%		
Adjustment for no-passing zones, fnp	27.7			
Percent time-spent-following, PTSFd	85.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.50	
Peak 15-min vehicle-miles of travel, VMT15	43	veh-mi
Peak-hour vehicle-miles of travel, VMT60	158	veh-mi
Peak 15-min total travel time, TT15	1.4	veh-h
Capacity from ATS, CdATS	1686	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1686	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	31.4	mi/h
Percent time-spent-following, PTSFd (from above)	85.5	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	850.5
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.26
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter AM
Highway	SR-89 SB
From/To	W River St to Squaw Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1			Peak hour factor, PHF	0.93	
Shoulder width	8.0	ft		% Trucks and buses	2	%
Lane width	12.0	ft		% Trucks crawling	0.0	%
Segment length	7.8	mi		Truck crawl speed	0.0	mi/hr
Terrain type	Rolling			% Recreational vehicles	0	%
Grade: Length	-	mi		% No-passing zones	55	%
Up/down	-	%		Access point density	1	/mi

Analysis direction volume, Vd	999	veh/h
Opposing direction volume, Vo	232	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.2	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.977	
Grade adj. factor,(note-1) fg	1.00		0.79	
Directional flow rate,(note-2) vi	1081	pc/h	323	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	46.1	mi/h
Percent Free Flow Speed, PFFS	77.1	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.986
Grade adjustment factor,(note-1) fg	1.00	0.82
Directional flow rate,(note-2) vi	1074 pc/h	308 pc/h

Base percent time-spent-following,(note-4) BPTSFd	73.5	%
Adjustment for no-passing zones, fnp	15.3	
Percent time-spent-following, PTSFd	85.4	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.64	
Peak 15-min vehicle-miles of travel, VMT15	2095	veh-mi
Peak-hour vehicle-miles of travel, VMT60	7792	veh-mi
Peak 15-min total travel time, TT15	45.5	veh-h
Capacity from ATS, CdATS	1397	veh/h
Capacity from PTSF, CdPTSF	1428	veh/h
Directional Capacity	1397	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.1	mi/h
Percent time-spent-following, PTSFd (from above)	85.4	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1074.2
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	1.86
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter AM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 607 veh/h
Opposing direction volume, Vo 518 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.6		1.7	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.988		0.986	
Grade adj. factor,(note-1) fg	0.98		0.97	
Directional flow rate,(note-2) vi	697	pc/h	602	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h
Average travel speed, ATSd	38.0	mi/h
Percent Free Flow Speed, PFFS	76.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.2	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.996	
Grade adjustment factor,(note-1) fg	0.98		0.97	
Directional flow rate,(note-2) vi	688	pc/h	596	pc/h
Base percent time-spent-following,(note-4) BPTSFd	62.4	%		
Adjustment for no-passing zones, fnp	31.3			
Percent time-spent-following, PTSFd	79.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.41	
Peak 15-min vehicle-miles of travel, VMT15	219	veh-mi
Peak-hour vehicle-miles of travel, VMT60	789	veh-mi
Peak 15-min total travel time, TT15	5.8	veh-h
Capacity from ATS, CdATS	1626	veh/h
Capacity from PTSF, CdPTSF	1642	veh/h
Directional Capacity	1626	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	38.0	mi/h
Percent time-spent-following, PTSFd (from above)	79.2	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	674.4
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.51
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter AM
Highway	SR-89 NB
From/To	SR 28 to A. Meadows Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	6.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	877	veh/h
Opposing direction volume, Vo	235	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.2	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.977	
Grade adj. factor,(note-1) fg	1.00		0.80	
Directional flow rate,(note-2) vi	980	pc/h	334	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	49.8	mi/h
Adjustment for no-passing zones, fnp	3.1	mi/h
Average travel speed, ATSd	36.4	mi/h
Percent Free Flow Speed, PFFS	73.2	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.986
Grade adjustment factor,(note-1) fg	1.00	0.83
Directional flow rate,(note-2) vi	974 pc/h	319 pc/h

Base percent time-spent-following,(note-4) BPTSFd	71.4	%
Adjustment for no-passing zones, fnp	31.0	
Percent time-spent-following, PTSFd	94.8	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.58	
Peak 15-min vehicle-miles of travel, VMT15	901	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3245	veh-mi
Peak 15-min total travel time, TT15	24.7	veh-h
Capacity from ATS, CdATS	1397	veh/h
Capacity from PTSF, CdPTSF	1445	veh/h
Directional Capacity	1397	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.4	mi/h
Percent time-spent-following, PTSFd (from above)	94.8	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	974.4
Effective width of outside lane, We	24.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.74
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	9/23/14
Analysis Time Period	Winter AM
Highway	SR89 NB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.87	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 740 veh/h
Opposing direction volume, Vo 339 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	851	pc/h	392	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	2.1	mi/h
Average travel speed, ATSd	27.9	mi/h
Percent Free Flow Speed, PFFS	70.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.998	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	851	pc/h	390	pc/h
Base percent time-spent-following,(note-4) BPTSFd	67.7	%		
Adjustment for no-passing zones, fnp	25.0			
Percent time-spent-following, PTSFd	84.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.50	
Peak 15-min vehicle-miles of travel, VMT15	64	veh-mi
Peak-hour vehicle-miles of travel, VMT60	222	veh-mi
Peak 15-min total travel time, TT15	2.3	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1697	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	27.9	mi/h
Percent time-spent-following, PTSFd (from above)	84.8	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	850.6
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.68
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.89	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	1217	veh/h
Opposing direction volume, Vo	284	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.4	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.992	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1367	pc/h	322	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	3.2	mi/h
Average travel speed, ATSd	27.4	mi/h
Percent Free Flow Speed, PFFS	62.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.998
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1367 pc/h	320 pc/h

Base percent time-spent-following,(note-4) BPTSFd	82.1	%
Adjustment for no-passing zones, fnp	20.8	
Percent time-spent-following, PTSFd	99.0	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.80	
Peak 15-min vehicle-miles of travel, VMT15	68	veh-mi
Peak-hour vehicle-miles of travel, VMT60	243	veh-mi
Peak 15-min total travel time, TT15	2.5	veh-h
Capacity from ATS, CdATS	1686	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1686	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	27.4	mi/h
Percent time-spent-following, PTSFd (from above)	99.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1367.4
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.50
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.89	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1292 veh/h
Opposing direction volume, Vo 192 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.975	
Grade adj. factor,(note-1) fg	1.00		0.76	
Directional flow rate,(note-2) vi	1460	pc/h	291	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	3.0	mi/h
Average travel speed, ATSd	43.2	mi/h
Percent Free Flow Speed, PFFS	72.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.986	
Grade adjustment factor,(note-1) fg	1.00		0.81	
Directional flow rate,(note-2) vi	1452	pc/h	270	pc/h
Base percent time-spent-following,(note-4) BPTSFd	83.3	%		
Adjustment for no-passing zones, fnp	10.9			
Percent time-spent-following, PTSFd	92.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.86	
Peak 15-min vehicle-miles of travel, VMT15	2831	veh-mi
Peak-hour vehicle-miles of travel, VMT60	10078	veh-mi
Peak 15-min total travel time, TT15	65.6	veh-h
Capacity from ATS, CdATS	1345	veh/h
Capacity from PTSF, CdPTSF	1408	veh/h
Directional Capacity	1345	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	43.2	mi/h
Percent time-spent-following, PTSFd (from above)	92.5	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1451.7
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	2.01
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.89	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	684	veh/h
Opposing direction volume, Vo	513	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.7	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.990		0.986	
Grade adj. factor,(note-1) fg	0.99		0.97	
Directional flow rate,(note-2) vi	784	pc/h	603	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h
Average travel speed, ATSd	37.3	mi/h
Percent Free Flow Speed, PFFS	74.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.2
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.996
Grade adjustment factor,(note-1) fg	1.00	0.97
Directional flow rate,(note-2) vi	769 pc/h	597 pc/h

Base percent time-spent-following,(note-4) BPTSFd	65.9	%
Adjustment for no-passing zones, fnp	28.5	
Percent time-spent-following, PTSFd	81.9	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.46	
Peak 15-min vehicle-miles of travel, VMT15	250	veh-mi
Peak-hour vehicle-miles of travel, VMT60	889	veh-mi
Peak 15-min total travel time, TT15	6.7	veh-h
Capacity from ATS, CdATS	1626	veh/h
Capacity from PTSF, CdPTSF	1642	veh/h
Directional Capacity	1626	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	37.3	mi/h
Percent time-spent-following, PTSFd (from above)	81.9	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	768.5
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.58
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Winter PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.87	
Shoulder width	5.5	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	792	veh/h
Opposing direction volume, Vo	335	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.0	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.980	
Grade adj. factor,(note-1) fg	1.00		0.89	
Directional flow rate,(note-2) vi	916	pc/h	441	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	2.5	mi/h
Average travel speed, ATSd	35.4	mi/h
Percent Free Flow Speed, PFFS	73.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.6	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.988	
Grade adjustment factor,(note-1) fg	1.00		0.89	
Directional flow rate,(note-2) vi	910	pc/h	438	pc/h
Base percent time-spent-following,(note-4) BPTSFd	70.1	%		
Adjustment for no-passing zones, fnp	23.7			
Percent time-spent-following, PTSFd	86.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.54	
Peak 15-min vehicle-miles of travel, VMT15	842	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2930	veh-mi
Peak 15-min total travel time, TT15	23.8	veh-h
Capacity from ATS, CdATS	1536	veh/h
Capacity from PTSF, CdPTSF	1552	veh/h
Directional Capacity	1536	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	35.4	mi/h
Percent time-spent-following, PTSFd (from above)	86.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	910.3
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.94
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	9/23/14
Analysis Time Period	Winter PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 547 veh/h
Opposing direction volume, Vo 453 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.998		0.998	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	685	pc/h	567	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	1.5	mi/h
Average travel speed, ATSd	28.4	mi/h
Percent Free Flow Speed, PFFS	71.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	684 pc/h	566 pc/h
Base percent time-spent-following,(note-4) BPTSFd	61.8 %	
Adjustment for no-passing zones, fnp	30.0	
Percent time-spent-following, PTSFd	78.2 %	

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.40	
Peak 15-min vehicle-miles of travel, VMT15	51	veh-mi
Peak-hour vehicle-miles of travel, VMT60	164	veh-mi
Peak 15-min total travel time, TT15	1.8	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	28.4	mi/h
Percent time-spent-following, PTSFd (from above)	78.2	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	683.8
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.57
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	4.7	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 690 veh/h
Opposing direction volume, Vo 676 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.993		0.993	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	772	pc/h	756	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h
Average travel speed, ATSd	30.5	mi/h
Percent Free Flow Speed, PFFS	69.8	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	767	pc/h	751	pc/h
Base percent time-spent-following,(note-4) BPTSFd	67.6	%		
Adjustment for no-passing zones, fnp	26.6			
Percent time-spent-following, PTSFd	81.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.45	
Peak 15-min vehicle-miles of travel, VMT15	38	veh-mi
Peak-hour vehicle-miles of travel, VMT60	138	veh-mi
Peak 15-min total travel time, TT15	1.2	veh-h
Capacity from ATS, CdATS	1688	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1688	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	30.5	mi/h
Percent time-spent-following, PTSFd (from above)	81.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	766.7
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.55
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 690 veh/h
Opposing direction volume, Vo 659 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.5	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.966		0.966	
Grade adj. factor,(note-1) fg	0.99		0.98	
Directional flow rate,(note-2) vi	802	pc/h	773	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	46.4	mi/h
Percent Free Flow Speed, PFFS	77.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	0.99
Directional flow rate,(note-2) vi	767 pc/h	740 pc/h

Base percent time-spent-following,(note-4) BPTSFd	67.2	%
Adjustment for no-passing zones, fnp	23.9	
Percent time-spent-following, PTSFd	79.4	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.47	
Peak 15-min vehicle-miles of travel, VMT15	1495	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5382	veh-mi
Peak 15-min total travel time, TT15	32.2	veh-h
Capacity from ATS, CdATS	1609	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1609	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.4	mi/h
Percent time-spent-following, PTSFd (from above)	79.4	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	766.7
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.15
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 675 veh/h
Opposing direction volume, Vo 661 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.5	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.966		0.966	
Grade adj. factor,(note-1) fg	0.99		0.98	
Directional flow rate,(note-2) vi	784	pc/h	776	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h
Average travel speed, ATSd	36.5	mi/h
Percent Free Flow Speed, PFFS	73.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	750	pc/h	742	pc/h
Base percent time-spent-following,(note-4) BPTSFd	67.4	%		
Adjustment for no-passing zones, fnp	27.0			
Percent time-spent-following, PTSFd	81.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.46	
Peak 15-min vehicle-miles of travel, VMT15	244	veh-mi
Peak-hour vehicle-miles of travel, VMT60	877	veh-mi
Peak 15-min total travel time, TT15	6.7	veh-h
Capacity from ATS, CdATS	1609	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1609	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.5	mi/h
Percent time-spent-following, PTSFd (from above)	81.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	750.0
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.91
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	9/23/14
Analysis Time Period	Summer PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	Existing Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.93	
Shoulder width	5.5	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	688	veh/h
Opposing direction volume, Vo	671	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.6	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.966		0.960	
Grade adj. factor,(note-1) fg	0.98		0.98	
Directional flow rate,(note-2) vi	781	pc/h	767	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h
Average travel speed, ATSd	35.1	mi/h
Percent Free Flow Speed, PFFS	72.4	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	0.99	0.99
Directional flow rate,(note-2) vi	747 pc/h	729 pc/h

Base percent time-spent-following,(note-4) BPTSFd	66.9	%
Adjustment for no-passing zones, fnp	27.3	
Percent time-spent-following, PTSFd	80.7	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.46	
Peak 15-min vehicle-miles of travel, VMT15	684	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2546	veh-mi
Peak 15-min total travel time, TT15	19.5	veh-h
Capacity from ATS, CdATS	1609	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1609	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	35.1	mi/h
Percent time-spent-following, PTSFd (from above)	80.7	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	739.8
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.18
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	9/23/14
Analysis Time Period	Summer PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.87	
Shoulder width	2.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 886 veh/h
Opposing direction volume, Vo 716 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.993	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1018	pc/h	829	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATSd	24.5	mi/h
Percent Free Flow Speed, PFFS	61.8	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1018	pc/h	823	pc/h
Base percent time-spent-following,(note-4) BPTSFd	76.3	%		
Adjustment for no-passing zones, fnp	19.2			
Percent time-spent-following, PTSFd	86.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	76	veh-mi
Peak-hour vehicle-miles of travel, VMT60	266	veh-mi
Peak 15-min total travel time, TT15	3.1	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	24.5	mi/h
Percent time-spent-following, PTSFd (from above)	86.9	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1018.4
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.23
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	WB	NB	NB	NB	SB	SB	B33
Directions Served	L	LT	LTR	L	T	TR	T	R	T
Maximum Queue (ft)	85	60	34	261	80	10	295	142	10
Average Queue (ft)	56	16	8	173	23	1	179	44	1
95th Queue (ft)	95	61	32	267	64	16	299	213	16
Link Distance (ft)		524	166		420	420	339		653
Upstream Blk Time (%)							0		
Queuing Penalty (veh)							0		
Storage Bay Dist (ft)	450			400				260	
Storage Blk Time (%)							7	0	
Queuing Penalty (veh)							45	1	

Intersection: 29: Bend

Movement	WB
Directions Served	T
Maximum Queue (ft)	337
Average Queue (ft)	75
95th Queue (ft)	361
Link Distance (ft)	458
Upstream Blk Time (%)	1
Queuing Penalty (veh)	4
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 49

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	B29	WB	NB	NB	NB	B31	SB	SB
Directions Served	L	LT	T	LTR	L	T	TR	T	T	R
Maximum Queue (ft)	474	599	103	32	405	444	501	56	96	87
Average Queue (ft)	261	281	24	9	88	200	194	0	53	62
95th Queue (ft)	454	529	89	32	123	362	355	0	92	81
Link Distance (ft)		526	1488	165		406	406	1588	325	
Upstream Blk Time (%)		7			0	2	1			
Queuing Penalty (veh)		0			0	0	0			
Storage Bay Dist (ft)	450				400					260
Storage Blk Time (%)	5	12			0	2				
Queuing Penalty (veh)	19	50			0	2				

APPENDIX B:

EXISTING PLUS PROJECT CONDITIONS TECHNICAL CALCULATIONS

8/20/2014

PROJECT BUILDOUT - WINTER CONDITIONS TRIP GENERATION SPREADSHEET

Color Legend:
- = Data from LSC Parking Study,
- = Study assumption
- = Village at Squaw Valley Winter Length of Stay Data,2010-2012.
- = Village at Squaw Valley Overnight Guest Check-in Survey, 2013.
- =Village at Squaw Valley Winter Employee Survey/Data, 2013.
- = Village at Squaw Valley Retail/Rest. Employee Data, 2013.
- = Village at Squaw Valley Winter Overnight Visitor Survey, 2011.
- = Traffic Count data, 2011-2012 season.

Table 1: SATURDAY AM PEAK HOUR and DAILY - CONDO HOTEL GUEST ARRIVALS and DEPARTURES ONLY

# bedrooms	total units (after lock-off)	# vehicles/ unit	Fri Night Occupancy	Sat Night Occupancy	% of Friday Occupied Rooms Checking out on Saturday	**Outbound Saturday Daily Departure Vehicles**	% Outbound Exiting from 8-9 am	**Saturday AM Pk Hr Outbound Trips**	% Rooms Checking in on Saturday (1)	# of new room occupancies on Sat.	% Arriving during Saturday AM Pk Hr (2)	**Saturday AM Pk Hr Inbound Trips**	**Inbound Saturday Daily Arrival Vehicles**
1	1118	0.75	0.95	1	39%	311	10%	31	42%	470	10%	35	353
2	129	1	0.95	1	39%	48	10%	5	42%	54	10%	5	54
3	8	1.25	0.95	1	39%	4	10%	0	42%	3	10%	0	4
TOTAL						**363**		**36**				**40**	**411**

Notes: (1) Based on data from Village at Squaw Valley.
(2) Surveys of guests checking in at Village of Squaw Valley for Saturday overnight stays revealed that less than 5% arrived in Squaw Valley between 8 and 9 am.
To be conservative, analysis assumes 10% of guests arrive between 8 and 9.

Table 2: SUNDAY PM PEAK HOUR - CONDO HOTEL GUEST ARRIVALS and DEPARTURES ONLY

# bedrooms	tot. units (after lock-off)	# vehicles/ unit	Sat Night Occupancy	% of Saturday Occupied Rooms Checking out on Sunday	% Outbound Exiting from 3-4 pm (1)	**Sunday PM Pk Hr Outbound Trips**	% of rooms occupied by a new Sunday visitor group	% Arriving during Sunday PM Pk Hr (2)	**Sunday PM Pk Hr Inbound Trips**
1	1118	0.75	1	52%	15%	65	10%	25%	21
2	129	1	1	52%	15%	10	10%	25%	3
3	8	1.25	1	52%	15%	1	10%	25%	0
TOTAL						**76**			**24**

Notes: (1) 15% of overnight visitors checked out and departed Squaw Valley from 3 to 4 pm.
(2) Surveys of guests checking in at Village of Squaw Valley for Sunday overnight stays revealed that 19% arrived in Squaw Valley between 3 and 4 pm.
To be conservative, analysis assumes 25% of guests arrive between 3 and 4 pm.

Table 3: SATURDAY DAILY - CONDO HOTEL GUEST INTERNAL-EXTERNAL SQUAW VALLEY TRIPS FOR OTHER PURPOSES

# bedrooms	tot. units (after lock-off)	# vehicles/ unit	Sat Night Occupancy	External (non-primary) Trip Rate in/out of Squaw Valley	Proportion of External Trips Made on Saturday (1)	**Saturday Daily Outbound Trips**	**Saturday Daily Inbound Trips**
1	1118	0.75	1	0.93	60%	468	468
2	129	1	1	0.93	60%	72	72
3	8	1.25	1	0.93	60%	6	6
TOTAL						**546**	**546**

Notes: (1) since Friday/Saturday night room arrival length of stay averages 2-3 days, assumption of 60% of trips occurring on Saturday is conservative.

8/20/14

Table 4: SATURDAY AM PEAK HOUR and DAILY - FRACTIONAL CABIN GUEST ARRIVALS and DEPARTURES ONLY

# bedrooms	Fract-ionals	# vehicles/ unit	Fri Night Occupancy	Sat Night Occupancy	% of Friday Occupied Rooms Checking out on Saturday	**Outbound Saturday Daily Departure Vehicles**	% Outbound Exiting from 8-9 am	**Saturday AM Pk Hr Outbound Trips**	% Rooms Checking in on Saturday (1)	# of new room occupancies on Sat.	% Arriving during Saturday AM Pk Hr (2)	**Saturday AM Pk Hr Inbound Trips**	**Inbound Saturday Daily Arrival Vehicles**
1	0	0.75	0.95	1	39%	0	10%	0	42%	0	10%	0	0
2	0	1	0.95	1	39%	0	10%	0	42%	0	10%	0	0
3	31	1.5	0.95	1	39%	17	10%	2	42%	13	10%	2	20
TOTAL						**17**		**2**				**2**	**20**

Notes: (1) Based on data from Village at Squaw Valley.
(2) Surveys of guests checking in at Village of Squaw Valley for Saturday overnight stays revealed that less than 5% arrived in Squaw Valley between 8 and 9 am.
To be conservative, analysis assumes 10% of guests arrive between 8 and 9.

Table 5: SUNDAY PM PEAK HOUR - FRACTIONAL CABIN GUEST ARRIVALS and DEPARTURES ONLY

# bedrooms	Fract-ionals	# vehicles/ unit	Sat Night Occupancy	% of Saturday Occupied Rooms Checking out on Sunday	% Outbound Exiting from 3-4 pm (1)	**Sunday PM Pk Hr Outbound Trips**	% of rooms occupied by a new Sunday visitor group	% Arriving during Sunday PM Pk Hr (2)	**Sunday PM Pk Hr Inbound Trips**
1	0	0.75	1	52%	15%	0	10%	25%	0
2	0	1	1	52%	15%	0	10%	25%	0
3	31	1.5	1	52%	15%	4	10%	25%	1
TOTAL						**4**			**1**

Notes: (1) 15% of overnight visitors checked out and departed Squaw Valley from 3 to 4 pm.
(2) Surveys of guests checking in at Village of Squaw Valley for Sunday overnight stays revealed that 19% arrived in Squaw Valley between 3 and 4 pm.
To be conservative, analysis assumes 25% of guests arrive between 3 and 4 pm.

Table 6: SATURDAY DAILY - FRACTIONAL CABIN GUEST INTERNAL-EXTERNAL SQUAW VALLEY TRIPS FOR OTHER PURPOSES

# bedrooms	Fract-ionals	# vehicles/ unit	Sat Night Occupancy	External (non-primary) Trip Rate in/out of Squaw Valley	Proportion of External Trips Made on Saturday (1)	**Saturday Daily Outbound Trips**	**Saturday Daily Inbound Trips**
1	0	0.75	1	0.93	60%	0	0
2	0	1	1	0.93	60%	0	0
3	31	1.5	1	0.93	60%	26	26
TOTAL						**26**	**26**

Notes: (1) since Friday/Saturday night room arrival length of stay averages 2-3 days, assumption of 60% of trips occurring on Saturday is conservative.

Table 7: SATURDAY AM PEAK HOUR and DAILY - CONDO HOTEL FRACTIONAL EMPLOYEES ONLY (Those Residing on East Parcel)

# bedrooms	units	# Employees Per Unit (1)	Total Number of Employees	Number Residing on East Parcel That Take Shuttle (2), (3)	% Arriving at Work between 8 and 9 am (4)	Avg. Shuttle Seating Capacity (5)	# of Shuttle Trips (Round Trip) during AM peak hour	# of Daily Shuttle Trips (Round Trip)	**Saturday AM Inbound Trips (East Parcel to SVSP)**	**Saturday AM Outbound Trips (SVSP to East Parcel)**	**Saturday Daily Inbound Trips (East Parcel to SVSP)**	**Saturday Daily Outbound Trips (SVSP to East Parcel)**
1,2 , and 3		n/a	462	113	10%	35	0	8	0	0	8	8
TOTAL						**Drive-Alone Employees = 12**			1	0	12	**12**

Notes: (1) unit estimates not used. Instead, data from Squaw Valley USA of projected employees by category is used. Employee total is peak (not FTEs).
(2) of 264 beds at the East Parcel, 99 would be reserved for existing displaced employee housing. East Parcel can accommodate 200 total new employees (26.7% of 751 total) from all employment types.
(3) 10% of employees expected to drive to project site due to need for car for local work trips. Remaining 90% take shuttle.
(4) Employee shifts expected to start at 7 am, 8 am, 3 pm, 6 pm, or 11 pm. To be conservative, 10% assumed to arrive during 8-9 AM pk hr.
(5) Based on seating capacity of medium-sized bus used by TART.

Table 8: SUNDAY PM PEAK HOUR - CONDO HOTEL FRACTIONAL EMPLOYEES ONLY (Those Residing on East Parcel)

# bedrooms	tot. units (after lock-off)	# Employees Per Unit	Total Number of Employees	Number Residing on East Parcel That Take Shuttle (1), (2)	% Returning home after work between 3 and 4 pm (3)	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during PM peak hour	**Sunday PM Inbound Trips (East Parcel to SVSP)**	**Sunday PM Outbound Trips (SVSP to East Parcel)**
1,2 , and 3		n/a	462	113	25%	35	1	1	1
						Drive-Alone Employees = 12		**0**	3

(1) 27% of all employees reside in east pacel. Remainder reside outside of Olympic Valley.
(2) 10% of employees expected to drive to project site due to need for car for local work trips. Remaining 90% take shuttle.
(3) 19% of employee shifts expected to end at 3 pm. To be conservative, 25% assumed to depart during 3-4 PM pk hr.

Table 9: SATURDAY AM PEAK HOUR and DAILY - CONDO HOTEL FRACTIONAL EMPLOYEES ONLY (Those Residing outside Olympic Valley)

# bedrooms	tot. units (after lock-off)	# Employees Per Unit	Total Number of Employees	Number Residing outside Squaw Valley	% Arriving by Car (1)	Avg. Vehicle Occupancy	% Arriving at Work between 8 and 9 am (2)	**Saturday AM Inbound Trips (external origin to East Parcel) (3)**	**Saturday AM Outbound Trips (4)**	**Saturday Daily Inbound Trips (external trips to East Parcel)**	**Saturday Daily Outbound Trips (East Parcel to external dest.)**
1,2 , and 3		n/a	462	337	86%	1.76	10%	16	5	165	165
TOTAL											
						Drive-Alone Employees = 10% of trips (these trips have origin/destination at project site)		2	**0**	17	17

Notes: (1) The remainder arrive by TART, shuttle, or other means.
(2) 85% of housekeeper/staff shifts start at 8 am. Thus, employees should arrive at East Parcel before 8 am. To be conservative, 10% assumed.
(3) 90% of employees that drive would park at East Parcel and take shuttle to Squaw Ski Area during design peak hour and day. 10% of these trips continue to drive to project site.
(4) Late night employee shift departures.

Table 10: SATURDAY AM PEAK HOUR and DAILY - CONDO HOTEL FRACTIONAL EMPLOYEES ONLY (Those Residing outside of Olympic Valley) - SHUTTLE TO SQUAW SKI AREA

# bedrooms	tot. units (after lock-off)	# Employees Per Unit	Total Number of Shuttle Riders (1)	% Arriving at Work between 8 and 9 am	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during AM peak hour	# of Daily Shuttle Trips (Round Trip) (2)	**Saturday AM Inbound Trips (East Parcel to SVSP)**	**Saturday AM Outbound Trips (SVSP to East Parcel)**	**Saturday Daily Inbound Trips (East Parcel to SVSP)**	**Saturday Daily Outbound Trips (SVSP to East Parcel)**
1,2 , and 3		n/a	303	10%	35	2	24	2	2	24	24
TOTAL											

Notes:
(1) 303 of the 337 employees (90%) ride shuttle, with remainder driving to site due to need for use of car during work shift.
(2) Shuttle round trips also consider the need for the shuttles to additionally transport approximately 100 displaced existing employees who will now reside on East Parcel.

8/20/14

Table 11: SUNDAY PM PEAK HOUR - CONDO HOTEL FRACTIONAL EMPLOYEES ONLY (Those Residing outside of Olympic Valley)

# bedrooms	tot. units (after lock-off)	# Employees Per Unit	Total Number of Employees	Number Residing outside Olympic Valley	% Arriving by Car	Avg. Vehicle Occupancy	% Returning home after work between 3 and 4 pm (1)	**Sunday PM Inbound Trips (East Parcel to SVSP)**	**Sunday PM Outbound Trips (East Parcel to external dest.)**
1,2 , and 3		n/a	462	303	86%	1.76	25%	0	37
TOTAL						**Drive-Alone Employees = 10% of trips (these trips have origin/destination at project site)**		0	4

(1) 19% of employee shifts expected to end at 3 pm. To be conservative, 25% assumed to depart during 3-4 PM pk hr.

Table 12: SUNDAY PM PEAK HOUR - CONDO HOTEL FRACTIONAL EMPLOYEES ONLY (Those residing outside of Olympic Valley) - SHUTTLE FROM SQUAW AREA

# bedrooms	tot. units (after lock-off)	# Employees Per Unit	Total Number of Shuttle Riders	% Returning home after work between 3 and 4 pm	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during PM peak hour	**Sunday PM Inbound Trips (East Parcel to SVSP)**	**Sunday PM Outbound Trips (SVSP to East Parcel)**
1,2 , and 3		n/a	303	25%	35	3	3	3
TOTAL								

Table 13: SATURDAY AM PEAK HOUR and DAILY - RESTAURANT & RETAIL EMPLOYEES ONLY (Those residing on East Parcel)

Total Restaurant KSF	Total Retail KSF	Restaurant Employees per KSF (1)	Retail Employees per KSF (1)	Number Residing on East Parcel	% Arriving at Work between 8 and 9 am (2)	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during AM peak hour (3)	# of Daily Shuttle Trips (Round Trip)	**Saturday AM Inbound Trips (East Parcel to SVSP)**	**Saturday AM Outbound Trips (SVSP to East Parcel)**	**Saturday Daily Inbound Trips (East Parcel to SVSP)**	**Saturday Daily Outbound Trips (SVSP to East Parcel)**
29.53	27.7	6.13	2.31	66	15%	35	0	6	0	0	6	6
TOTAL												

Notes: (1) Based on peak employment levels at Village at Squaw Valley. Vast majority of F&B employees work continuously on-site and therefore do not require a vehicle for work.
(2) 15% estimated based on data provided by Squaw Valley of existing F&B operations.
(3) Not sufficient size employee numbers to warrant a separate shuttle bus trip. Instead, employees would use same shuttles as hotel-condo employees.

Table 14: SUNDAY PM PEAK HOUR - RESTAURANT & RETAIL EMPLOYEES ONLY (Those residing on East Parcel)

Total Restaurant KSF	Total Retail KSF	Restaurant Employees per KSF	Retail Employees per KSF	Number Residing on East Parcel	% Returning home after work between 3 and 4 pm	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during PM peak hour	**Sunday PM Inbound Trips (East Parcel to SVSP)**	**Sunday PM Outbound Trips (SVSP to East Parcel)**
29.53	27.7	6.13	2.31	66	15%	35	0	1	1
TOTAL									

Table 15: SATURDAY AM PEAK HOUR and DAILY - RESTAURANT & RETAIL EMPLOYEES ONLY (Those residing outside Olympic Valley)

Total Restaurant KSF	Total Retail KSF	Restaurant Employees per KSF	Retail Employees per KSF	Number Residing outside Olympic Valley	% Arriving by Car	Avg. Vehicle Occupancy	% Arriving at Work between 8 and 9 am	**Saturday AM Inbound Trips (external origin to East Parcel)**	**Saturday AM Outbound Trips**	**Saturday Daily Inbound Trips (external trips to East Parcel)**	**Saturday Daily Outbound Trips (East Parcel to external dest.)**
29.53	27.7	6.13	2.31	179	86%	1.76	15%	13	0	87	87
TOTAL											

Table 16: SATURDAY AM PEAK HOUR and DAILY - RESTAURANT & RETAIL EMPLOYEES ONLY (Those residing outside of Olympic Valley) - SHUTTLE TO SQUAW SKI AREA

Total Restaurant KSF	Total Retail KSF	Residing outside Squaw Valley	Total Number of Shuttle Riders (1)	% Arriving at Work between 8 and 9 am	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during AM peak hour (2)	# of Daily Shuttle Trips (Round Trip) (2)	**Saturday AM Inbound Trips (East Parcel to SVSP)**	**Saturday AM Outbound Trips (SVSP to East Parcel)**	**Saturday Daily Inbound Trips (East Parcel to SVSP)**	**Saturday Daily Outbound Trips (SVSP to East Parcel)**
29.53	27.7	179	179	15%	35	1	12	1	1	12	12
TOTAL											

Notes: (1) All employees park at East Parcel and take shuttle to Squaw Ski Area during design peak hour and day.
(2) Not sufficient employee numbers to warrant a separate shuttle bus trip. Instead, employees use same shuttles as hotel-condo employees.

Table 17: SUNDAY PM PEAK HOUR - RESTAURANT & RETAIL EMPLOYEES ONLY (Those residing outside of Olympic Valley)

Total Restaurant KSF	Total Retail KSF	Restaurant Employees per KSF	Retail Employees per KSF	Number Residing outside Squaw Valley	% Arriving by Car	Avg. Vehicle Occupancy	% Returning home after work between 3 and 4 pm	**Sunday PM Inbound Trips (East Parcel to SVSP)**	**Sunday PM Outbound Trips (East Parcel to external dest.)**
29.53	27.7	6.13	2.31	179	86%	1.76	15%	2	13
TOTAL									

Table 18: SUNDAY PM PEAK HOUR - RESTAURANT & RETAIL EMPLOYEES ONLY (Those residing outside of Olympic Valley) - SHUTTLE FROM SQUAW AREA

Total Restaurant KSF	Total Retail KSF	Number Residing outside Squaw Valley	Total Number of Shuttle Riders	% Returning home after work between 3 and 4 pm	Avg. Shuttle Seating Capacity	# of Shuttle Trips (Round Trip) during PM peak hour (1)	**Sunday PM Inbound Trips (East Parcel to SVSP)**	**Sunday PM Outbound Trips (SVSP to East Parcel)**
29.53	27.7	179	179	15%	35	1	1	1
TOTAL								

(1) Not sufficient employee numbers to warrant a separate shuttle bus trip. Instead, employees use same shuttles as hotel-condo employees.

8/20/14

Color Legend: = Trip Rates from ITE's Trip Generation Manual

Table 19: SATURDAY AM PEAK HOUR and DAILY - RESTAURANT & RETAIL CUSTOMERS (Non-Ski/Board and Not Staying in Squaw Valley)

Total Restaurant KSF	Total Retail KSF	Gross Restaurant AM Trip Rate per KSF (1)	Gross Restaurant Daily Trip Rate per KSF (1)	Gross Retail AM Trip Rate per KSF (1)	Gross Retail Daily Trip Rate per KSF (1)	Restaurant Reduction for Trips Made by Skiers and Overnight Visitors	Retail Reduction for Trips Made by Skiers and Overnight Visitors	External Restaurant AM Trips	External Restaurant Daily Trips	External Retail AM Trips	External Retail Daily Trips
29.53	27.7	4.91	44.97	0.83	142.53	95%	97.5%	7	66	1	99
TOTAL											

Notes: (1) Based on trip rates from categories 820 (Shopping Center) and 932 (High Turnover Restaurant) in Trip Generation Manual (ITE, 2012) using hourly variation tables.
Trip rates have been reduced by 10% from ITE values to account for separate estimate of employee trips (see Tables 10-15).

Table 20: SUNDAY PM PEAK HOUR - RESTAURANT & RETAIL CUSTOMERS (Non-Ski/Board and Not Staying in Squaw Valley)

Total Restaurant KSF	Total Retail KSF	Gross Restaurant PM Trip Rate per KSF (1)	Gross Retail PM Trip Rate per KSF (1)	Restaurant Reduction for Trips Made by Skiers and Overnight Visitors	Retail Reduction for Trips Made by Skiers and Overnight Visitors	External Restaurant PM Trips		External Retail PM Trips
29.53	27.7	9.5	2.81	95%	97.5%	14		2
TOTAL							Total In	**8**
							Total Out	**8**

Notes: (1) Based on trip rates from categories 820 (Shopping Center) and 932 (High Turnover Restaurant) in Trip Generation Manual (ITE, 2012) using hourly variation tables.
Trip rates have been reduced by 10% from ITE values to account for separate estimate of employee trips (see Tables 10-15).

Table 21: SATURDAY AM PEAK HOUR, DAILY, and SUNDAY PM PEAK HOUR - MOUNTAIN ADVENTURE CENTER ONLY (Includes both external guests and employees)

User	Total	% Internal Trips	% Arriving between 8 and 9 am	External Trips % Arriving by Car	Avg. Vehicle Occupancy	% Returning home between 3 and 4 pm	**Saturday AM Inbound Trips**	**Saturday AM Outbound Trips**	**Saturday Daily Inbound Trips**	**Saturday Daily Outbound Trips**	**Sunday PM Pk Hr Outbound Trips**	**Sunday PM Pk Hr Inbound Trips**
Guests	1200	95%	10%	86%	1.76	15%	3	1	29	29	4	2
Employees	44	10%	10%	86%	1.76	15%	2	1	19	19	3	1
						TOTAL	5	2	49	49	7	3

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Existing + Project Conditions
Winter AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	121	422	150	138	30	132	39	95	40	64	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3379	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.98	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3379	
Peak-hour factor, PHF	0.86	0.86	0.86	0.79	0.79	0.79	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	30	141	491	190	175	38	147	43	106	43	69	29
RTOR Reduction (vph)	0	0	296	0	0	25	0	0	85	0	16	0
Lane Group Flow (vph)	30	141	195	190	175	13	147	43	21	0	125	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	2.5	14.7	28.9	12.7	25.4	25.4	14.2	14.2	14.2		10.3	
Effective Green, g (s)	2.5	14.7	28.9	12.7	25.4	25.4	14.2	14.2	14.2		10.3	
Actuated g/C Ratio	0.03	0.20	0.40	0.17	0.35	0.35	0.19	0.19	0.19		0.14	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	60	375	627	308	649	551	344	362	308		477	
v/s Ratio Prot	0.02	c0.08	0.06	c0.11	0.09		c0.08	0.02			c0.04	
v/s Ratio Perm			0.06			0.01			0.01			
v/c Ratio	0.50	0.38	0.31	0.62	0.27	0.02	0.43	0.12	0.07		0.26	
Uniform Delay, d1	34.6	25.1	15.1	27.8	17.1	15.6	25.8	24.2	23.9		27.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	2.4	0.2	0.1	2.6	0.1	0.0	0.3	0.1	0.0		0.1	
Delay (s)	37.0	25.4	15.2	30.4	17.2	15.6	26.1	24.2	24.0		28.0	
Level of Service	D	C	B	C	B	B	C	C	C		C	
Approach Delay (s)		18.4			23.3			25.1			28.0	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	72.9	Sum of lost time (s)	21.0
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_E+P_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	163	3.0	0.176	4.9	LOS A	0.0	0.0	0.00	0.72	27.9
8	T	223	3.0	0.176	4.9	LOS A	0.0	0.0	0.00	0.34	32.0
Approach		386	3.0	0.176	4.9	LOS A	0.0	0.0	0.00	0.50	30.0
East: I-80 WB off-ramp											
1	L	150	3.0	0.192	6.5	LOS A	0.5	12.8	0.36	0.76	24.7
6	T	3	3.0	0.192	6.5	LOS A	0.5	12.8	0.36	0.50	27.1
16	R	58	3.0	0.074	5.3	LOS A	0.2	4.8	0.34	0.58	27.5
Approach		211	3.0	0.192	6.2	LOS A	0.5	12.8	0.35	0.71	25.4
North: HWY 89											
4	T	516	3.0	0.386	9.3	LOS A	1.7	43.3	0.52	0.63	26.0
14	R	96	3.0	0.386	9.3	LOS A	1.7	43.3	0.52	0.70	25.6
Approach		612	3.0	0.386	9.3	LOS A	1.7	43.3	0.52	0.64	26.0
All Vehicles		1209	3.0	0.386	7.3	LOS A	1.7	43.3	0.32	0.61	27.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_E+P_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	364	3.0	0.400	9.1	LOS A	1.8	46.9	0.48	0.61	27.9
18	R	309	3.0	0.400	9.1	LOS A	1.8	46.9	0.48	0.66	27.2
Approach		673	3.0	0.400	9.1	LOS A	1.8	46.9	0.48	0.64	27.6
North: HWY 89											
7	L	138	3.0	0.352	6.8	LOS A	0.0	0.0	0.00	0.88	27.9
4	T	635	3.0	0.352	6.8	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		773	3.0	0.352	6.8	LOS A	0.0	0.0	0.00	0.47	31.3
West: I-80 EB off-ramp											
5	L	120	3.0	0.594	17.5	LOS C	2.6	67.0	0.66	1.00	20.9
2	T	1	3.0	0.594	17.5	LOS C	2.6	67.0	0.66	0.84	22.0
12	R	603	3.0	0.594	17.1	LOS C	2.6	67.0	0.65	0.89	22.4
Approach		724	3.0	0.594	17.2	LOS C	2.6	67.0	0.65	0.91	22.1
All Vehicles		2170	3.0	0.594	11.0	LOS B	2.6	67.0	0.37	0.67	26.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

Existing + Project Conditions
Winter AM

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	156	41	56	298	10	805	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.81	0.81	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	193	51	62	331	11	866	202
RTOR Reduction (vph)	0	40	0	0	0	0	51
Lane Group Flow (vph)	193	11	62	331	11	866	151
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	9.2	16.5	7.3	60.3	1.5	54.5	63.7
Effective Green, g (s)	9.2	16.5	7.3	60.3	1.5	54.5	63.7
Actuated g/C Ratio	0.11	0.19	0.09	0.71	0.02	0.64	0.75
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	371	307	152	2510	31	1839	1186
v/s Ratio Prot	c0.06	0.00	c0.04	0.09	0.01	c0.30	0.01
v/s Ratio Perm		0.00					0.08
v/c Ratio	0.52	0.03	0.41	0.13	0.35	0.47	0.13
Uniform Delay, d1	35.8	27.8	36.8	4.0	41.3	7.8	3.0
Progression Factor	1.00	1.00	1.16	0.77	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.0	1.8	0.1	6.9	0.9	0.0
Delay (s)	36.4	27.8	44.4	3.2	48.1	8.7	3.0
Level of Service	D	C	D	A	D	A	A
Approach Delay (s)	34.6			9.7		8.0	
Approach LOS	C			A		A	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	220	122	232	44	8	838
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.93	0.93
Adj. Flow (vph)	262	145	258	49	9	901
RTOR Reduction (vph)	0	108	0	11	0	0
Lane Group Flow (vph)	262	37	258	38	9	901
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	16.9	21.9	48.8	65.7	5.0	57.3
Effective Green, g (s)	16.9	21.9	48.8	65.7	5.0	57.3
Actuated g/C Ratio	0.20	0.26	0.57	0.77	0.06	0.67
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	351	407	1647	1223	104	1255
v/s Ratio Prot	c0.15	0.01	0.09	0.01	0.01	c0.48
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.75	0.09	0.16	0.03	0.09	0.72
Uniform Delay, d1	32.0	24.0	8.5	2.2	37.8	8.7
Progression Factor	1.00	1.00	1.00	1.00	1.34	0.72
Incremental Delay, d2	7.4	0.0	0.2	0.0	0.1	3.3
Delay (s)	39.4	24.0	8.7	2.2	50.7	9.6
Level of Service	D	C	A	A	D	A
Approach Delay (s)	33.9		7.6			10.0
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	6	43	218	99	29	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	76	76	93	93	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	57	234	106	45	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	234	0	-	0	306	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1333	-	-	-	686	805
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	951	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1333	-	-	-	682	805
Mov Cap-2 Maneuver	-	-	-	-	682	-
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	945	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1333	-	-	-	724
HCM Lane V/C Ratio	0.006	-	-	-	0.1
HCM Control Delay (s)	7.7	0	-	-	10.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	5.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	66	15	398	336	13	67
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	93	93	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	94	21	428	361	16	81

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	116	0	1322	105
Stage 1	-	-	-	-	105	-
Stage 2	-	-	-	-	1217	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1473	-	173	949
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	280	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1473	-	123	949
Mov Cap-2 Maneuver	-	-	-	-	123	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	199	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.6	15.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	454	-	-	1473	-
HCM Lane V/C Ratio	0.212	-	-	0.291	-
HCM Control Delay (s)	15.1	-	-	8.4	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.8	-	-	1.2	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	1	125	0	500	722	2	1	5	93
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	93	93	93	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	179	0	538	776	2	1	6	121

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	778	0	0	179	0	0	2057	2035	179
Stage 1	-	-	-	-	-	-	181	181	-
Stage 2	-	-	-	-	-	-	1876	1854	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	839	-	-	1397	-	-	41	57	864
Stage 1	-	-	-	-	-	-	821	750	-
Stage 2	-	-	-	-	-	-	92	124	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	839	-	-	1397	-	-	14	35	864
Mov Cap-2 Maneuver	-	-	-	-	-	-	14	35	-
Stage 1	-	-	-	-	-	-	820	749	-
Stage 2	-	-	-	-	-	-	38	76	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	3.7	24.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	308	839	-	-	1397	-	-	20	68
HCM Lane V/C Ratio	0.417	0.002	-	-	0.385	-	-	0.333	0.686
HCM Control Delay (s)	24.8	9.3	-	-	9.2	-	-	257.5	133.4
HCM Lane LOS	C	A	-	-	A	-	-	F	F
HCM 95th %tile Q(veh)	2	0	-	-	1.8	-	-	1	3.1

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	4	13	15
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	7	22	25

Major/Minor	Minor2		
Conflicting Flow All	2098	2034	777
Stage 1	1853	1853	-
Stage 2	245	181	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	38	57	397
Stage 1	95	124	-
Stage 2	759	750	-
Platoon blocked, %			
Mov Cap-1 Maneuver	20	35	397
Mov Cap-2 Maneuver	20	35	-
Stage 1	95	76	-
Stage 2	646	749	-

Approach	SB
HCM Control Delay, s	148.9
HCM LOS	F

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	222	1182	8	8	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	93	93	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	317	1271	9	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1280	0	-	0	1601	1275
Stage 1	-	-	-	-	1275	-
Stage 2	-	-	-	-	326	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	542	-	-	-	117	204
Stage 1	-	-	-	-	263	-
Stage 2	-	-	-	-	731	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	542	-	-	-	116	204
Mov Cap-2 Maneuver	-	-	-	-	116	-
Stage 1	-	-	-	-	263	-
Stage 2	-	-	-	-	724	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	34.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	542	-	-	-	164
HCM Lane V/C Ratio	0.008	-	-	-	0.254
HCM Control Delay (s)	11.7	0	-	-	34.3
HCM Lane LOS	B	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	1

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	196	34	20	1102	45	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	93	93	69	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	280	49	22	1185	65	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	329	0	1532	304
Stage 1	-	-	-	-	304	-
Stage 2	-	-	-	-	1228	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1231	-	128	736
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	277	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1231	-	126	736
Mov Cap-2 Maneuver	-	-	-	-	126	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	272	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	54
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	126	736	-	-	1231	-
HCM Lane V/C Ratio	0.518	0.014	-	-	0.017	-
HCM Control Delay (s)	60.8	10	-	-	8	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	2.4	0	-	-	0.1	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Saturday AM E+P
AM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	540	511	94.7%	28.3	4.6	C
	Through	172	175	101.6%	3.3	1.3	A
	Right Turn						
	Subtotal	**712**	**686**	**96.3%**	**21.9**	**3.6**	**C**
SB	Left Turn						
	Through	492	448	91.1%	33.8	8.6	C
	Right Turn	684	658	96.2%	5.7	1.6	A
	Subtotal	**1,176**	**1,106**	**94.1%**	**17.0**	**4.3**	**B**
EB	Left Turn	136	175	128.8%	30.0	3.1	C
	Through						
	Right Turn	100	135	134.8%	2.0	0.2	A
	Subtotal	**236**	**310**	**131.4%**	**17.8**	**2.7**	**B**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,124**	**2,102**	**99.0%**	**18.7**	**2.3**	**B**

Intersection	
Int Delay, s/veh	13.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	79	44	334	574	203	328
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	360	-	-	220
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	90	90	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	93	52	371	638	221	357

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1601	221	221	0	-	0
Stage 1	221	-	-	-	-	-
Stage 2	1380	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	117	819	1348	-	-	-
Stage 1	816	-	-	-	-	-
Stage 2	233	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 85	819	1348	-	-	-
Mov Cap-2 Maneuver	~ 85	-	-	-	-	-
Stage 1	816	-	-	-	-	-
Stage 2	169	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	141.1	3.2	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1348	-	85	819	-	-
HCM Lane V/C Ratio	0.275	-	1.093	0.063	-	-
HCM Control Delay (s)	8.7	-	214.3	9.7	-	-
HCM Lane LOS	A	-	F	A	-	-
HCM 95th %tile Q(veh)	1.1	-	6.4	0.2	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	165	110	202	609	8	422	71	254	10	32	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9	3.9	4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.91	0.91	0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3389	1422	1681	1709	1560		1813	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3389	1422	1681	1709	1560		1813	
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.87	0.87	0.87	0.75	0.75	0.75
Adj. Flow (vph)	16	190	126	227	684	9	485	82	292	13	43	8
RTOR Reduction (vph)	0	0	96	0	0	5	0	0	0	0	6	0
Lane Group Flow (vph)	16	190	30	227	685	3	281	286	292	0	58	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			Free			
Actuated Green, G (s)	0.8	14.0	14.0	9.3	22.3	22.3	16.0	16.0	58.9		4.2	
Effective Green, g (s)	0.8	14.0	14.0	9.3	22.3	22.3	16.0	16.0	58.9		4.2	
Actuated g/C Ratio	0.01	0.24	0.24	0.16	0.38	0.38	0.27	0.27	1.00		0.07	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9	3.9	4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.5			2.5	
Lane Grp Cap (vph)	24	841	371	542	1283	538	456	464	1560		129	
v/s Ratio Prot	0.01	0.05		0.07	c0.20		0.17	c0.17			c0.03	
v/s Ratio Perm			0.02			0.00			c0.19			
v/c Ratio	0.67	0.23	0.08	0.42	0.53	0.01	0.62	0.62	0.19		0.45	
Uniform Delay, d1	28.9	18.1	17.4	22.4	14.3	11.4	18.8	18.8	0.0		26.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	42.9	0.0	0.0	0.2	0.2	0.0	2.1	2.1	0.3		1.8	
Delay (s)	71.8	18.1	17.5	22.6	14.5	11.4	20.9	20.8	0.3		28.1	
Level of Service	E	B	B	C	B	B	C	C	A		C	
Approach Delay (s)		20.5			16.4			13.9			28.1	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	58.9	Sum of lost time (s)	15.6
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Existing + Project Conditions
Winter PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	239	152	122	230	58	337	123	185	46	110	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3321	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3321	
Peak-hour factor, PHF	0.85	0.85	0.85	0.80	0.80	0.80	0.89	0.89	0.89	0.83	0.83	0.83
Adj. Flow (vph)	120	281	179	152	288	72	379	138	208	55	133	102
RTOR Reduction (vph)	0	0	87	0	0	56	0	0	142	0	52	0
Lane Group Flow (vph)	120	281	92	152	288	16	379	138	66	0	238	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	11.2	19.3	49.8	13.3	21.9	21.9	30.5	30.5	30.5		12.3	
Effective Green, g (s)	11.2	19.3	49.8	13.3	21.9	21.9	30.5	30.5	30.5		12.3	
Actuated g/C Ratio	0.12	0.20	0.52	0.14	0.23	0.23	0.32	0.32	0.32		0.13	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	205	372	817	244	423	359	560	589	500		423	
v/s Ratio Prot	0.07	0.15	0.04	c0.09	c0.15		c0.21	0.07			c0.07	
v/s Ratio Perm			0.02			0.01			0.04			
v/c Ratio	0.59	0.76	0.11	0.62	0.68	0.05	0.68	0.23	0.13		0.56	
Uniform Delay, d1	40.4	36.3	12.0	39.2	34.1	29.1	28.7	24.3	23.5		39.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	2.7	7.6	0.0	3.5	3.6	0.0	2.6	0.1	0.0		1.0	
Delay (s)	43.1	43.9	12.0	42.7	37.6	29.1	31.2	24.4	23.5		40.5	
Level of Service	D	D	B	D	D	C	C	C	C		D	
Approach Delay (s)		33.9			37.9			27.7			40.5	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	33.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	96.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_E+P_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	411	3.0	0.459	8.3	LOS A	0.0	0.0	0.00	0.73	27.9
8	T	597	3.0	0.459	8.3	LOS A	0.0	0.0	0.00	0.34	32.0
Approach		1008	3.0	0.459	8.3	LOS A	0.0	0.0	0.00	0.50	30.1
East: I-80 WB off-ramp											
1	L	152	3.0	0.291	11.0	LOS B	0.8	21.2	0.60	0.89	22.9
6	T	2	3.0	0.291	11.0	LOS B	0.8	21.2	0.60	0.73	24.5
16	R	125	3.0	0.248	10.7	LOS B	0.7	17.9	0.61	0.79	24.7
Approach		279	3.0	0.291	10.9	LOS B	0.8	21.2	0.60	0.84	23.7
North: HWY 89											
4	T	341	3.0	0.440	12.6	LOS B	2.0	51.2	0.65	0.81	24.4
14	R	198	3.0	0.440	12.6	LOS B	2.0	51.2	0.65	0.85	23.9
Approach		539	3.0	0.440	12.6	LOS B	2.0	51.2	0.65	0.82	24.2
All Vehicles		1826	3.0	0.459	10.0	LOS A	2.0	51.2	0.28	0.65	27.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_E+P_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	992	3.0	0.873	29.1	LOS D	13.6	347.8	0.96	0.99	19.5
18	R	540	3.0	0.873	29.1	LOS D	13.6	347.8	0.96	0.99	19.3
Approach		1533	3.0	0.873	29.1	LOS D	13.6	347.8	0.96	0.99	19.4
North: HWY 89											
7	L	174	3.0	0.231	5.4	LOS A	0.0	0.0	0.00	0.77	27.9
4	T	334	3.0	0.231	5.4	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		508	3.0	0.231	5.4	LOS A	0.0	0.0	0.00	0.51	30.6
West: I-80 EB off-ramp											
5	L	41	3.0	0.150	6.6	LOS A	0.4	10.2	0.41	0.85	24.8
2	T	1	3.0	0.150	6.7	LOS A	0.4	10.2	0.41	0.57	27.1
12	R	175	3.0	0.150	6.6	LOS A	0.4	10.2	0.40	0.67	27.1
Approach		217	3.0	0.150	6.6	LOS A	0.4	10.2	0.40	0.71	26.6
All Vehicles		2258	3.0	0.873	21.6	LOS C	13.6	347.8	0.69	0.86	21.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

Existing + Project Conditions
Winter PM

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	334	48	143	1172	10	266	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.88	0.88	0.89	0.86	0.83	0.83	0.83
Adj. Flow (vph)	380	55	161	1363	12	320	265
RTOR Reduction (vph)	0	36	0	0	0	0	77
Lane Group Flow (vph)	380	19	161	1363	12	320	188
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	12.1	23.7	11.6	42.5	1.4	32.3	44.4
Effective Green, g (s)	12.1	23.7	11.6	42.5	1.4	32.3	44.4
Actuated g/C Ratio	0.17	0.34	0.17	0.61	0.02	0.46	0.63
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	593	535	293	2148	35	1323	1004
v/s Ratio Prot	c0.11	0.01	c0.09	c0.39	0.01	0.11	0.03
v/s Ratio Perm		0.01					0.09
v/c Ratio	0.64	0.03	0.55	0.63	0.34	0.24	0.19
Uniform Delay, d1	26.9	15.5	26.8	8.8	33.8	11.4	5.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	0.0	2.1	1.4	5.8	0.4	0.0
Delay (s)	28.7	15.5	28.9	10.2	39.6	11.9	5.3
Level of Service	C	B	C	B	D	B	A
Approach Delay (s)	27.0			12.2		9.5	
Approach LOS	C			B		A	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	61	80	1235	163	154	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.76	0.76	0.89	0.89	0.83	0.83
Adj. Flow (vph)	80	105	1388	183	186	193
RTOR Reduction (vph)	0	1	0	62	0	0
Lane Group Flow (vph)	80	104	1388	121	186	193
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	8.1	20.7	44.0	52.1	12.6	60.1
Effective Green, g (s)	8.1	20.7	44.0	52.1	12.6	60.1
Actuated g/C Ratio	0.10	0.26	0.56	0.66	0.16	0.76
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	181	414	1597	1043	282	1417
v/s Ratio Prot	c0.05	0.04	c0.48	0.01	c0.11	0.10
v/s Ratio Perm		0.03		0.06		
v/c Ratio	0.44	0.25	0.87	0.12	0.66	0.14
Uniform Delay, d1	33.3	23.0	15.0	5.0	31.2	2.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	6.7	0.0	4.2	0.2
Delay (s)	34.0	23.1	21.7	5.0	35.4	2.7
Level of Service	C	C	C	A	D	A
Approach Delay (s)	27.8		19.8			18.8
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	79.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	12	132	113	47	185	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	82	82	72	72
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	176	138	57	257	49

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	138	0	-	0	346	138
Stage 1	-	-	-	-	138	-
Stage 2	-	-	-	-	208	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1446	-	-	-	651	910
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	827	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1446	-	-	-	643	910
Mov Cap-2 Maneuver	-	-	-	-	643	-
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	817	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	14.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1446	-	-	-	674
HCM Lane V/C Ratio	0.011	-	-	-	0.453
HCM Control Delay (s)	7.5	0	-	-	14.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	2.4

Intersection	
Int Delay, s/veh	32.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	300	17	78	115	45	485
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	72	72	85	85	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	417	24	92	135	51	545

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	440	0	747	428
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	319	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1120	-	381	627
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	737	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1120	-	350	627
Mov Cap-2 Maneuver	-	-	-	-	350	-
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	66.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	588	-	-	1120	-
HCM Lane V/C Ratio	1.013	-	-	0.082	-
HCM Control Delay (s)	66.9	-	-	8.5	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	15.4	-	-	0.3	-

Intersection	
Int Delay, s/veh	77

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	21	759	5	34	166	9	8	9	424
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	85	85	85	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	872	6	40	195	11	9	10	476

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	206	0	0	878	0	0	1223	1210	875
Stage 1	-	-	-	-	-	-	924	924	-
Stage 2	-	-	-	-	-	-	299	286	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1365	-	-	769	-	-	156	183	~ 349
Stage 1	-	-	-	-	-	-	323	348	-
Stage 2	-	-	-	-	-	-	710	675	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1365	-	-	769	-	-	139	170	~ 349
Mov Cap-2 Maneuver	-	-	-	-	-	-	139	170	-
Stage 1	-	-	-	-	-	-	317	342	-
Stage 2	-	-	-	-	-	-	643	640	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	1.6	264.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	333	1365	-	-	769	-	-	-	546
HCM Lane V/C Ratio	1.488	0.018	-	-	0.052	-	-	-	0.067
HCM Control Delay (s)	264.5	7.7	-	-	9.9	-	-	-	12.1
HCM Lane LOS	F	A	-	-	A	-	-	-	B
HCM 95th %tile Q(veh)	27.2	0.1	-	-	0.2	-	-	-	0.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	17	3	19
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	28	5	32

Major/Minor	Minor2		
Conflicting Flow All	1448	1207	201
Stage 1	281	281	-
Stage 2	1167	926	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	109	183	840
Stage 1	726	678	-
Stage 2	236	347	-
Platoon blocked, %			
Mov Cap-1 Maneuver	-	170	840
Mov Cap-2 Maneuver	-	170	-
Stage 1	713	643	-
Stage 2	-	341	-

Approach	SB
HCM Control Delay, s	
HCM LOS	-

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	7	1193	197	13	14	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	85	85	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	1371	232	15	23	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	247	0	-	0	1626	239
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	1387	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1319	-	-	-	112	800
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	232	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1319	-	-	-	109	800
Mov Cap-2 Maneuver	-	-	-	-	109	-
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	226	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	31
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1319	-	-	-	181
HCM Lane V/C Ratio	0.006	-	-	-	0.239
HCM Control Delay (s)	7.7	0	-	-	31
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.9

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1186	41	31	211	14	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	85	85	69	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1363	47	36	248	20	64

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1410	0	1708	1387
Stage 1	-	-	-	-	1387	-
Stage 2	-	-	-	-	321	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	484	-	100	175
Stage 1	-	-	-	-	232	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	484	-	93	175
Mov Cap-2 Maneuver	-	-	-	-	93	-
Stage 1	-	-	-	-	232	-
Stage 2	-	-	-	-	680	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	41.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	93	175	-	-	484	-
HCM Lane V/C Ratio	0.218	0.364	-	-	0.075	-
HCM Control Delay (s)	54.2	36.9	-	-	13	-
HCM Lane LOS	F	E	-	-	B	-
HCM 95th %tile Q(veh)	0.8	1.5	-	-	0.2	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Sunday PM E+P
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	116	120	103.4%	50.0	9.6	D
	Through	672	632	94.0%	62.2	21.0	E
	Right Turn						
	Subtotal	**788**	**752**	**95.4%**	**60.3**	**18.6**	**E**
SB	Left Turn						
	Through	96	109	113.3%	27.6	6.3	C
	Right Turn	152	149	97.9%	2.7	0.3	A
	Subtotal	**248**	**258**	**103.9%**	**12.9**	**3.0**	**B**
EB	Left Turn	908	775	85.4%	72.6	21.1	E
	Through	4	2	60.0%	21.1	40.6	C
	Right Turn	540	550	101.9%	10.0	0.8	A
	Subtotal	**1,452**	**1,328**	**91.5%**	**46.7**	**12.3**	**D**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,488**	**2,338**	**94.0%**	**47.4**	**10.2**	**D**

Intersection	
Int Delay, s/veh	132.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	410	335	60	285	509	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	360	-	-	220
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	91	91	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	482	394	66	313	585	66

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1030	585	585	0	-	0
Stage 1	585	-	-	-	-	-
Stage 2	445	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 259	511	990	-	-	-
Stage 1	557	-	-	-	-	-
Stage 2	646	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 242	511	990	-	-	-
Mov Cap-2 Maneuver	~ 242	-	-	-	-	-
Stage 1	557	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	286.8	1.5	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	990	-	242	511	-	-
HCM Lane V/C Ratio	0.067	-	1.993	0.771	-	-
HCM Control Delay (s)	8.9	-	$ 494.9	32	-	-
HCM Lane LOS	A	-	F	D	-	-
HCM 95th %tile Q(veh)	0.2	-	35.2	6.9	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	567	245	256	165	21	159	58	240	21	60	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3470		1681	1729	1560		1794	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3470		1681	1729	1560		1794	
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.84	0.84	0.84	0.78	0.78	0.78
Adj. Flow (vph)	35	616	266	301	194	25	189	69	286	27	77	26
RTOR Reduction (vph)	0	0	185	0	7	0	0	0	0	0	10	0
Lane Group Flow (vph)	35	616	81	301	212	0	127	131	286	0	120	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	2.4	20.3	20.3	11.0	28.7		12.3	12.3	67.0		8.0	
Effective Green, g (s)	2.4	20.3	20.3	11.0	28.7		12.3	12.3	67.0		8.0	
Actuated g/C Ratio	0.04	0.30	0.30	0.16	0.43		0.18	0.18	1.00		0.12	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	63	1072	473	563	1486		308	317	1560		214	
v/s Ratio Prot	0.02	c0.17		c0.09	0.06		0.08	c0.08			c0.07	
v/s Ratio Perm			0.05						0.18			
v/c Ratio	0.56	0.57	0.17	0.53	0.14		0.41	0.41	0.18		0.56	
Uniform Delay, d1	31.8	19.7	17.2	25.7	11.7		24.2	24.2	0.0		27.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	5.9	0.5	0.1	0.5	0.0		0.7	0.6	0.3		2.7	
Delay (s)	37.7	20.2	17.2	26.1	11.7		24.8	24.8	0.3		30.6	
Level of Service	D	C	B	C	B		C	C	A		C	
Approach Delay (s)		20.0			20.1			11.9			30.6	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

9/18/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	86	314	292	240	359	70	285	109	116	67	156	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.96	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1566	1770	1863	1520	1770	1863	1583		3401	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1566	1770	1863	1520	1770	1863	1583		3401	
Peak-hour factor, PHF	0.88	0.88	0.88	0.84	0.84	0.84	0.90	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	98	357	332	286	427	83	317	121	129	77	179	57
RTOR Reduction (vph)	0	0	134	0	0	54	0	0	99	0	14	0
Lane Group Flow (vph)	98	357	198	286	427	29	317	121	30	0	299	0
Confl. Peds. (#/hr)			5			5						
Confl. Bikes (#/hr)			5			5						
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	10.8	26.8	53.0	23.6	40.1	40.1	26.2	26.2	26.2		15.9	
Effective Green, g (s)	10.8	26.8	53.0	23.6	40.1	40.1	26.2	26.2	26.2		15.9	
Actuated g/C Ratio	0.10	0.24	0.47	0.21	0.35	0.35	0.23	0.23	0.23		0.14	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	168	439	731	368	658	537	408	430	365		476	
v/s Ratio Prot	0.06	c0.19	0.06	c0.16	0.23		c0.18	0.06			c0.09	
v/s Ratio Perm			0.06			0.02			0.02			
v/c Ratio	0.58	0.81	0.27	0.78	0.65	0.05	0.78	0.28	0.08		0.63	
Uniform Delay, d1	49.2	41.0	18.5	42.5	30.8	24.2	40.9	35.9	34.2		46.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	3.3	10.4	0.1	9.1	1.7	0.0	8.2	0.1	0.0		1.9	
Delay (s)	52.5	51.4	18.5	51.5	32.5	24.2	49.1	36.0	34.3		47.9	
Level of Service	D	D	B	D	C	C	D	D	C		D	
Approach Delay (s)		37.7			38.5			43.0			47.9	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	40.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	113.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_E+P_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	196	3.0	0.296	6.1	LOS A	0.0	0.0	0.00	0.79	27.9
8	T	453	3.0	0.296	6.1	LOS A	0.0	0.0	0.00	0.33	32.0
Approach		649	3.0	0.296	6.1	LOS A	0.0	0.0	0.00	0.47	30.6
East: I-80 WB off-ramp											
1	L	214	3.0	0.327	9.6	LOS A	1.0	24.8	0.50	0.85	23.5
6	T	5	3.0	0.327	9.6	LOS A	1.0	24.8	0.50	0.64	25.3
16	R	133	3.0	0.204	8.0	LOS A	0.6	14.5	0.48	0.71	26.0
Approach		352	3.0	0.327	9.0	LOS A	1.0	24.8	0.49	0.80	24.4
North: HWY 89											
4	T	795	3.0	0.635	16.5	LOS C	4.3	109.0	0.72	0.90	22.7
14	R	114	3.0	0.635	16.5	LOS C	4.3	109.0	0.72	0.94	22.5
Approach		909	3.0	0.635	16.5	LOS C	4.3	109.0	0.72	0.90	22.7
All Vehicles		1910	3.0	0.635	11.6	LOS B	4.3	109.0	0.43	0.74	25.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_E+P_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	650	3.0	0.696	18.3	LOS C	5.5	141.5	0.75	0.93	23.3
18	R	412	3.0	0.696	18.3	LOS C	5.5	141.5	0.75	0.96	22.9
Approach		1062	3.0	0.696	18.3	LOS C	5.5	141.5	0.75	0.94	23.1
North: HWY 89											
7	L	304	3.0	0.492	8.9	LOS A	0.0	0.0	0.00	0.81	27.9
4	T	775	3.0	0.492	8.9	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		1079	3.0	0.492	8.9	LOS A	0.0	0.0	0.00	0.50	30.8
West: I-80 EB off-ramp											
5	L	48	3.0	0.396	14.4	LOS B	1.3	33.1	0.68	0.98	22.0
2	T	1	3.0	0.396	14.4	LOS B	1.3	33.1	0.68	0.82	23.2
12	R	339	3.0	0.396	14.0	LOS B	1.3	33.1	0.67	0.87	23.6
Approach		388	3.0	0.396	14.1	LOS B	1.3	33.1	0.67	0.88	23.4
All Vehicles		2529	3.0	0.696	13.6	LOS B	5.5	141.5	0.42	0.74	26.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

9/18/2014

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	245	41	121	730	10	775	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1572	1770	3374	1770	2735	1556
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1572	1770	3374	1770	2735	1556
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	292	49	134	811	11	891	301
RTOR Reduction (vph)	0	31	0	0	0	0	94
Lane Group Flow (vph)	292	18	134	811	11	891	207
Confl. Peds. (#/hr)		2					2
Heavy Vehicles (%)	2%	2%	2%	7%	2%	7%	2%
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	11.5	21.0	9.5	48.1	1.4	40.0	51.5
Effective Green, g (s)	11.5	21.0	9.5	48.1	1.4	40.0	51.5
Actuated g/C Ratio	0.15	0.28	0.13	0.64	0.02	0.53	0.69
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	526	440	224	2163	33	1458	1068
v/s Ratio Prot	c0.09	0.01	c0.08	0.24	0.01	c0.33	0.03
v/s Ratio Perm		0.01					0.10
v/c Ratio	0.56	0.04	0.60	0.37	0.33	0.61	0.19
Uniform Delay, d1	29.4	19.7	30.9	6.4	36.3	12.1	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.0	4.3	0.5	5.9	1.9	0.0
Delay (s)	30.1	19.7	35.2	6.8	42.2	14.0	4.3
Level of Service	C	B	D	A	D	B	A
Approach Delay (s)	28.6			10.9		11.9	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: SR 89 & West River St

9/18/2014

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	106	148	703	171	105	711
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1520	2735	1515	1719	1776
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1520	2735	1515	1719	1776
Peak-hour factor, PHF	0.80	0.80	0.90	0.90	0.87	0.87
Adj. Flow (vph)	132	185	781	190	121	817
RTOR Reduction (vph)	0	69	0	78	0	0
Lane Group Flow (vph)	132	116	781	112	121	817
Confl. Peds. (#/hr)		2		2		
Heavy Vehicles (%)	5%	5%	7%	5%	5%	7%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	11.6	21.4	23.1	34.7	9.8	36.4
Effective Green, g (s)	11.6	21.4	23.1	34.7	9.8	36.4
Actuated g/C Ratio	0.20	0.36	0.39	0.59	0.17	0.62
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	339	553	1074	894	286	1099
v/s Ratio Prot	c0.08	0.04	0.29	0.02	0.07	c0.46
v/s Ratio Perm		0.04		0.05		
v/c Ratio	0.39	0.21	0.73	0.13	0.42	0.74
Uniform Delay, d1	20.5	12.9	15.2	5.3	22.0	7.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.1	2.1	0.0	0.4	2.4
Delay (s)	20.8	12.9	17.3	5.4	22.3	10.3
Level of Service	C	B	B	A	C	B
Approach Delay (s)	16.2		14.9			11.9
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	58.8	Sum of lost time (s)	14.3
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2010 TWSC
6: Squaw Valley Rd & Chamonix Pl

Existing + Project Conditions
Summer PM

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	15	108	105	122	154	19
Conflicting Peds, #/hr	10	0	0	10	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	79	79	65	65	79	79
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	137	162	188	195	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	172	0	-	0	347	182
Stage 1	-	-	-	-	172	-
Stage 2	-	-	-	-	175	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1405	-	-	-	650	861
Stage 1	-	-	-	-	858	-
Stage 2	-	-	-	-	855	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1393	-	-	-	630	847
Mov Cap-2 Maneuver	-	-	-	-	630	-
Stage 1	-	-	-	-	851	-
Stage 2	-	-	-	-	835	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1393	-	-	-	648
HCM Lane V/C Ratio	0.014	-	-	-	0.338
HCM Control Delay (s)	7.6	0	-	-	13.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.5

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	252	9	104	223	6	125
Conflicting Peds, #/hr	0	10	10	0	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	75	75	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	293	10	139	297	8	160

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	313	0	883	318
Stage 1	-	-	-	-	308	-
Stage 2	-	-	-	-	575	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1247	-	316	723
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	563	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1237	-	276	711
Mov Cap-2 Maneuver	-	-	-	-	276	-
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	496	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	663	-	-	1237	-
HCM Lane V/C Ratio	0.253	-	-	0.112	-
HCM Control Delay (s)	12.3	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1	-	-	0.4	-

Intersection	
Int Delay, s/veh	8.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	10	356	1	150	314	19	0	0	189
Conflicting Peds, #/hr	2	0	2	2	0	2	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	72	80	80	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	396	1	208	392	24	0	0	262

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	416	0	0	397	0	0	1246	1251	398
Stage 1	-	-	-	-	-	-	418	418	-
Stage 2	-	-	-	-	-	-	828	833	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1143	-	-	1162	-	-	151	172	652
Stage 1	-	-	-	-	-	-	612	591	-
Stage 2	-	-	-	-	-	-	365	384	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1141	-	-	1160	-	-	126	140	651
Mov Cap-2 Maneuver	-	-	-	-	-	-	126	140	-
Stage 1	-	-	-	-	-	-	606	585	-
Stage 2	-	-	-	-	-	-	292	315	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	2.9	14.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	651	1141	-	-	1160	-	-	63	644
HCM Lane V/C Ratio	0.403	0.01	-	-	0.18	-	-	0.693	0.023
HCM Control Delay (s)	14.2	8.2	-	-	8.8	-	-	143.3	10.7
HCM Lane LOS	B	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	1.9	0	-	-	0.7	-	-	3	0.1

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	24	0	8
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	55	55	55
Heavy Vehicles, %	2	2	2
Mvmt Flow	44	0	15

Major/Minor	Minor2		
Conflicting Flow All	1371	1240	406
Stage 1	821	821	-
Stage 2	550	419	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	123	175	645
Stage 1	369	389	-
Stage 2	519	590	-
Platoon blocked, %			
Mov Cap-1 Maneuver	63	142	644
Mov Cap-2 Maneuver	63	142	-
Stage 1	365	319	-
Stage 2	306	584	-

Approach	SB
HCM Control Delay, s	110.2
HCM LOS	F

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	6	563	463	11	12	10
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	80	80	55	55
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	626	579	14	22	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	593	0	-	0	1225	588
Stage 1	-	-	-	-	586	-
Stage 2	-	-	-	-	639	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	983	-	-	-	198	509
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	526	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	981	-	-	-	196	508
Mov Cap-2 Maneuver	-	-	-	-	196	-
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	520	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	981	-	-	-	272
HCM Lane V/C Ratio	0.007	-	-	-	0.147
HCM Control Delay (s)	8.7	0	-	-	20.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	590	26	78	497	19	54
Conflicting Peds, #/hr	0	2	2	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	72	72	70	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	686	30	108	690	27	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	716	0	1608	703
Stage 1	-	-	-	-	701	-
Stage 2	-	-	-	-	907	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	885	-	115	438
Stage 1	-	-	-	-	492	-
Stage 2	-	-	-	-	394	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	884	-	101	437
Mov Cap-2 Maneuver	-	-	-	-	101	-
Stage 1	-	-	-	-	492	-
Stage 2	-	-	-	-	345	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	25
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	101	437	-	-	884	-
HCM Lane V/C Ratio	0.269	0.177	-	-	0.123	-
HCM Control Delay (s)	53.3	15	-	-	9.6	-
HCM Lane LOS	F	C	-	-	A	-
HCM 95th %tile Q(veh)	1	0.6	-	-	0.4	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Friday PM E+P
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	304	314	103.2%	24.4	4.0	C
	Through	548	549	100.1%	4.9	0.8	A
	Right Turn						
	Subtotal	**852**	**862**	**101.2%**	**11.9**	**1.5**	**B**
SB	Left Turn	4	2	60.0%	9.3	10.0	A
	Through	548	545	99.5%	28.5	3.7	C
	Right Turn	324	315	97.3%	6.4	1.8	A
	Subtotal	**876**	**863**	**98.5%**	**20.4**	**3.0**	**C**
EB	Left Turn	388	454	117.0%	22.0	3.2	C
	Through	4	2	40.0%	3.0	6.2	A
	Right Turn	308	331	107.5%	2.6	0.2	A
	Subtotal	**700**	**787**	**112.4%**	**13.7**	**1.4**	**B**
WB	Left Turn						
	Through	4	5	120.0%	12.0	13.1	B
	Right Turn						
	Subtotal	**4**	**5**	**120.0%**	**12.0**	**13.1**	**B**
Total		**2,432**	**2,517**	**103.5%**	**15.5**	**1.7**	**B**

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	67	72	58	727	748	51
Conflicting Peds, #/hr	0	0	14	0	0	14
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	360	-	-	220
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	93	93	93	93
Heavy Vehicles, %	2	2	2	7	7	2
Mvmt Flow	89	96	62	782	804	55

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1710	818	804	0	-	0
Stage 1	804	-	-	-	-	-
Stage 2	906	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	100	376	820	-	-	-
Stage 1	440	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	92	372	810	-	-	-
Mov Cap-2 Maneuver	92	-	-	-	-	-
Stage 1	440	-	-	-	-	-
Stage 2	364	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	90.5	0.7	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	810	-	92	372	-	-
HCM Lane V/C Ratio	0.077	-	0.971	0.258	-	-
HCM Control Delay (s)	9.8	-	168.5	18	-	-
HCM Lane LOS	A	-	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	5.6	1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	440	441	398	397	40	278	67	412	32	92	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85		0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1687	3374	1484	3273	3314		1603	1636	1480		1727	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1687	3374	1484	3273	3314		1603	1636	1480		1727	
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.89	0.89	0.87	0.87	0.87	0.81	0.81	0.81
Adj. Flow (vph)	36	478	479	447	446	45	320	77	474	40	114	19
RTOR Reduction (vph)	0	0	364	0	6	0	0	0	0	0	4	0
Lane Group Flow (vph)	36	478	115	447	485	0	195	202	474	0	169	0
Confl. Peds. (#/hr)			5			1			23			
Confl. Bikes (#/hr)						22			2			2
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	3.9	18.6	18.6	14.5	29.0		17.0	17.0	77.8		12.3	
Effective Green, g (s)	3.9	18.6	18.6	14.5	29.0		17.0	17.0	77.8		12.3	
Actuated g/C Ratio	0.05	0.24	0.24	0.19	0.37		0.22	0.22	1.00		0.16	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	84	806	354	610	1235		350	357	1480		273	
v/s Ratio Prot	0.02	c0.14		c0.14	0.15		0.12	c0.12			c0.10	
v/s Ratio Perm			0.08						0.32			
v/c Ratio	0.43	0.59	0.32	0.73	0.39		0.56	0.57	0.32		0.62	
Uniform Delay, d1	35.9	26.2	24.4	29.8	17.9		27.1	27.1	0.0		30.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	1.3	0.8	0.2	3.9	0.1		1.5	1.7	0.6		3.5	
Delay (s)	37.1	27.0	24.6	33.7	18.0		28.6	28.8	0.6		34.1	
Level of Service	D	C	C	C	B		C	C	A		C	
Approach Delay (s)		26.2			25.5			13.4			34.1	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	15.6
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter AM PP
Highway	SR-89 SB
From/To	Deerfield Dr to W River St
Jurisdiction	Nevada/Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.93	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 845 veh/h
Opposing direction volume, Vo 354 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	909	pc/h	383	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	30.9	mi/h
Percent Free Flow Speed, PFFS	70.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.998	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	909	pc/h	381	pc/h
Base percent time-spent-following,(note-4) BPTSFd	68.9	%		
Adjustment for no-passing zones, fnp	25.1			
Percent time-spent-following, PTSFd	86.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	45	veh-mi
Peak-hour vehicle-miles of travel, VMT60	169	veh-mi
Peak 15-min total travel time, TT15	1.5	veh-h
Capacity from ATS, CdATS	1690	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1690	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	30.9	mi/h
Percent time-spent-following, PTSFd (from above)	86.6	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	908.6
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.29
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter AM PP
Highway	SR-89 SB
From/To	W River St to Squaw Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1			Peak hour factor, PHF	0.93	
Shoulder width	8.0	ft		% Trucks and buses	2	%
Lane width	12.0	ft		% Trucks crawling	0.0	%
Segment length	7.8	mi		Truck crawl speed	0.0	mi/hr
Terrain type	Rolling			% Recreational vehicles	0	%
Grade: Length	-	mi		% No-passing zones	55	%
Up/down	-	%		Access point density	1	/mi

Analysis direction volume, Vd	1058	veh/h
Opposing direction volume, Vo	276	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.1	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.978	
Grade adj. factor,(note-1) fg	1.00		0.83	
Directional flow rate,(note-2) vi	1145	pc/h	366	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.6	mi/h
Average travel speed, ATSd	45.5	mi/h
Percent Free Flow Speed, PFFS	76.1	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.986
Grade adjustment factor,(note-1) fg	1.00	0.85
Directional flow rate,(note-2) vi	1138 pc/h	354 pc/h

Base percent time-spent-following,(note-4) BPTSFd	76.1	%
Adjustment for no-passing zones, fnp	15.0	
Percent time-spent-following, PTSFd	87.5	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.67	
Peak 15-min vehicle-miles of travel, VMT15	2218	veh-mi
Peak-hour vehicle-miles of travel, VMT60	8252	veh-mi
Peak 15-min total travel time, TT15	48.8	veh-h
Capacity from ATS, CdATS	1449	veh/h
Capacity from PTSF, CdPTSF	1478	veh/h
Directional Capacity	1449	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.5	mi/h
Percent time-spent-following, PTSFd (from above)	87.5	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1137.6
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	1.89
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter AM PP
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 640 veh/h
Opposing direction volume, Vo 531 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.6		1.7	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.988		0.986	
Grade adj. factor,(note-1) fg	0.98		0.97	
Directional flow rate,(note-2) vi	734	pc/h	617	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.8	mi/h
Average travel speed, ATSd	37.7	mi/h
Percent Free Flow Speed, PFFS	75.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.2	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.996	
Grade adjustment factor,(note-1) fg	0.99		0.97	
Directional flow rate,(note-2) vi	718	pc/h	611	pc/h
Base percent time-spent-following,(note-4) BPTSFd	64.1	%		
Adjustment for no-passing zones, fnp	29.9			
Percent time-spent-following, PTSFd	80.3	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.43	
Peak 15-min vehicle-miles of travel, VMT15	231	veh-mi
Peak-hour vehicle-miles of travel, VMT60	832	veh-mi
Peak 15-min total travel time, TT15	6.1	veh-h
Capacity from ATS, CdATS	1626	veh/h
Capacity from PTSF, CdPTSF	1649	veh/h
Directional Capacity	1626	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	37.7	mi/h
Percent time-spent-following, PTSFd (from above)	80.3	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	711.1
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.54
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter AM PP
Highway	SR-89 NB
From/To	SR 28 to A. Meadows Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1			Peak hour factor, PHF	0.90	
Shoulder width	6.0	ft		% Trucks and buses	2	%
Lane width	12.0	ft		% Trucks crawling	0.0	%
Segment length	3.7	mi		Truck crawl speed	0.0	mi/hr
Terrain type	Rolling			% Recreational vehicles	0	%
Grade: Length	-	mi		% No-passing zones	100	%
Up/down	-	%		Access point density	1	/mi

Analysis direction volume, Vd	908	veh/h
Opposing direction volume, Vo	247	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.2	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.977	
Grade adj. factor,(note-1) fg	1.00		0.81	
Directional flow rate,(note-2) vi	1015	pc/h	347	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	49.8	mi/h
Adjustment for no-passing zones, fnp	3.0	mi/h
Average travel speed, ATSd	36.1	mi/h
Percent Free Flow Speed, PFFS	72.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.986
Grade adjustment factor,(note-1) fg	1.00	0.84
Directional flow rate,(note-2) vi	1009 pc/h	331 pc/h

Base percent time-spent-following,(note-4) BPTSFd	71.8	%
Adjustment for no-passing zones, fnp	30.8	
Percent time-spent-following, PTSFd	95.0	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	933	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3360	veh-mi
Peak 15-min total travel time, TT15	25.8	veh-h
Capacity from ATS, CdATS	1413	veh/h
Capacity from PTSF, CdPTSF	1461	veh/h
Directional Capacity	1413	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.1	mi/h
Percent time-spent-following, PTSFd (from above)	95.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1008.9
Effective width of outside lane, We	24.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.76
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/14
Analysis Time Period	Winter AM PP
Highway	SR89 NB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	Existing PP
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.87	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 747 veh/h
Opposing direction volume, Vo 344 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	859	pc/h	398	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	2.1	mi/h
Average travel speed, ATSd	27.8	mi/h
Percent Free Flow Speed, PFFS	70.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.998	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	859	pc/h	396	pc/h
Base percent time-spent-following,(note-4) BPTSFd	67.7	%		
Adjustment for no-passing zones, fnp	24.7			
Percent time-spent-following, PTSFd	84.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	64	veh-mi
Peak-hour vehicle-miles of travel, VMT60	224	veh-mi
Peak 15-min total travel time, TT15	2.3	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1697	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	27.8	mi/h
Percent time-spent-following, PTSFd (from above)	84.6	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	858.6
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.68
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter PM PP
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.89	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 1315 veh/h
Opposing direction volume, Vo 314 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1478	pc/h	355	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	3.0	mi/h
Average travel speed, ATSd	26.5	mi/h
Percent Free Flow Speed, PFFS	60.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.998
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1478 pc/h	354 pc/h

Base percent time-spent-following,(note-4) BPTSFd	83.9	%
Adjustment for no-passing zones, fnp	16.4	
Percent time-spent-following, PTSFd	97.1	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.87	
Peak 15-min vehicle-miles of travel, VMT15	74	veh-mi
Peak-hour vehicle-miles of travel, VMT60	263	veh-mi
Peak 15-min total travel time, TT15	2.8	veh-h
Capacity from ATS, CdATS	1690	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1690	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	26.5	mi/h
Percent time-spent-following, PTSFd (from above)	97.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1477.5
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.54
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter PM PP
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.89	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1398 veh/h
Opposing direction volume, Vo 221 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.2	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.977	
Grade adj. factor,(note-1) fg	1.00		0.79	
Directional flow rate,(note-2) vi	1580	pc/h	322	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	42.2	mi/h
Percent Free Flow Speed, PFFS	70.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.986	
Grade adjustment factor,(note-1) fg	1.00		0.82	
Directional flow rate,(note-2) vi	1571	pc/h	307	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.0	%		
Adjustment for no-passing zones, fnp	10.5			
Percent time-spent-following, PTSFd	93.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.93	
Peak 15-min vehicle-miles of travel, VMT15	3063	veh-mi
Peak-hour vehicle-miles of travel, VMT60	10904	veh-mi
Peak 15-min total travel time, TT15	72.6	veh-h
Capacity from ATS, CdATS	1380	veh/h
Capacity from PTSF, CdPTSF	1428	veh/h
Directional Capacity	1380	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	42.2	mi/h
Percent time-spent-following, PTSFd (from above)	93.8	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1570.8
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	2.05
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter PM PP
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.89	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	695	veh/h
Opposing direction volume, Vo	566	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.7	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.992		0.986	
Grade adj. factor,(note-1) fg	0.99		0.97	
Directional flow rate,(note-2) vi	795	pc/h	665	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.7	mi/h
Average travel speed, ATSd	37.0	mi/h
Percent Free Flow Speed, PFFS	73.9	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	0.98
Directional flow rate,(note-2) vi	781 pc/h	649 pc/h
Base percent time-spent-following,(note-4) BPTSFd	67.2 %	
Adjustment for no-passing zones, fnp	27.4	
Percent time-spent-following, PTSFd	82.2 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.47	
Peak 15-min vehicle-miles of travel, VMT15	254	veh-mi
Peak-hour vehicle-miles of travel, VMT60	903	veh-mi
Peak 15-min total travel time, TT15	6.9	veh-h
Capacity from ATS, CdATS	1626	veh/h
Capacity from PTSF, CdPTSF	1666	veh/h
Directional Capacity	1626	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	37.0	mi/h
Percent time-spent-following, PTSFd (from above)	82.2	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	780.9
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.59
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter PM PP
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	Existing Conditions PP
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.87	
Shoulder width	5.5	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	844	veh/h
Opposing direction volume, Vo	345	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.0	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.980	
Grade adj. factor,(note-1) fg	1.00		0.90	
Directional flow rate,(note-2) vi	976	pc/h	450	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	2.5	mi/h
Average travel speed, ATSd	34.9	mi/h
Percent Free Flow Speed, PFFS	72.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.6	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.988	
Grade adjustment factor,(note-1) fg	1.00		0.90	
Directional flow rate,(note-2) vi	970	pc/h	446	pc/h
Base percent time-spent-following,(note-4) BPTSFd	73.1	%		
Adjustment for no-passing zones, fnp	23.0			
Percent time-spent-following, PTSFd	88.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	897	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3123	veh-mi
Peak 15-min total travel time, TT15	25.7	veh-h
Capacity from ATS, CdATS	1536	veh/h
Capacity from PTSF, CdPTSF	1568	veh/h
Directional Capacity	1536	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	34.9	mi/h
Percent time-spent-following, PTSFd (from above)	88.9	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	970.1
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.97
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/14
Analysis Time Period	Winter PM PP
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	Existing PP
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 561 veh/h
Opposing direction volume, Vo 457 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.998		0.998	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	703	pc/h	572	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	1.5	mi/h
Average travel speed, ATSd	28.3	mi/h
Percent Free Flow Speed, PFFS	71.3	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	701 pc/h	571 pc/h
Base percent time-spent-following,(note-4) BPTSFd	62.4 %	
Adjustment for no-passing zones, fnp	29.3	
Percent time-spent-following, PTSFd	78.5 %	

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.41	
Peak 15-min vehicle-miles of travel, VMT15	53	veh-mi
Peak-hour vehicle-miles of travel, VMT60	168	veh-mi
Peak 15-min total travel time, TT15	1.9	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	28.3	mi/h
Percent time-spent-following, PTSFd (from above)	78.5	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	701.3
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.58
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	E+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	4.7	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 851 veh/h
Opposing direction volume, Vo 816 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	946	pc/h	907	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	28.2	mi/h
Percent Free Flow Speed, PFFS	64.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	946	pc/h	907	pc/h
Base percent time-spent-following,(note-4) BPTSFd	75.3	%		
Adjustment for no-passing zones, fnp	21.0			
Percent time-spent-following, PTSFd	86.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.56	
Peak 15-min vehicle-miles of travel, VMT15	47	veh-mi
Peak-hour vehicle-miles of travel, VMT60	170	veh-mi
Peak 15-min total travel time, TT15	1.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	28.2	mi/h
Percent time-spent-following, PTSFd (from above)	86.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	945.6
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.66
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	E+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 874 veh/h
Opposing direction volume, Vo 817 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.979	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	992	pc/h	927	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h
Average travel speed, ATSd	43.9	mi/h
Percent Free Flow Speed, PFFS	73.5	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	971 pc/h	908 pc/h

Base percent time-spent-following,(note-4) BPTSFd	76.0	%
Adjustment for no-passing zones, fnp	18.6	
Percent time-spent-following, PTSFd	85.6	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.58	
Peak 15-min vehicle-miles of travel, VMT15	1894	veh-mi
Peak-hour vehicle-miles of travel, VMT60	6817	veh-mi
Peak 15-min total travel time, TT15	43.1	veh-h
Capacity from ATS, CdATS	1664	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1664	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	43.9	mi/h
Percent time-spent-following, PTSFd (from above)	85.6	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	971.1
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.27
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	E+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 799 veh/h
Opposing direction volume, Vo 794 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.979	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	907	pc/h	901	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	34.8	mi/h
Percent Free Flow Speed, PFFS	69.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	888	pc/h	882	pc/h
Base percent time-spent-following,(note-4) BPTSFd	73.4	%		
Adjustment for no-passing zones, fnp	22.5			
Percent time-spent-following, PTSFd	84.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	289	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1039	veh-mi
Peak 15-min total travel time, TT15	8.3	veh-h
Capacity from ATS, CdATS	1664	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1664	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	34.8	mi/h
Percent time-spent-following, PTSFd (from above)	84.7	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	887.8
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.00
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Summer PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	E+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.93	
Shoulder width	5.5	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	820	veh/h
Opposing direction volume, Vo	785	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.4	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.973	
Grade adj. factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	901	pc/h	876	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	33.5	mi/h
Percent Free Flow Speed, PFFS	69.1	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	882 pc/h	844 pc/h

Base percent time-spent-following,(note-4) BPTSFd	72.7	%
Adjustment for no-passing zones, fnp	23.1	
Percent time-spent-following, PTSFd	84.5	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	816	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3034	veh-mi
Peak 15-min total travel time, TT15	24.4	veh-h
Capacity from ATS, CdATS	1638	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1638	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	33.5	mi/h
Percent time-spent-following, PTSFd (from above)	84.5	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	881.7
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.27
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/14
Analysis Time Period	Summer PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	E+P
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.87	
Shoulder width	2.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd	931	veh/h
Opposing direction volume, Vo	757	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1070	pc/h	870	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATSd	23.8	mi/h
Percent Free Flow Speed, PFFS	60.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1070	pc/h	870	pc/h
Base percent time-spent-following,(note-4) BPTSFd	78.2	%		
Adjustment for no-passing zones, fnp	17.8			
Percent time-spent-following, PTSFd	88.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.63	
Peak 15-min vehicle-miles of travel, VMT15	80	veh-mi
Peak-hour vehicle-miles of travel, VMT60	279	veh-mi
Peak 15-min total travel time, TT15	3.4	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	23.8	mi/h
Percent time-spent-following, PTSFd (from above)	88.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1070.1
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.25
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	WB	NB	NB	NB	B31	SB	SB	B33
Directions Served	L	LT	LTR	L	T	TR	T	T	R	T
Maximum Queue (ft)	143	96	26	334	203	35	59	385	270	240
Average Queue (ft)	87	31	9	233	65	5	13	247	99	83
95th Queue (ft)	149	98	31	383	273	66	114	435	320	412
Link Distance (ft)		523	166		420	420	1602	339		653
Upstream Blk Time (%)				2	3	0		7		3
Queuing Penalty (veh)				0	0	0		0		0
Storage Bay Dist (ft)	450			400					260	
Storage Blk Time (%)				4	1			21	0	
Queuing Penalty (veh)				3	5			141	2	

Intersection: 29: Bend

Movement	WB	WB
Directions Served	T	
Maximum Queue (ft)	472	76
Average Queue (ft)	161	11
95th Queue (ft)	554	132
Link Distance (ft)	498	498
Upstream Blk Time (%)	2	0
Queuing Penalty (veh)	15	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 31: Bend

Movement	SB
Directions Served	T
Maximum Queue (ft)	20
Average Queue (ft)	3
95th Queue (ft)	58
Link Distance (ft)	420
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 166

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	B29	B29	WB	NB	NB	NB	B31	SB	SB	SB
Directions Served	L	LT	T	T	LTR	L	T	TR	T	L	T	R
Maximum Queue (ft)	437	530	204	103	21	187	319	317	36	5	83	69
Average Queue (ft)	330	370	62	22	7	102	241	249	14	2	49	58
95th Queue (ft)	522	624	276	190	26	244	397	387	116	11	96	75
Link Distance (ft)		526	1488	1488	165		406	406	1588		325	
Upstream Blk Time (%)		7				0	3	2				
Queuing Penalty (veh)		0				0	0	0				
Storage Bay Dist (ft)	450					400				180		260
Storage Blk Time (%)	3	9				0	3					
Queuing Penalty (veh)	15	43				0	3					

Intersection: 33: Bend

Movement	NB	NB
Directions Served	T	
Maximum Queue (ft)	358	341
Average Queue (ft)	343	322
95th Queue (ft)	402	389
Link Distance (ft)	318	318
Upstream Blk Time (%)	72	17
Queuing Penalty (veh)	581	134
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 776

APPENDIX C:

CUMULATIVE CONDITIONS TECHNICAL CALCULATIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	150	560	190	160	30	180	40	130	40	70	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3377	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3377	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.80	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	33	167	622	238	200	38	200	44	144	42	74	32
RTOR Reduction (vph)	0	0	332	0	0	27	0	0	111	0	27	0
Lane Group Flow (vph)	33	167	290	238	200	11	200	44	33	0	121	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	2.2	14.4	30.5	8.1	20.8	20.8	16.1	16.1	16.1		10.1	
Effective Green, g (s)	2.2	14.4	30.5	8.1	20.8	20.8	16.1	16.1	16.1		10.1	
Actuated g/C Ratio	0.03	0.21	0.44	0.12	0.30	0.30	0.23	0.23	0.23		0.14	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	55	384	692	205	555	472	408	430	365		489	
v/s Ratio Prot	0.02	c0.09	0.10	c0.13	0.11		c0.11	0.02			c0.04	
v/s Ratio Perm			0.09			0.01			0.02			
v/c Ratio	0.60	0.43	0.42	1.16	0.36	0.02	0.49	0.10	0.09		0.25	
Uniform Delay, d1	33.3	24.1	13.5	30.8	19.2	17.3	23.2	21.1	21.1		26.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	11.2	0.3	0.1	113.0	0.1	0.0	0.3	0.0	0.0		0.1	
Delay (s)	44.5	24.4	13.6	143.8	19.4	17.3	23.6	21.1	21.1		26.5	
Level of Service	D	C	B	F	B	B	C	C	C		C	
Approach Delay (s)		17.1			81.4			22.4			26.5	
Approach LOS		B			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	69.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_Cumul_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	147	3.0	0.197	5.1	LOS A	0.0	0.0	0.00	0.77	27.9
8	T	284	3.0	0.197	5.1	LOS A	0.0	0.0	0.00	0.33	32.0
Approach		432	3.0	0.197	5.1	LOS A	0.0	0.0	0.00	0.48	30.4
East: I-80 WB off-ramp											
1	L	189	3.0	0.252	7.5	LOS A	0.7	17.7	0.39	0.79	24.3
6	T	5	3.0	0.252	7.5	LOS A	0.7	17.7	0.39	0.55	26.5
16	R	84	3.0	0.111	5.9	LOS A	0.3	7.4	0.37	0.61	27.2
Approach		279	3.0	0.252	7.0	LOS A	0.7	17.7	0.39	0.73	25.1
North: HWY 89											
4	T	695	3.0	0.546	12.9	LOS B	3.2	81.6	0.62	0.77	24.3
14	R	147	3.0	0.546	12.9	LOS B	3.2	81.6	0.62	0.82	23.9
Approach		842	3.0	0.546	12.9	LOS B	3.2	81.6	0.62	0.78	24.2
All Vehicles		1553	3.0	0.546	9.6	LOS A	3.2	81.6	0.41	0.69	25.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_Cumul_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	305	3.0	0.346	8.3	LOS A	1.5	38.3	0.46	0.60	28.4
18	R	274	3.0	0.346	8.3	LOS A	1.5	38.3	0.46	0.65	27.6
Approach		579	3.0	0.346	8.3	LOS A	1.5	38.3	0.46	0.63	28.0
North: HWY 89											
7	L	137	3.0	0.403	7.5	LOS A	0.0	0.0	0.00	0.90	27.9
4	T	747	3.0	0.403	7.5	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		884	3.0	0.403	7.5	LOS A	0.0	0.0	0.00	0.46	31.4
West: I-80 EB off-ramp											
5	L	126	3.0	0.549	16.9	LOS C	2.2	57.0	0.68	1.00	21.1
2	T	1	3.0	0.549	16.9	LOS C	2.2	57.0	0.68	0.84	22.2
12	R	495	3.0	0.549	16.5	LOS C	2.2	57.0	0.66	0.89	22.6
Approach		622	3.0	0.549	16.6	LOS C	2.2	57.0	0.67	0.91	22.3
All Vehicles		2085	3.0	0.549	10.4	LOS B	2.2	57.0	0.33	0.64	27.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

Cumulative Conditions
Winter AM

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	250	60	80	300	10	890	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.81	0.81	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	309	74	89	333	11	957	312
RTOR Reduction (vph)	0	28	0	0	0	0	80
Lane Group Flow (vph)	309	46	89	333	11	957	232
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	10.2	17.9	7.7	39.4	1.4	33.1	43.3
Effective Green, g (s)	10.2	17.9	7.7	39.4	1.4	33.1	43.3
Actuated g/C Ratio	0.16	0.28	0.12	0.61	0.02	0.51	0.67
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	538	435	209	2145	38	1460	1054
v/s Ratio Prot	c0.09	0.01	c0.05	0.09	0.01	c0.33	0.03
v/s Ratio Perm		0.02					0.11
v/c Ratio	0.57	0.11	0.43	0.16	0.29	0.66	0.22
Uniform Delay, d1	25.4	17.6	26.6	5.6	31.3	11.7	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	1.4	0.2	4.2	2.3	0.0
Delay (s)	26.3	17.7	28.0	5.7	35.5	14.1	4.3
Level of Service	C	B	C	A	D	B	A
Approach Delay (s)	24.6			10.4		11.9	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	260	150	230	50	10	940
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.85	0.85	0.90	0.90	0.95	0.95
Adj. Flow (vph)	306	176	256	56	11	989
RTOR Reduction (vph)	0	125	0	14	0	0
Lane Group Flow (vph)	306	51	256	42	11	989
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	18.2	23.3	42.4	60.6	5.1	51.0
Effective Green, g (s)	18.2	23.3	42.4	60.6	5.1	51.0
Actuated g/C Ratio	0.23	0.29	0.53	0.76	0.06	0.64
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	402	461	1520	1199	112	1187
v/s Ratio Prot	c0.17	0.01	0.09	0.01	0.01	c0.53
v/s Ratio Perm		0.03		0.02		
v/c Ratio	0.76	0.11	0.17	0.04	0.10	0.83
Uniform Delay, d1	28.9	20.8	9.7	2.4	35.3	11.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.5	0.0	0.2	0.0	0.1	6.9
Delay (s)	36.3	20.8	9.9	2.4	35.4	18.1
Level of Service	D	C	A	A	D	B
Approach Delay (s)	30.7		8.6			18.3
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	70	300	80	15	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	95	95	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	88	316	84	23	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	316	0	-	0	429	316
Stage 1	-	-	-	-	316	-
Stage 2	-	-	-	-	113	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1244	-	-	-	583	724
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	912	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1244	-	-	-	577	724
Mov Cap-2 Maneuver	-	-	-	-	577	-
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1244	-	-	-	642
HCM Lane V/C Ratio	0.01	-	-	-	0.072
HCM Control Delay (s)	7.9	0	-	-	11
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	80	20	400	390	15	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	95	95	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	114	29	421	411	18	71

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	143	0	1382	129
Stage 1	-	-	-	-	129	-
Stage 2	-	-	-	-	1253	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1440	-	159	921
Stage 1	-	-	-	-	897	-
Stage 2	-	-	-	-	269	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1440	-	113	921
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	897	-
Stage 2	-	-	-	-	190	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.3	17.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	379	-	-	1440	-
HCM Lane V/C Ratio	0.233	-	-	0.292	-
HCM Control Delay (s)	17.4	-	-	8.5	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.9	-	-	1.2	-

Intersection	
Int Delay, s/veh	10.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	1	130	0	480	780	5	1	5	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	95	95	95	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	186	0	505	821	5	1	6	88

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	826	0	0	186	0	0	2052	2026	186
Stage 1	-	-	-	-	-	-	189	189	-
Stage 2	-	-	-	-	-	-	1863	1837	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	805	-	-	1388	-	-	41	58	856
Stage 1	-	-	-	-	-	-	813	744	-
Stage 2	-	-	-	-	-	-	94	126	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	805	-	-	1388	-	-	13	37	856
Mov Cap-2 Maneuver	-	-	-	-	-	-	13	37	-
Stage 1	-	-	-	-	-	-	812	743	-
Stage 2	-	-	-	-	-	-	38	80	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	3.4	26.7
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	259	805	-	-	1388	-	-	23	76
HCM Lane V/C Ratio	0.367	0.002	-	-	0.364	-	-	0.362	0.768
HCM Control Delay (s)	26.7	9.5	-	-	9.1	-	-	232.8	138.3
HCM Lane LOS	D	A	-	-	A	-	-	F	F
HCM 95th %tile Q(veh)	1.6	0	-	-	1.7	-	-	1.1	3.7

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	5	15	20
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	8	25	33

Major/Minor	Minor2		
Conflicting Flow All	2069	2023	824
Stage 1	1834	1834	-
Stage 2	235	189	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	40	58	373
Stage 1	97	127	-
Stage 2	768	744	-
Platoon blocked, %			
Mov Cap-1 Maneuver	23	37	373
Mov Cap-2 Maneuver	23	37	-
Stage 1	97	81	-
Stage 2	683	743	-

Approach	SB
HCM Control Delay, s	150.1
HCM LOS	F

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	200	1240	10	10	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	95	95	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	286	1305	11	17	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1316	0	-	0	1611	1311
Stage 1	-	-	-	-	1311	-
Stage 2	-	-	-	-	300	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	525	-	-	-	115	194
Stage 1	-	-	-	-	252	-
Stage 2	-	-	-	-	752	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	525	-	-	-	113	194
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	252	-
Stage 2	-	-	-	-	740	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	38.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	525	-	-	-	157
HCM Lane V/C Ratio	0.014	-	-	-	0.318
HCM Control Delay (s)	12	0	-	-	38.3
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	1.3

Intersection	
Int Delay, s/veh	5.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	170	40	40	1190	60	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	95	95	70	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	243	57	42	1253	86	29

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	300	0	1608	271
Stage 1	-	-	-	-	271	-
Stage 2	-	-	-	-	1337	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1261	-	115	768
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	245	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1261	-	111	768
Mov Cap-2 Maneuver	-	-	-	-	111	-
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	237	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	80.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	111	768	-	-	1261	-
HCM Lane V/C Ratio	0.772	0.037	-	-	0.033	-
HCM Control Delay (s)	104.1	9.9	-	-	8	-
HCM Lane LOS	F	A	-	-	A	-
HCM 95th %tile Q(veh)	4.3	0.1	-	-	0.1	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Saturday AM Cumul NP
AM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	644	642	99.8%	28.9	8.1	C
	Through	212	205	96.8%	3.8	1.4	A
	Right Turn						
	Subtotal	**856**	**848**	**99.0%**	**23.0**	**7.2**	**C**
SB	Left Turn						
	Through	576	540	93.8%	46.0	7.3	D
	Right Turn	744	671	90.2%	13.5	2.7	B
	Subtotal	**1,320**	**1,211**	**91.7%**	**27.9**	**4.3**	**C**
EB	Left Turn	112	144	128.9%	33.4	4.8	C
	Through						
	Right Turn	112	146	130.7%	1.9	0.1	A
	Subtotal	**224**	**291**	**129.8%**	**17.5**	**2.9**	**B**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,400**	**2,349**	**97.9%**	**24.9**	**3.9**	**C**

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	80	50	350	700	280	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.58	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1080	1863	1863	1583
Peak-hour factor, PHF	0.85	0.85	0.90	0.90	0.95	0.95
Adj. Flow (vph)	94	59	389	778	295	358
RTOR Reduction (vph)	0	51	0	0	0	111
Lane Group Flow (vph)	94	8	389	778	295	247
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	6.4	6.4	31.9	31.9	31.9	31.9
Effective Green, g (s)	6.4	6.4	31.9	31.9	31.9	31.9
Actuated g/C Ratio	0.14	0.14	0.69	0.69	0.69	0.69
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	244	218	744	1283	1283	1090
v/s Ratio Prot	c0.05			c0.42	0.16	
v/s Ratio Perm		0.01	0.36			0.16
v/c Ratio	0.39	0.04	0.52	0.61	0.23	0.23
Uniform Delay, d1	18.2	17.3	3.5	3.8	2.7	2.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.1	0.7	0.8	0.1	0.1
Delay (s)	19.2	17.4	4.2	4.7	2.8	2.8
Level of Service	B	B	A	A	A	A
Approach Delay (s)	18.5			4.5	2.8	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	46.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	220	150	220	690	10	490	70	280	10	30	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3531		1681	1706	1560		1796	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3531		1681	1706	1560		1796	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	22	244	167	244	767	11	544	78	311	13	40	13
RTOR Reduction (vph)	0	0	121	0	1	0	0	0	0	0	11	0
Lane Group Flow (vph)	22	244	46	244	777	0	310	312	311	0	55	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	0.5	14.2	14.2	4.7	18.2		15.0	15.0	51.6		2.3	
Effective Green, g (s)	0.5	14.2	14.2	4.7	18.2		15.0	15.0	51.6		2.3	
Actuated g/C Ratio	0.01	0.28	0.28	0.09	0.35		0.29	0.29	1.00		0.04	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	17	973	429	312	1245		488	495	1560		80	
v/s Ratio Prot	0.01	0.07		c0.07	c0.22		c0.18	0.18			c0.03	
v/s Ratio Perm			0.03						0.20			
v/c Ratio	1.29	0.25	0.11	0.78	0.62		0.64	0.63	0.20		0.68	
Uniform Delay, d1	25.6	14.6	14.0	22.9	13.9		15.9	15.9	0.0		24.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	323.2	0.0	0.0	11.2	0.7		2.4	2.3	0.3		19.7	
Delay (s)	348.7	14.6	14.0	34.1	14.6		18.3	18.2	0.3		43.9	
Level of Service	F	B	B	C	B		B	B	A		D	
Approach Delay (s)		31.4			19.2			12.3			43.9	
Approach LOS		C			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	51.6	Sum of lost time (s)	15.6
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Cumulative + Project Conditions
Winter PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	280	260	190	270	60	470	130	250	50	120	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3323	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3323	
Peak-hour factor, PHF	0.85	0.85	0.85	0.80	0.80	0.80	0.90	0.90	0.90	0.85	0.85	0.85
Adj. Flow (vph)	118	329	306	238	338	75	522	144	278	59	141	106
RTOR Reduction (vph)	0	0	142	0	0	55	0	0	188	0	61	0
Lane Group Flow (vph)	118	329	164	238	338	20	522	144	90	0	245	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	10.4	22.8	57.5	16.1	29.0	29.0	34.7	34.7	34.7		12.7	
Effective Green, g (s)	10.4	22.8	57.5	16.1	29.0	29.0	34.7	34.7	34.7		12.7	
Actuated g/C Ratio	0.10	0.21	0.54	0.15	0.27	0.27	0.32	0.32	0.32		0.12	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	171	395	848	265	503	427	572	602	511		393	
v/s Ratio Prot	0.07	c0.18	0.06	c0.13	0.18		c0.29	0.08			c0.07	
v/s Ratio Perm			0.04			0.01			0.06			
v/c Ratio	0.69	0.83	0.19	0.90	0.67	0.05	0.91	0.24	0.18		0.62	
Uniform Delay, d1	46.9	40.4	12.9	44.8	34.9	28.9	34.8	26.6	26.0		45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	9.3	13.4	0.0	29.3	2.8	0.0	18.7	0.1	0.1		2.2	
Delay (s)	56.2	53.8	12.9	74.1	37.7	29.0	53.5	26.7	26.1		47.2	
Level of Service	E	D	B	E	D	C	D	C	C		D	
Approach Delay (s)		37.6			50.0			41.4			47.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	43.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	107.3	Sum of lost time (s)	21.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_Cumul_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	453	3.0	0.576	10.5	LOS B	0.0	0.0	0.00	0.76	27.9
8	T	811	3.0	0.576	10.5	LOS B	0.0	0.0	0.00	0.33	32.0
Approach		1263	3.0	0.576	10.5	LOS B	0.0	0.0	0.00	0.49	30.3
East: I-80 WB off-ramp											
1	L	189	3.0	0.441	16.7	LOS C	1.4	36.1	0.72	0.97	21.0
6	T	5	3.0	0.441	16.7	LOS C	1.4	36.1	0.72	0.85	22.1
16	R	147	3.0	0.356	15.2	LOS C	1.1	27.9	0.72	0.88	22.7
Approach		342	3.0	0.441	16.0	LOS C	1.4	36.1	0.72	0.93	21.7
North: HWY 89											
4	T	516	3.0	0.673	21.9	LOS C	4.2	107.2	0.78	0.99	20.8
14	R	242	3.0	0.673	21.9	LOS C	4.2	107.2	0.78	1.02	20.5
Approach		758	3.0	0.673	21.9	LOS C	4.2	107.2	0.78	1.00	20.7
All Vehicles		2363	3.0	0.673	15.0	LOS B	4.2	107.2	0.36	0.71	25.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION 5.1.2.1953
Project: N:\2012Projects\2978_SquawValleyOlympicVillagePlanProgramEIR\Analysis\Sidra \Squaw_Intersections_2and3.sip
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MOVEMENT SUMMARY

Site: int_3_Cumul_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	1211	3.0	1.121	90.4	LOS F	55.9	1431.0	1.00	2.23	10.2
18	R	684	3.0	1.121	90.4	LOS F	55.9	1431.0	1.00	2.23	10.1
Approach		1895	3.0	1.121	90.4	LOS F	55.9	1431.0	1.00	2.23	10.2
North: HWY 89											
7	L	200	3.0	0.321	6.4	LOS A	0.0	0.0	0.00	0.81	27.9
4	T	505	3.0	0.321	6.4	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		705	3.0	0.321	6.4	LOS A	0.0	0.0	0.00	0.50	30.8
West: I-80 EB off-ramp											
5	L	53	3.0	0.183	8.0	LOS A	0.5	12.8	0.49	0.87	24.3
2	T	1	3.0	0.183	8.0	LOS A	0.5	12.8	0.49	0.64	26.3
12	R	179	3.0	0.183	7.8	LOS A	0.5	12.8	0.47	0.73	26.5
Approach		233	3.0	0.183	7.8	LOS A	0.5	12.8	0.47	0.76	25.9
All Vehicles		2833	3.0	1.121	62.7	LOS F	55.9	1431.0	0.71	1.68	13.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	540	70	200	1260	10	280	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.85	0.85	0.85
Adj. Flow (vph)	600	78	222	1400	12	329	435
RTOR Reduction (vph)	0	46	0	0	0	0	52
Lane Group Flow (vph)	600	32	222	1400	12	329	383
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	16.8	28.8	12.0	38.4	0.8	27.2	44.0
Effective Green, g (s)	16.8	28.8	12.0	38.4	0.8	27.2	44.0
Actuated g/C Ratio	0.24	0.41	0.17	0.55	0.01	0.39	0.63
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	823	651	303	1941	20	1114	995
v/s Ratio Prot	c0.17	0.01	c0.13	c0.40	0.01	0.11	0.09
v/s Ratio Perm		0.01					0.15
v/c Ratio	0.73	0.05	0.73	0.72	0.60	0.30	0.38
Uniform Delay, d1	24.5	12.4	27.5	11.8	34.4	14.8	6.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	0.0	8.8	2.4	40.2	0.7	0.1
Delay (s)	27.3	12.4	36.3	14.2	74.6	15.5	6.5
Level of Service	C	B	D	B	E	B	A
Approach Delay (s)	25.6			17.2		11.3	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	70	100	1360	190	190	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.80	0.80	0.90	0.90	0.85	0.85
Adj. Flow (vph)	88	125	1511	211	224	188
RTOR Reduction (vph)	0	14	0	35	0	0
Lane Group Flow (vph)	88	111	1511	176	224	188
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	9.9	30.8	64.9	74.8	20.9	89.3
Effective Green, g (s)	9.9	30.8	64.9	74.8	20.9	89.3
Actuated g/C Ratio	0.09	0.28	0.59	0.68	0.19	0.81
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	159	443	1692	1076	336	1512
v/s Ratio Prot	c0.05	0.05	c0.53	0.01	c0.13	0.10
v/s Ratio Perm		0.02		0.10		
v/c Ratio	0.55	0.25	0.89	0.16	0.67	0.12
Uniform Delay, d1	47.9	30.7	19.5	6.3	41.3	2.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	0.1	7.7	0.0	3.8	0.2
Delay (s)	50.3	30.8	27.2	6.4	45.2	2.3
Level of Service	D	C	C	A	D	A
Approach Delay (s)	38.8		24.6			25.6
Approach LOS	D		C			C

Intersection Summary			
HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	20	230	130	30	150	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	85	85	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	307	153	35	200	40

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	153	0	-	0	513	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	360	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1428	-	-	-	521	893
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1428	-	-	-	509	893
Mov Cap-2 Maneuver	-	-	-	-	509	-
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	16.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1428	-	-	-	548
HCM Lane V/C Ratio	0.019	-	-	-	0.438
HCM Control Delay (s)	7.6	0	-	-	16.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	2.2

Intersection	
Int Delay, s/veh	46.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	370	20	80	110	50	480
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	85	85	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	493	27	94	129	56	533

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	520	0	825	507
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	318	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1046	-	342	566
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	738	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1046	-	311	566
Mov Cap-2 Maneuver	-	-	-	-	311	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	672	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	104.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	525	-	-	1046	-
HCM Lane V/C Ratio	1.122	-	-	0.09	-
HCM Control Delay (s)	104.1	-	-	8.8	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	19.4	-	-	0.3	-

Intersection	
Int Delay, s/veh	78.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	20	820	5	20	160	10	10	10	410
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	911	6	22	178	11	11	11	456

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	189	0	0	917	0	0	1205	1191	914
Stage 1	-	-	-	-	-	-	958	958	-
Stage 2	-	-	-	-	-	-	247	233	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1385	-	-	744	-	-	161	187	~ 331
Stage 1	-	-	-	-	-	-	309	336	-
Stage 2	-	-	-	-	-	-	757	712	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1385	-	-	744	-	-	145	179	~ 331
Mov Cap-2 Maneuver	-	-	-	-	-	-	145	179	-
Stage 1	-	-	-	-	-	-	304	331	-
Stage 2	-	-	-	-	-	-	700	691	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	1.1	278.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	315	1385	-	-	744	-	-	-	490
HCM Lane V/C Ratio	1.517	0.016	-	-	0.03	-	-	-	0.078
HCM Control Delay (s)	278.7	7.6	-	-	10	-	-	-	13
HCM Lane LOS	F	A	-	-	A	-	-	-	B
HCM 95th %tile Q(veh)	27	0	-	-	0.1	-	-	-	0.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	20	5	20
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	65	65	65
Heavy Vehicles, %	2	2	2
Mvmt Flow	31	8	31

Major/Minor	Minor2		
Conflicting Flow All	1420	1189	183
Stage 1	228	228	-
Stage 2	1192	961	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	114	188	859
Stage 1	775	715	-
Stage 2	228	335	-
Platoon blocked, %			
Mov Cap-1 Maneuver	-	180	859
Mov Cap-2 Maneuver	-	180	-
Stage 1	763	694	-
Stage 2	-	330	-

Approach	SB
HCM Control Delay, s	
HCM LOS	-

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	1270	170	15	15	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	1411	189	17	23	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	206	0	-	0	1630	197
Stage 1	-	-	-	-	197	-
Stage 2	-	-	-	-	1433	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1365	-	-	-	112	844
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	220	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1365	-	-	-	108	844
Mov Cap-2 Maneuver	-	-	-	-	108	-
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	212	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	29.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1365	-	-	-	191
HCM Lane V/C Ratio	0.008	-	-	-	0.242
HCM Control Delay (s)	7.7	0	-	-	29.8
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.9

Intersection	
Int Delay, s/veh	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1090	50	50	190	30	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	70	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1211	56	56	211	43	86

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1267	0	1561	1239
Stage 1	-	-	-	-	1239	-
Stage 2	-	-	-	-	322	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	548	-	123	214
Stage 1	-	-	-	-	273	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	548	-	110	214
Mov Cap-2 Maneuver	-	-	-	-	110	-
Stage 1	-	-	-	-	273	-
Stage 2	-	-	-	-	660	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	40.8
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	110	214	-	-	548	-
HCM Lane V/C Ratio	0.39	0.401	-	-	0.101	-
HCM Control Delay (s)	57.2	32.6	-	-	12.3	-
HCM Lane LOS	F	D	-	-	B	-
HCM 95th %tile Q(veh)	1.6	1.8	-	-	0.3	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Sunday (Winter) Cumul NP
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	136	116	85.6%	47.8	8.2	D
	Through	732	695	94.9%	41.8	8.4	D
	Right Turn						
	Subtotal	**868**	**811**	**93.5%**	**42.6**	**7.8**	**D**
SB	Left Turn						
	Through	112	125	111.8%	28.5	5.9	C
	Right Turn	148	138	93.2%	3.3	0.7	A
	Subtotal	**260**	**263**	**101.2%**	**15.3**	**3.5**	**B**
EB	Left Turn	988	878	88.9%	64.3	12.3	E
	Through	4	2	40.0%	18.5	30.0	B
	Right Turn	584	583	99.9%	12.4	2.7	B
	Subtotal	**1,576**	**1,463**	**92.8%**	**43.6**	**6.9**	**D**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,704**	**2,538**	**93.8%**	**40.3**	**5.7**	**D**

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	430	350	70	330	560	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.23	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	437	1863	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.90	0.90
Adj. Flow (vph)	478	389	74	347	622	67
RTOR Reduction (vph)	0	117	0	0	0	37
Lane Group Flow (vph)	478	272	74	347	622	30
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	15.8	15.8	18.9	18.9	18.9	18.9
Effective Green, g (s)	15.8	15.8	18.9	18.9	18.9	18.9
Actuated g/C Ratio	0.37	0.37	0.44	0.44	0.44	0.44
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	654	585	193	824	824	700
v/s Ratio Prot	c0.27			0.19	c0.33	
v/s Ratio Perm		0.17	0.17			0.02
v/c Ratio	0.73	0.47	0.38	0.42	0.75	0.04
Uniform Delay, d1	11.6	10.2	8.0	8.2	10.0	6.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.2	0.6	1.3	0.3	4.0	0.0
Delay (s)	15.8	10.8	9.3	8.5	13.9	6.8
Level of Service	B	B	A	A	B	A
Approach Delay (s)	13.6			8.6	13.2	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	42.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	610	270	290	200	20	190	60	270	20	60	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3484		1681	1724	1560		1795	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3484		1681	1724	1560		1795	
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.85	0.85	0.85	0.80	0.80	0.80
Adj. Flow (vph)	32	642	284	322	222	22	224	71	318	25	75	25
RTOR Reduction (vph)	0	0	196	0	8	0	0	0	0	0	11	0
Lane Group Flow (vph)	32	642	88	322	236	0	146	149	318	0	114	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	1.9	17.9	17.9	8.5	24.3		11.7	11.7	57.7		4.2	
Effective Green, g (s)	1.9	17.9	17.9	8.5	24.3		11.7	11.7	57.7		4.2	
Actuated g/C Ratio	0.03	0.31	0.31	0.15	0.42		0.20	0.20	1.00		0.07	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	58	1097	484	505	1467		340	349	1560		130	
v/s Ratio Prot	0.02	c0.18		c0.09	0.07		c0.09	0.09			c0.06	
v/s Ratio Perm			0.06						0.20			
v/c Ratio	0.55	0.59	0.18	0.64	0.16		0.43	0.43	0.20		0.88	
Uniform Delay, d1	27.5	16.8	14.5	23.2	10.4		20.1	20.1	0.0		26.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	6.3	0.5	0.1	1.9	0.0		0.6	0.6	0.3		43.3	
Delay (s)	33.8	17.3	14.6	25.1	10.4		20.7	20.7	0.3		69.8	
Level of Service	C	B	B	C	B		C	C	A		E	
Approach Delay (s)		17.0			18.8			10.1			69.8	
Approach LOS		B			B			B			E	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	57.7	Sum of lost time (s)	15.6
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Cumulative Conditions
Summer PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	350	410	420	440	70	320	120	150	70	160	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.96	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1564	1770	1863	1518	1770	1863	1583		3401	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1564	1770	1863	1518	1770	1863	1583		3401	
Peak-hour factor, PHF	0.90	0.90	0.90	0.85	0.85	0.85	0.95	0.95	0.95	0.90	0.90	0.90
Adj. Flow (vph)	100	389	456	494	518	82	337	126	158	78	178	56
RTOR Reduction (vph)	0	0	99	0	0	46	0	0	126	0	14	0
Lane Group Flow (vph)	100	389	357	494	518	36	337	126	32	0	298	0
Confl. Peds. (#/hr)			5			5						
Confl. Bikes (#/hr)			5			5						
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	10.5	30.9	58.5	39.1	60.0	60.0	27.6	27.6	27.6		16.8	
Effective Green, g (s)	10.5	30.9	58.5	39.1	60.0	60.0	27.6	27.6	27.6		16.8	
Actuated g/C Ratio	0.08	0.23	0.43	0.29	0.44	0.44	0.20	0.20	0.20		0.12	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	137	425	675	511	825	672	360	379	322		421	
v/s Ratio Prot	0.06	c0.21	0.11	c0.28	0.28		c0.19	0.07			c0.09	
v/s Ratio Perm			0.12			0.02			0.02			
v/c Ratio	0.73	0.92	0.53	0.97	0.63	0.05	0.94	0.33	0.10		0.71	
Uniform Delay, d1	61.1	51.0	28.3	47.5	29.1	21.5	53.0	46.0	43.8		56.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	15.2	23.7	0.3	31.0	1.1	0.0	30.9	0.2	0.0		4.4	
Delay (s)	76.2	74.6	28.6	78.5	30.2	21.5	83.9	46.2	43.9		61.4	
Level of Service	E	E	C	E	C	C	F	D	D		E	
Approach Delay (s)		52.6			51.3			66.1			61.4	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	55.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	135.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_Cumul_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	147	3.0	0.297	6.2	LOS A	0.0	0.0	0.00	0.84	27.9
8	T	505	3.0	0.297	6.2	LOS A	0.0	0.0	0.00	0.33	32.0
Approach		653	3.0	0.297	6.2	LOS A	0.0	0.0	0.00	0.45	30.9
East: I-80 WB off-ramp											
1	L	242	3.0	0.369	10.3	LOS B	1.2	29.7	0.51	0.86	23.2
6	T	5	3.0	0.369	10.3	LOS B	1.2	29.7	0.51	0.67	24.9
16	R	168	3.0	0.260	8.8	LOS A	0.7	19.1	0.50	0.72	25.6
Approach		416	3.0	0.369	9.7	LOS A	1.2	29.7	0.51	0.80	24.1
North: HWY 89											
4	T	1126	3.0	0.886	34.9	LOS D	11.9	303.8	0.98	1.28	17.2
14	R	168	3.0	0.886	34.9	LOS D	11.9	303.8	0.98	1.29	17.1
Approach		1295	3.0	0.886	34.9	LOS D	11.9	303.8	0.98	1.28	17.2
All Vehicles		2363	3.0	0.886	22.5	LOS C	11.9	303.8	0.63	0.97	20.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_Cumul_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	600	3.0	0.784	24.6	LOS C	7.4	189.1	0.85	1.06	21.0
18	R	526	3.0	0.784	24.6	LOS C	7.4	189.1	0.85	1.07	20.5
Approach		1126	3.0	0.784	24.6	LOS C	7.4	189.1	0.85	1.07	20.8
North: HWY 89											
7	L	358	3.0	0.624	11.7	LOS B	0.0	0.0	0.00	0.82	27.9
4	T	1011	3.0	0.624	11.7	LOS B	0.0	0.0	0.00	0.38	32.2
Approach		1368	3.0	0.624	11.7	LOS B	0.0	0.0	0.00	0.49	30.9
West: I-80 EB off-ramp											
5	L	53	3.0	0.454	19.3	LOS C	1.5	37.9	0.77	1.01	20.4
2	T	1	3.0	0.454	19.3	LOS C	1.5	37.9	0.77	0.90	21.3
12	R	305	3.0	0.454	18.6	LOS C	1.5	37.9	0.76	0.94	21.8
Approach		359	3.0	0.454	18.7	LOS C	1.5	37.9	0.76	0.95	21.6
All Vehicles		2854	3.0	0.784	17.7	LOS C	7.4	189.1	0.43	0.78	24.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	410	70	170	660	10	740	510
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1571	1770	3374	1770	2735	1560
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1571	1770	3374	1770	2735	1560
Peak-hour factor, PHF	0.85	0.85	0.95	0.95	0.90	0.90	0.90
Adj. Flow (vph)	482	82	179	695	11	822	567
RTOR Reduction (vph)	0	39	0	0	0	0	59
Lane Group Flow (vph)	482	43	179	695	11	822	508
Confl. Peds. (#/hr)		2					2
Heavy Vehicles (%)	2%	2%	2%	7%	2%	7%	2%
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	13.9	23.8	9.9	36.3	0.8	27.2	41.1
Effective Green, g (s)	13.9	23.8	9.9	36.3	0.8	27.2	41.1
Actuated g/C Ratio	0.21	0.37	0.15	0.56	0.01	0.42	0.63
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	734	575	269	1884	21	1144	986
v/s Ratio Prot	c0.14	0.01	c0.10	0.21	0.01	c0.30	0.11
v/s Ratio Perm		0.02					0.22
v/c Ratio	0.66	0.07	0.67	0.37	0.52	0.72	0.52
Uniform Delay, d1	23.4	13.4	26.0	8.0	31.9	15.7	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	0.1	6.1	0.6	21.6	3.9	0.2
Delay (s)	25.0	13.5	32.1	8.5	53.5	19.6	6.7
Level of Service	C	B	C	A	D	B	A
Approach Delay (s)	23.3			13.4		14.7	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	110	180	650	180	130	680
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1515	2735	1517	1719	1776
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1515	2735	1517	1719	1776
Peak-hour factor, PHF	0.85	0.85	0.95	0.95	0.90	0.90
Adj. Flow (vph)	129	212	684	189	144	756
RTOR Reduction (vph)	0	71	0	17	0	0
Lane Group Flow (vph)	129	141	684	172	144	756
Confl. Peds. (#/hr)		2		2		
Heavy Vehicles (%)	5%	5%	7%	5%	5%	7%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	10.4	15.3	17.6	28.0	4.9	26.0
Effective Green, g (s)	10.4	15.3	17.6	28.0	4.9	26.0
Actuated g/C Ratio	0.22	0.32	0.37	0.59	0.10	0.55
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	378	491	1019	899	178	978
v/s Ratio Prot	c0.08	0.03	0.25	0.04	0.08	c0.43
v/s Ratio Perm		0.06		0.07		
v/c Ratio	0.34	0.29	0.67	0.19	0.81	0.77
Uniform Delay, d1	15.5	11.9	12.4	4.4	20.7	8.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	1.4	0.0	21.9	3.5
Delay (s)	15.7	12.0	13.8	4.4	42.5	11.8
Level of Service	B	B	B	A	D	B
Approach Delay (s)	13.4		11.7			16.7
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	47.2	Sum of lost time (s)	14.3
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	20	150	120	30	50	20
Conflicting Peds, #/hr	10	0	0	10	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	70	70	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	188	171	43	62	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	181	0	-	0	419	191
Stage 1	-	-	-	-	181	-
Stage 2	-	-	-	-	238	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1394	-	-	-	591	851
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	802	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1382	-	-	-	570	837
Mov Cap-2 Maneuver	-	-	-	-	570	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1382	-	-	-	627
HCM Lane V/C Ratio	0.018	-	-	-	0.14
HCM Control Delay (s)	7.7	0	-	-	11.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5

Intersection	
Int Delay, s/veh	2.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	180	10	70	150	10	80
Conflicting Peds, #/hr	0	10	10	0	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	75	75	80	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	200	11	93	200	12	80

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	221	0	603	226
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	387	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1348	-	462	813
Stage 1	-	-	-	-	820	-
Stage 2	-	-	-	-	686	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1337	-	423	800
Mov Cap-2 Maneuver	-	-	-	-	423	-
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	633	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	714	-	-	1337	-
HCM Lane V/C Ratio	0.13	-	-	0.07	-
HCM Control Delay (s)	10.8	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0.2	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	10	240	1	20	200	20	0	0	30
Conflicting Peds, #/hr	2	0	2	2	0	2	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	267	1	27	267	27	0	0	40

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	293	0	0	268	0	0	631	636	269
Stage 1	-	-	-	-	-	-	289	289	-
Stage 2	-	-	-	-	-	-	342	347	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1269	-	-	1296	-	-	394	395	770
Stage 1	-	-	-	-	-	-	719	673	-
Stage 2	-	-	-	-	-	-	673	635	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1267	-	-	1294	-	-	376	383	769
Mov Cap-2 Maneuver	-	-	-	-	-	-	376	383	-
Stage 1	-	-	-	-	-	-	713	667	-
Stage 2	-	-	-	-	-	-	643	622	-

Approach	EB	WB	NB
HCM Control Delay, s	0.3	0.7	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	769	1267	-	-	1294	-	-	358	756
HCM Lane V/C Ratio	0.052	0.009	-	-	0.021	-	-	0.14	0.022
HCM Control Delay (s)	9.9	7.9	-	-	7.8	-	-	16.7	9.9
HCM Lane LOS	A	A	-	-	A	-	-	C	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.5	0.1

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	30	0	10
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	50	0	17

Major/Minor	Minor2		
Conflicting Flow All	642	623	282
Stage 1	333	333	-
Stage 2	309	290	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	387	402	757
Stage 1	681	644	-
Stage 2	701	672	-
Platoon blocked, %			
Mov Cap-1 Maneuver	358	390	756
Mov Cap-2 Maneuver	358	390	-
Stage 1	675	631	-
Stage 2	658	666	-

Approach	SB
HCM Control Delay, s	15
HCM LOS	C

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	260	220	10	15	15
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	75	75	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	289	293	13	25	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	307	0	-	0	600	302
Stage 1	-	-	-	-	300	-
Stage 2	-	-	-	-	300	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1254	-	-	-	464	738
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	752	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1252	-	-	-	461	737
Mov Cap-2 Maneuver	-	-	-	-	461	-
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	747	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1252	-	-	-	567
HCM Lane V/C Ratio	0.004	-	-	-	0.088
HCM Control Delay (s)	7.9	0	-	-	12
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	320	30	100	250	30	70
Conflicting Peds, #/hr	0	2	2	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	356	33	133	333	40	93

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	389	0	972	374
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	600	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1170	-	280	672
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	548	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1168	-	248	671
Mov Cap-2 Maneuver	-	-	-	-	248	-
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	485	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	14.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	248	671	-	-	1168	-
HCM Lane V/C Ratio	0.161	0.139	-	-	0.114	-
HCM Control Delay (s)	22.3	11.2	-	-	8.5	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.6	0.5	-	-	0.4	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Summer Cumul NP
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	200	186	92.8%	22.6	2.9	C
	Through	644	634	98.4%	5.1	0.8	A
	Right Turn						
	Subtotal	**844**	**820**	**97.1%**	**9.0**	**1.4**	**A**
SB	Left Turn	4	1	30.0%	2.2	4.7	A
	Through	644	642	99.7%	23.6	2.8	C
	Right Turn	188	191	101.7%	6.7	1.0	A
	Subtotal	**836**	**834**	**99.8%**	**19.7**	**2.5**	**B**
EB	Left Turn	232	246	106.2%	18.5	1.5	B
	Through	4	1	30.0%	2.7	8.4	A
	Right Turn	188	206	109.8%	3.3	0.3	A
	Subtotal	**424**	**454**	**107.1%**	**11.6**	**1.2**	**B**
WB	Left Turn						
	Through	4	5	120.0%	19.8	19.9	B
	Right Turn						
	Subtotal	**4**	**5**	**120.0%**	**19.8**	**19.9**	**B**
Total		**2,108**	**2,113**	**100.2%**	**13.8**	**1.1**	**B**

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	70	80	70	730	740	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.87
Flpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1760	1776	1776	1383
Flt Permitted	0.95	1.00	0.29	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	532	1776	1776	1383
Peak-hour factor, PHF	0.80	0.80	0.95	0.95	0.95	0.95
Adj. Flow (vph)	88	100	74	768	779	53
RTOR Reduction (vph)	0	86	0	0	0	17
Lane Group Flow (vph)	88	14	74	768	779	36
Confl. Peds. (#/hr)			14			14
Confl. Bikes (#/hr)						164
Heavy Vehicles (%)	2%	2%	2%	7%	7%	2%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	6.3	6.3	30.6	30.6	30.6	30.6
Effective Green, g (s)	6.3	6.3	30.6	30.6	30.6	30.6
Actuated g/C Ratio	0.14	0.14	0.68	0.68	0.68	0.68
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	248	222	362	1210	1210	942
v/s Ratio Prot	c0.05			0.43	c0.44	
v/s Ratio Perm		0.01	0.14			0.03
v/c Ratio	0.35	0.06	0.20	0.63	0.64	0.04
Uniform Delay, d1	17.5	16.7	2.6	4.0	4.1	2.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	0.3	1.1	1.2	0.0
Delay (s)	18.3	16.9	2.9	5.1	5.2	2.4
Level of Service	B	B	A	A	A	A
Approach Delay (s)	17.6			4.9	5.1	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	44.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	410	470	430	390	40	280	70	450	30	90	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1687	3374	1485	3273	3314		1603	1638	1480		1719	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1687	3374	1485	3273	3314		1603	1638	1480		1719	
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.85	0.85	0.85
Adj. Flow (vph)	42	432	495	478	433	44	311	78	500	35	106	24
RTOR Reduction (vph)	0	0	369	0	8	0	0	0	0	0	6	0
Lane Group Flow (vph)	42	432	126	478	469	0	193	196	500	0	159	0
Confl. Peds. (#/hr)			5			1			23			
Confl. Bikes (#/hr)						22			2			2
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	2.3	17.2	17.2	13.7	28.4		13.8	13.8	67.4		7.3	
Effective Green, g (s)	2.3	17.2	17.2	13.7	28.4		13.8	13.8	67.4		7.3	
Actuated g/C Ratio	0.03	0.26	0.26	0.20	0.42		0.20	0.20	1.00		0.11	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	57	861	378	665	1396		328	335	1480		186	
v/s Ratio Prot	0.02	c0.13		c0.15	0.14		c0.12	0.12			c0.09	
v/s Ratio Perm			0.09						0.34			
v/c Ratio	0.74	0.50	0.33	0.72	0.34		0.59	0.59	0.34		0.85	
Uniform Delay, d1	32.3	21.4	20.4	25.1	13.1		24.2	24.2	0.0		29.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	34.3	0.2	0.2	3.1	0.1		2.2	2.2	0.6		29.3	
Delay (s)	66.5	21.6	20.6	28.2	13.2		26.5	26.4	0.6		58.8	
Level of Service	E	C	C	C	B		C	C	A		E	
Approach Delay (s)		23.1			20.7			11.9			58.8	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	15.6
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter AM
Highway	SR-89 SB
From/To	Deerfield Dr to W River St
Jurisdiction	Nevada/Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	950	veh/h
Opposing direction volume, Vo	380	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1000	pc/h	402	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	2.7	mi/h
Average travel speed, ATSd	30.1	mi/h
Percent Free Flow Speed, PFFS	68.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.998	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1000	pc/h	401	pc/h
Base percent time-spent-following,(note-4) BPTSFd	72.5	%		
Adjustment for no-passing zones, fnp	23.7			
Percent time-spent-following, PTSFd	89.4	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.59	
Peak 15-min vehicle-miles of travel, VMT15	50	veh-mi
Peak-hour vehicle-miles of travel, VMT60	190	veh-mi
Peak 15-min total travel time, TT15	1.7	veh-h
Capacity from ATS, CdATS	1690	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1690	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	30.1	mi/h
Percent time-spent-following, PTSFd (from above)	89.4	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1000.0
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.34
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/14
Analysis Time Period	Winter AM
Highway	SR-89 SB
From/To	W River St to Squaw Valley Rd
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	1200	veh/h
Opposing direction volume, Vo	280	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.1	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.978	
Grade adj. factor,(note-1) fg	1.00		0.83	
Directional flow rate,(note-2) vi	1271	pc/h	363	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.6	mi/h
Average travel speed, ATSd	44.5	mi/h
Percent Free Flow Speed, PFFS	74.5	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.986
Grade adjustment factor,(note-1) fg	1.00	0.85
Directional flow rate,(note-2) vi	1263 pc/h	352 pc/h

Base percent time-spent-following,(note-4) BPTSFd	79.6	%
Adjustment for no-passing zones, fnp	13.1	
Percent time-spent-following, PTSFd	89.8	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.75	
Peak 15-min vehicle-miles of travel, VMT15	2463	veh-mi
Peak-hour vehicle-miles of travel, VMT60	9360	veh-mi
Peak 15-min total travel time, TT15	55.4	veh-h
Capacity from ATS, CdATS	1449	veh/h
Capacity from PTSF, CdPTSF	1478	veh/h
Directional Capacity	1449	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	44.5	mi/h
Percent time-spent-following, PTSFd (from above)	89.8	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1263.2
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	1.94
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 770 veh/h
Opposing direction volume, Vo 620 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.6	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.988	
Grade adj. factor,(note-1) fg	1.00		0.98	
Directional flow rate,(note-2) vi	861	pc/h	711	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.6	mi/h
Average travel speed, ATSd	36.2	mi/h
Percent Free Flow Speed, PFFS	72.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	856	pc/h	696	pc/h
Base percent time-spent-following,(note-4) BPTSFd	70.7	%		
Adjustment for no-passing zones, fnp	25.4			
Percent time-spent-following, PTSFd	84.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	278	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1001	veh-mi
Peak 15-min total travel time, TT15	7.7	veh-h
Capacity from ATS, CdATS	1646	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1646	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.2	mi/h
Percent time-spent-following, PTSFd (from above)	84.7	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	855.6
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.63
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR-89 NB
From/To	SR 28 to A. Meadows Rd
Jurisdiction	Placer County
Analysis Year	
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	6.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	1050	veh/h
Opposing direction volume, Vo	330	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.1	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.978	
Grade adj. factor,(note-1) fg	1.00		0.86	
Directional flow rate,(note-2) vi	1112	pc/h	413	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	49.8	mi/h
Adjustment for no-passing zones, fnp	2.6	mi/h
Average travel speed, ATSd	35.3	mi/h
Percent Free Flow Speed, PFFS	70.9	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.6
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.988
Grade adjustment factor,(note-1) fg	1.00	0.87
Directional flow rate,(note-2) vi	1105 pc/h	404 pc/h

Base percent time-spent-following,(note-4) BPTSFd	75.5	%
Adjustment for no-passing zones, fnp	25.4	
Percent time-spent-following, PTSFd	94.1	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.65	
Peak 15-min vehicle-miles of travel, VMT15	1022	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3885	veh-mi
Peak 15-min total travel time, TT15	29.0	veh-h
Capacity from ATS, CdATS	1499	veh/h
Capacity from PTSF, CdPTSF	1518	veh/h
Directional Capacity	1499	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	35.3	mi/h
Percent time-spent-following, PTSFd (from above)	94.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1105.3
Effective width of outside lane, We	24.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.80
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR89 NB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.90	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd	840	veh/h
Opposing direction volume, Vo	400	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	933	pc/h	447	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h
Average travel speed, ATSd	27.0	mi/h
Percent Free Flow Speed, PFFS	68.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	933	pc/h	444	pc/h
Base percent time-spent-following,(note-4) BPTSFd	70.4	%		
Adjustment for no-passing zones, fnp	22.5			
Percent time-spent-following, PTSFd	85.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.55	
Peak 15-min vehicle-miles of travel, VMT15	70	veh-mi
Peak-hour vehicle-miles of travel, VMT60	252	veh-mi
Peak 15-min total travel time, TT15	2.6	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	27.0	mi/h
Percent time-spent-following, PTSFd (from above)	85.6	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	933.3
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.73
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd	1460	veh/h
Opposing direction volume, Vo	350	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1622	pc/h	391	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	25.3	mi/h
Percent Free Flow Speed, PFFS	57.9	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.998
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1622 pc/h	390 pc/h
Base percent time-spent-following,(note-4) BPTSFd	87.1 %	
Adjustment for no-passing zones, fnp	10.8	
Percent time-spent-following, PTSFd	95.8 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.95	
Peak 15-min vehicle-miles of travel, VMT15	81	veh-mi
Peak-hour vehicle-miles of travel, VMT60	292	veh-mi
Peak 15-min total travel time, TT15	3.2	veh-h
Capacity from ATS, CdATS	1690	veh/h
Capacity from PTSF, CdPTSF	1697	veh/h
Directional Capacity	1690	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	25.3	mi/h
Percent time-spent-following, PTSFd (from above)	95.8	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1622.2
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.59
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Cumulative PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1550 veh/h
Opposing direction volume, Vo 230 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.2	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.977	
Grade adj. factor,(note-1) fg	1.00		0.79	
Directional flow rate,(note-2) vi	1733	pc/h	331	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	41.0	mi/h
Percent Free Flow Speed, PFFS	68.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.986	
Grade adjustment factor,(note-1) fg	1.00		0.83	
Directional flow rate,(note-2) vi	1722	pc/h	312	pc/h
Base percent time-spent-following,(note-4) BPTSFd	87.2	%		
Adjustment for no-passing zones, fnp	10.1			
Percent time-spent-following, PTSFd	95.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	F	
Volume to capacity ratio, v/c	1.02	
Peak 15-min vehicle-miles of travel, VMT15	3358	veh-mi
Peak-hour vehicle-miles of travel, VMT60	12090	veh-mi
Peak 15-min total travel time, TT15	81.9	veh-h
Capacity from ATS, CdATS	1397	veh/h
Capacity from PTSF, CdPTSF	1445	veh/h
Directional Capacity	1397	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	41.0	mi/h
Percent time-spent-following, PTSFd (from above)	95.8	
Level of service, LOSd (from above)	F	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1722.2
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	2.10
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1			Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft		% Trucks and buses	2	%
Lane width	12.0	ft		% Trucks crawling	0.0	%
Segment length	1.3	mi		Truck crawl speed	0.0	mi/hr
Terrain type	Rolling			% Recreational vehicles	0	%
Grade: Length	-	mi		% No-passing zones	100	%
Up/down	-	%		Access point density	0	/mi

Analysis direction volume, Vd	761	veh/h
Opposing direction volume, Vo	610	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.6	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.992		0.988	
Grade adj. factor,(note-1) fg	0.99		0.98	
Directional flow rate,(note-2) vi	861	pc/h	700	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.6	mi/h
Average travel speed, ATSd	36.3	mi/h
Percent Free Flow Speed, PFFS	72.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	0.99
Directional flow rate,(note-2) vi	846 pc/h	685 pc/h

Base percent time-spent-following,(note-4) BPTSFd	69.9	%
Adjustment for no-passing zones, fnp	25.7	
Percent time-spent-following, PTSFd	84.1	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	275	veh-mi
Peak-hour vehicle-miles of travel, VMT60	989	veh-mi
Peak 15-min total travel time, TT15	7.6	veh-h
Capacity from ATS, CdATS	1646	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1646	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.3	mi/h
Percent time-spent-following, PTSFd (from above)	84.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	845.6
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.63
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	5.5	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	910	veh/h
Opposing direction volume, Vo	400	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.0	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.980	
Grade adj. factor,(note-1) fg	1.00		0.91	
Directional flow rate,(note-2) vi	964	pc/h	472	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	2.4	mi/h
Average travel speed, ATSd	34.9	mi/h
Percent Free Flow Speed, PFFS	72.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.4	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.992	
Grade adjustment factor,(note-1) fg	1.00		0.91	
Directional flow rate,(note-2) vi	958	pc/h	466	pc/h
Base percent time-spent-following,(note-4) BPTSFd	72.9	%		
Adjustment for no-passing zones, fnp	22.3			
Percent time-spent-following, PTSFd	87.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	886	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3367	veh-mi
Peak 15-min total travel time, TT15	25.4	veh-h
Capacity from ATS, CdATS	1553	veh/h
Capacity from PTSF, CdPTSF	1585	veh/h
Directional Capacity	1553	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	34.9	mi/h
Percent time-spent-following, PTSFd (from above)	87.9	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	957.9
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.96
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.85	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 620 veh/h
Opposing direction volume, Vo 520 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.998		0.998	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	731	pc/h	613	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h
Average travel speed, ATSd	27.9	mi/h
Percent Free Flow Speed, PFFS	70.3	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	729 pc/h	612 pc/h

Base percent time-spent-following,(note-4) BPTSFd	64.6	%
Adjustment for no-passing zones, fnp	27.6	
Percent time-spent-following, PTSFd	79.6	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.43	
Peak 15-min vehicle-miles of travel, VMT15	55	veh-mi
Peak-hour vehicle-miles of travel, VMT60	186	veh-mi
Peak 15-min total travel time, TT15	2.0	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	27.9	mi/h
Percent time-spent-following, PTSFd (from above)	79.6	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	729.4
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.60
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	4.7	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 830 veh/h
Opposing direction volume, Vo 810 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	874	pc/h	853	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	29.1	mi/h
Percent Free Flow Speed, PFFS	66.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	874	pc/h	853	pc/h
Base percent time-spent-following,(note-4) BPTSFd	72.4	%		
Adjustment for no-passing zones, fnp	23.2			
Percent time-spent-following, PTSFd	84.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	44	veh-mi
Peak-hour vehicle-miles of travel, VMT60	166	veh-mi
Peak 15-min total travel time, TT15	1.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	29.1	mi/h
Percent time-spent-following, PTSFd (from above)	84.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	873.7
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.62
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	830	veh/h
Opposing direction volume, Vo	790	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.4	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.973	
Grade adj. factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	892	pc/h	863	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	45.1	mi/h
Percent Free Flow Speed, PFFS	75.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	874 pc/h	832 pc/h

Base percent time-spent-following,(note-4) BPTSFd	72.4	%
Adjustment for no-passing zones, fnp	21.1	
Percent time-spent-following, PTSFd	83.2	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.52	
Peak 15-min vehicle-miles of travel, VMT15	1704	veh-mi
Peak-hour vehicle-miles of travel, VMT60	6474	veh-mi
Peak 15-min total travel time, TT15	37.7	veh-h
Capacity from ATS, CdATS	1638	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1638	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.1	mi/h
Percent time-spent-following, PTSFd (from above)	83.2	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	873.7
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.21
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 801 veh/h
Opposing direction volume, Vo 790 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.4	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.973		0.973	
Grade adj. factor,(note-1) fg	0.99		0.99	
Directional flow rate,(note-2) vi	875	pc/h	863	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	35.3	mi/h
Percent Free Flow Speed, PFFS	70.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	843	pc/h	832	pc/h
Base percent time-spent-following,(note-4) BPTSFd	71.4	%		
Adjustment for no-passing zones, fnp	24.1			
Percent time-spent-following, PTSFd	83.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	274	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1041	veh-mi
Peak 15-min total travel time, TT15	7.8	veh-h
Capacity from ATS, CdATS	1638	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1638	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	35.3	mi/h
Percent time-spent-following, PTSFd (from above)	83.5	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	843.2
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.97
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	5.5	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	820	veh/h
Opposing direction volume, Vo	800	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.4	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.973	
Grade adj. factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	882	pc/h	874	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	33.6	mi/h
Percent Free Flow Speed, PFFS	69.4	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	863 pc/h	842 pc/h

Base percent time-spent-following,(note-4) BPTSFd	72.1	%
Adjustment for no-passing zones, fnp	23.5	
Percent time-spent-following, PTSFd	84.0	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.52	
Peak 15-min vehicle-miles of travel, VMT15	798	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3034	veh-mi
Peak 15-min total travel time, TT15	23.7	veh-h
Capacity from ATS, CdATS	1638	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1638	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	33.6	mi/h
Percent time-spent-following, PTSFd (from above)	84.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	863.2
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.26
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	Cumulative Conditions
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.95	
Shoulder width	2.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd	990	veh/h
Opposing direction volume, Vo	800	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.993	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1042	pc/h	848	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATSd	24.2	mi/h
Percent Free Flow Speed, PFFS	61.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1042	pc/h	842	pc/h
Base percent time-spent-following,(note-4) BPTSFd	77.5	%		
Adjustment for no-passing zones, fnp	18.6			
Percent time-spent-following, PTSFd	87.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.61	
Peak 15-min vehicle-miles of travel, VMT15	78	veh-mi
Peak-hour vehicle-miles of travel, VMT60	297	veh-mi
Peak 15-min total travel time, TT15	3.2	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	24.2	mi/h
Percent time-spent-following, PTSFd (from above)	87.8	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1042.1
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.24
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	WB	NB	NB	SB	SB	B33
Directions Served	L	LT	LTR	L	T	T	R	T
Maximum Queue (ft)	122	112	32	279	76	456	285	709
Average Queue (ft)	84	54	16	225	31	404	285	197
95th Queue (ft)	124	113	38	308	72	521	285	654
Link Distance (ft)		528	166		426	382		1311
Upstream Blk Time (%)						13		
Queuing Penalty (veh)						0		
Storage Bay Dist (ft)	460			400			260	
Storage Blk Time (%)						35	1	
Queuing Penalty (veh)						249	3	

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	B1	B1	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	T	T	LTR	L	T	TR	L	T
Maximum Queue (ft)	416	487	291	233	26	141	256	262	12	120
Average Queue (ft)	241	271	72	41	5	84	156	166	2	72
95th Queue (ft)	453	523	316	263	24	145	262	272	15	137
Link Distance (ft)		516	939	939	165		425	425		440
Upstream Blk Time (%)		6								
Queuing Penalty (veh)		0								
Storage Bay Dist (ft)	450					400			180	
Storage Blk Time (%)	2	6								0
Queuing Penalty (veh)	12	32								0

APPENDIX D:

CUMULATIVE PLUS PROJECT CONDITIONS TECHNICAL CALCULATIONS

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Cumulative + Project Conditions
Winter AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	150	563	192	160	30	181	40	130	40	70	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3377	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3377	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.80	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	33	167	626	240	200	38	201	44	144	42	74	32
RTOR Reduction (vph)	0	0	332	0	0	27	0	0	111	0	27	0
Lane Group Flow (vph)	33	167	294	240	200	11	201	44	33	0	121	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	2.2	14.4	30.5	8.1	20.8	20.8	16.1	16.1	16.1		10.1	
Effective Green, g (s)	2.2	14.4	30.5	8.1	20.8	20.8	16.1	16.1	16.1		10.1	
Actuated g/C Ratio	0.03	0.21	0.44	0.12	0.30	0.30	0.23	0.23	0.23		0.14	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	55	384	692	205	555	472	408	430	365		489	
v/s Ratio Prot	0.02	c0.09	0.10	c0.14	0.11		c0.11	0.02			c0.04	
v/s Ratio Perm			0.09			0.01			0.02			
v/c Ratio	0.60	0.43	0.42	1.17	0.36	0.02	0.49	0.10	0.09		0.25	
Uniform Delay, d1	33.3	24.1	13.5	30.8	19.2	17.3	23.3	21.1	21.1		26.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	11.2	0.3	0.2	116.5	0.1	0.0	0.3	0.0	0.0		0.1	
Delay (s)	44.5	24.4	13.7	147.3	19.4	17.3	23.6	21.1	21.1		26.5	
Level of Service	D	C	B	F	B	B	C	C	C		C	
Approach Delay (s)		17.1			83.4			22.4			26.5	
Approach LOS		B			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	69.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_C+P_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	177	3.0	0.211	5.2	LOS A	0.0	0.0	0.00	0.74	27.9
8	T	285	3.0	0.211	5.2	LOS A	0.0	0.0	0.00	0.34	32.0
Approach		462	3.0	0.211	5.2	LOS A	0.0	0.0	0.00	0.49	30.2
East: I-80 WB off-ramp											
1	L	206	3.0	0.279	8.0	LOS A	0.8	20.0	0.41	0.81	24.1
6	T	5	3.0	0.279	8.0	LOS A	0.8	20.0	0.41	0.57	26.2
16	R	84	3.0	0.114	6.1	LOS A	0.3	7.6	0.39	0.63	27.1
Approach		296	3.0	0.279	7.4	LOS A	0.8	20.0	0.41	0.76	24.9
North: HWY 89											
4	T	700	3.0	0.576	14.2	LOS B	3.5	89.6	0.67	0.84	23.7
14	R	147	3.0	0.576	14.2	LOS B	3.5	89.6	0.67	0.89	23.4
Approach		847	3.0	0.576	14.2	LOS B	3.5	89.6	0.67	0.85	23.6
All Vehicles		1605	3.0	0.576	10.4	LOS B	3.5	89.6	0.43	0.73	25.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_C+P_WinterAM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	336	3.0	0.372	8.7	LOS A	1.6	42.2	0.47	0.61	28.2
18	R	286	3.0	0.372	8.7	LOS A	1.6	42.2	0.47	0.66	27.4
Approach		622	3.0	0.372	8.7	LOS A	1.6	42.2	0.47	0.63	27.8
North: HWY 89											
7	L	137	3.0	0.413	7.6	LOS A	0.0	0.0	0.00	0.90	27.9
4	T	769	3.0	0.413	7.6	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		906	3.0	0.413	7.6	LOS A	0.0	0.0	0.00	0.46	31.5
West: I-80 EB off-ramp											
5	L	126	3.0	0.589	18.6	LOS C	2.5	64.0	0.70	1.01	20.6
2	T	1	3.0	0.589	18.6	LOS C	2.5	64.0	0.70	0.87	21.6
12	R	529	3.0	0.589	18.1	LOS C	2.5	64.0	0.69	0.92	22.0
Approach		657	3.0	0.589	18.2	LOS C	2.5	64.0	0.69	0.94	21.7
All Vehicles		2185	3.0	0.589	11.1	LOS B	2.5	64.0	0.34	0.65	26.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

HCM Signalized Intersection Capacity Analysis
4: SR 89/SR89 & Deerfield Dr

Cumulative + Project Conditions
Winter AM

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	250	61	80	341	10	944	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.81	0.81	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	309	75	89	379	11	1015	312
RTOR Reduction (vph)	0	22	0	0	0	0	80
Lane Group Flow (vph)	309	53	89	379	11	1015	232
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	10.2	17.9	7.7	39.4	1.4	33.1	43.3
Effective Green, g (s)	10.2	17.9	7.7	39.4	1.4	33.1	43.3
Actuated g/C Ratio	0.16	0.28	0.12	0.61	0.02	0.51	0.67
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	538	435	209	2145	38	1460	1054
v/s Ratio Prot	c0.09	0.01	c0.05	0.11	0.01	c0.35	0.03
v/s Ratio Perm		0.02					0.11
v/c Ratio	0.57	0.12	0.43	0.18	0.29	0.70	0.22
Uniform Delay, d1	25.4	17.7	26.6	5.6	31.3	12.1	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	1.4	0.2	4.2	2.8	0.0
Delay (s)	26.3	17.8	28.0	5.8	35.5	14.9	4.3
Level of Service	C	B	C	A	D	B	A
Approach Delay (s)	24.6			10.0		12.6	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	264	150	271	53	10	995
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.85	0.85	0.90	0.90	0.95	0.95
Adj. Flow (vph)	311	176	301	59	11	1047
RTOR Reduction (vph)	0	127	0	13	0	0
Lane Group Flow (vph)	311	49	301	46	11	1047
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	19.7	24.9	50.8	70.5	5.2	59.5
Effective Green, g (s)	19.7	24.9	50.8	70.5	5.2	59.5
Actuated g/C Ratio	0.22	0.28	0.56	0.78	0.06	0.66
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	387	437	1619	1240	102	1231
v/s Ratio Prot	c0.18	0.01	0.10	0.01	0.01	c0.56
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.80	0.11	0.19	0.04	0.11	0.85
Uniform Delay, d1	33.3	24.3	9.5	2.2	40.2	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.8	0.0	0.3	0.0	0.2	7.5
Delay (s)	44.2	24.3	9.8	2.2	40.4	19.3
Level of Service	D	C	A	A	D	B
Approach Delay (s)	37.0		8.5			19.5
Approach LOS	D		A			B

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	70	300	105	33	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	95	95	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	88	316	111	51	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	316	0	-	0	429	316
Stage 1	-	-	-	-	316	-
Stage 2	-	-	-	-	113	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1244	-	-	-	583	724
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	912	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1244	-	-	-	577	724
Mov Cap-2 Maneuver	-	-	-	-	577	-
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1244	-	-	-	622
HCM Lane V/C Ratio	0.01	-	-	-	0.126
HCM Control Delay (s)	7.9	0	-	-	11.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	4.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	98	20	410	415	15	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	95	95	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	140	29	432	437	18	80

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	169	0	1454	154
Stage 1	-	-	-	-	154	-
Stage 2	-	-	-	-	1300	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1409	-	143	892
Stage 1	-	-	-	-	874	-
Stage 2	-	-	-	-	255	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1409	-	99	892
Mov Cap-2 Maneuver	-	-	-	-	99	-
Stage 1	-	-	-	-	874	-
Stage 2	-	-	-	-	177	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.3	18.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	364	-	-	1409	-
HCM Lane V/C Ratio	0.268	-	-	0.306	-
HCM Control Delay (s)	18.5	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.1	-	-	1.3	-

Intersection	
Int Delay, s/veh	15.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	1	156	0	512	815	5	1	5	99
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	95	95	95	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	223	0	539	858	5	1	6	124

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	863	0	0	223	0	0	2194	2167	223
Stage 1	-	-	-	-	-	-	226	226	-
Stage 2	-	-	-	-	-	-	1968	1941	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	779	-	-	1346	-	-	32	47	817
Stage 1	-	-	-	-	-	-	777	717	-
Stage 2	-	-	-	-	-	-	81	112	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	779	-	-	1346	-	-	5	28	817
Mov Cap-2 Maneuver	-	-	-	-	-	-	5	28	-
Stage 1	-	-	-	-	-	-	776	716	-
Stage 2	-	-	-	-	-	-	28	67	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	3.6	47
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	210	779	-	-	1346	-	-	15	59
HCM Lane V/C Ratio	0.625	0.002	-	-	0.4	-	-	0.556	0.989
HCM Control Delay (s)	47	9.6	-	-	9.4	-	-	$ 409.6	228.3
HCM Lane LOS	E	A	-	-	A	-	-	F	F
HCM 95th %tile Q(veh)	3.6	0	-	-	2	-	-	1.4	4.6

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	5	15	20
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	8	25	33

Major/Minor	Minor2		
Conflicting Flow All	2229	2164	861
Stage 1	1938	1938	-
Stage 2	291	226	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	31	47	355
Stage 1	85	112	-
Stage 2	717	717	-
Platoon blocked, %			
Mov Cap-1 Maneuver	15	28	355
Mov Cap-2 Maneuver	15	28	-
Stage 1	85	67	-
Stage 2	602	716	-

Approach	SB
HCM Control Delay, s	251
HCM LOS	F

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	254	1307	10	10	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	95	95	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	363	1376	11	17	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1386	0	-	0	1758	1381
Stage 1	-	-	-	-	1381	-
Stage 2	-	-	-	-	377	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	494	-	-	-	93	176
Stage 1	-	-	-	-	233	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	494	-	-	-	91	176
Mov Cap-2 Maneuver	-	-	-	-	91	-
Stage 1	-	-	-	-	233	-
Stage 2	-	-	-	-	682	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	47
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	494	-	-	-	134
HCM Lane V/C Ratio	0.014	-	-	-	0.373
HCM Control Delay (s)	12.4	0	-	-	47
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	1.6

Intersection	
Int Delay, s/veh	8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	224	40	40	1257	60	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	95	95	70	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	320	57	42	1323	86	29

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	377	0	1756	349
Stage 1	-	-	-	-	349	-
Stage 2	-	-	-	-	1407	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1181	-	93	694
Stage 1	-	-	-	-	714	-
Stage 2	-	-	-	-	226	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1181	-	90	694
Mov Cap-2 Maneuver	-	-	-	-	90	-
Stage 1	-	-	-	-	714	-
Stage 2	-	-	-	-	218	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	126.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	90	694	-	-	1181	-
HCM Lane V/C Ratio	0.952	0.041	-	-	0.036	-
HCM Control Delay (s)	165.7	10.4	-	-	8.2	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	5.4	0.1	-	-	0.1	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Saturday AM C+P
AM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	680	354	52.1%	82.9	10.0	F
	Through	212	117	55.1%	7.0	2.2	A
	Right Turn						
	Subtotal	**892**	**471**	**52.8%**	**64.1**	**8.8**	**E**
SB	Left Turn						
	Through	576	379	65.8%	31.4	4.9	C
	Right Turn	812	514	63.3%	9.0	1.7	A
	Subtotal	**1,388**	**892**	**64.3%**	**18.5**	**3.0**	**B**
EB	Left Turn	160	134	83.8%	27.9	3.6	C
	Through						
	Right Turn	124	107	86.1%	2.1	0.3	A
	Subtotal	**284**	**241**	**84.8%**	**16.3**	**1.4**	**B**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,564**	**1,604**	**62.6%**	**31.5**	**2.5**	**C**

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	81	50	350	731	292	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.57	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1068	1863	1863	1583
Peak-hour factor, PHF	0.85	0.85	0.90	0.90	0.95	0.95
Adj. Flow (vph)	95	59	389	812	307	358
RTOR Reduction (vph)	0	51	0	0	0	106
Lane Group Flow (vph)	95	8	389	812	307	252
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	6.5	6.5	34.6	34.6	34.6	34.6
Effective Green, g (s)	6.5	6.5	34.6	34.6	34.6	34.6
Actuated g/C Ratio	0.13	0.13	0.70	0.70	0.70	0.70
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	234	209	752	1312	1312	1115
v/s Ratio Prot	c0.05			c0.44	0.16	
v/s Ratio Perm		0.00	0.36			0.16
v/c Ratio	0.41	0.04	0.52	0.62	0.23	0.23
Uniform Delay, d1	19.5	18.6	3.4	3.8	2.6	2.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.1	0.6	0.9	0.1	0.1
Delay (s)	20.7	18.6	4.0	4.7	2.7	2.7
Level of Service	C	B	A	A	A	A
Approach Delay (s)	19.9			4.4	2.7	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	49.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	228	155	220	715	10	497	70	280	10	30	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3531		1681	1705	1560		1796	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3531		1681	1705	1560		1796	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	22	253	172	244	794	11	552	78	311	13	40	13
RTOR Reduction (vph)	0	0	125	0	1	0	0	0	0	0	11	0
Lane Group Flow (vph)	22	253	47	244	804	0	315	315	311	0	55	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	0.4	14.4	14.4	4.7	18.5		15.4	15.4	52.2		2.3	
Effective Green, g (s)	0.4	14.4	14.4	4.7	18.5		15.4	15.4	52.2		2.3	
Actuated g/C Ratio	0.01	0.28	0.28	0.09	0.35		0.30	0.30	1.00		0.04	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	13	976	430	309	1251		495	503	1560		79	
v/s Ratio Prot	0.01	0.07		c0.07	c0.23		c0.19	0.18			c0.03	
v/s Ratio Perm			0.03						0.20			
v/c Ratio	1.69	0.26	0.11	0.79	0.64		0.64	0.63	0.20		0.69	
Uniform Delay, d1	25.9	14.7	14.1	23.3	14.1		16.0	15.9	0.0		24.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	515.9	0.1	0.0	11.7	0.9		2.3	2.1	0.3		21.2	
Delay (s)	541.8	14.8	14.2	34.9	14.9		18.3	18.0	0.3		45.8	
Level of Service	F	B	B	C	B		B	B	A		D	
Approach Delay (s)		40.5			19.6			12.3			45.8	
Approach LOS		D			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	52.2	Sum of lost time (s)	15.6
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Cumulative + Project Conditions
Winter PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	280	261	190	270	60	475	130	253	50	120	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3324	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583		3324	
Peak-hour factor, PHF	0.85	0.85	0.85	0.80	0.80	0.80	0.89	0.89	0.89	0.83	0.83	0.83
Adj. Flow (vph)	118	329	307	238	338	75	534	146	284	60	145	108
RTOR Reduction (vph)	0	0	142	0	0	55	0	0	192	0	60	0
Lane Group Flow (vph)	118	329	165	238	338	20	534	146	92	0	253	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	10.5	22.9	58.0	16.1	29.0	29.0	35.1	35.1	35.1		13.0	
Effective Green, g (s)	10.5	22.9	58.0	16.1	29.0	29.0	35.1	35.1	35.1		13.0	
Actuated g/C Ratio	0.10	0.21	0.54	0.15	0.27	0.27	0.32	0.32	0.32		0.12	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	171	394	849	263	499	424	574	604	513		399	
v/s Ratio Prot	0.07	c0.18	0.06	c0.13	0.18		c0.30	0.08			c0.08	
v/s Ratio Perm			0.04			0.01			0.06			
v/c Ratio	0.69	0.84	0.19	0.90	0.68	0.05	0.93	0.24	0.18		0.63	
Uniform Delay, d1	47.2	40.8	13.0	45.2	35.4	29.3	35.3	26.7	26.2		45.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	9.3	13.6	0.0	31.0	2.9	0.0	21.6	0.1	0.1		2.4	
Delay (s)	56.5	54.4	13.0	76.2	38.2	29.3	57.0	26.8	26.2		47.7	
Level of Service	E	D	B	E	D	C	E	C	C		D	
Approach Delay (s)		37.9			51.1			43.3			47.7	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	108.1	Sum of lost time (s)	21.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: int_2_C+P_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	518	3.0	0.609	11.3	LOS B	0.0	0.0	0.00	0.74	27.9
8	T	819	3.0	0.609	11.3	LOS B	0.0	0.0	0.00	0.34	32.0
Approach		1337	3.0	0.609	11.3	LOS B	0.0	0.0	0.00	0.49	30.2
East: I-80 WB off-ramp											
1	L	199	3.0	0.488	19.0	LOS C	1.6	41.2	0.76	0.99	20.3
6	T	5	3.0	0.488	19.0	LOS C	1.6	41.2	0.76	0.89	21.2
16	R	147	3.0	0.377	16.6	LOS C	1.2	29.7	0.74	0.90	22.2
Approach		352	3.0	0.488	18.0	LOS C	1.6	41.2	0.75	0.95	21.1
North: HWY 89											
4	T	517	3.0	0.728	26.8	LOS D	4.8	122.0	0.82	1.05	19.3
14	R	242	3.0	0.728	26.8	LOS D	4.8	122.0	0.82	1.08	19.0
Approach		759	3.0	0.728	26.8	LOS D	4.8	122.0	0.82	1.06	19.2
All Vehicles		2447	3.0	0.728	17.1	LOS C	4.8	122.0	0.36	0.73	24.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: int_3_C+P_WinterPM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	1284	3.0	1.182	112.9	LOS F	71.1	1820.4	1.00	2.63	8.7
18	R	713	3.0	1.182	112.9	LOS F	71.1	1820.4	1.00	2.63	8.6
Approach		1997	3.0	1.182	112.9	LOS F	71.1	1820.4	1.00	2.63	8.7
North: HWY 89											
7	L	200	3.0	0.326	6.5	LOS A	0.0	0.0	0.00	0.81	27.9
4	T	516	3.0	0.326	6.5	LOS A	0.0	0.0	0.00	0.38	32.2
Approach		716	3.0	0.326	6.5	LOS A	0.0	0.0	0.00	0.50	30.9
West: I-80 EB off-ramp											
5	L	53	3.0	0.201	8.3	LOS A	0.6	14.2	0.49	0.88	24.1
2	T	1	3.0	0.201	8.3	LOS A	0.6	14.2	0.49	0.64	26.2
12	R	200	3.0	0.201	8.1	LOS A	0.6	14.2	0.48	0.73	26.3
Approach		254	3.0	0.201	8.1	LOS A	0.6	14.2	0.48	0.76	25.8
All Vehicles		2966	3.0	1.182	78.3	LOS F	71.1	1820.4	0.71	1.96	11.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	540	70	201	1357	10	310	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	1770	2869	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	1770	2869	1583
Peak-hour factor, PHF	0.88	0.88	0.89	0.89	0.83	0.83	0.83
Adj. Flow (vph)	614	80	226	1525	12	373	446
RTOR Reduction (vph)	0	47	0	0	0	0	71
Lane Group Flow (vph)	614	33	226	1525	12	373	375
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	17.7	30.6	12.9	42.5	0.8	30.4	48.1
Effective Green, g (s)	17.7	30.6	12.9	42.5	0.8	30.4	48.1
Actuated g/C Ratio	0.24	0.41	0.17	0.57	0.01	0.41	0.64
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	810	645	304	2005	18	1162	1015
v/s Ratio Prot	c0.18	0.01	c0.13	c0.43	0.01	0.13	0.09
v/s Ratio Perm		0.01					0.15
v/c Ratio	0.76	0.05	0.74	0.76	0.67	0.32	0.37
Uniform Delay, d1	26.7	13.4	29.5	12.4	37.0	15.2	6.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	0.0	9.5	2.8	66.1	0.7	0.1
Delay (s)	30.3	13.5	38.9	15.2	103.1	16.0	6.4
Level of Service	C	B	D	B	F	B	A
Approach Delay (s)	28.4			18.2		12.1	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	72	100	1458	198	190	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	2869	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	2869	1583	1770	1863
Peak-hour factor, PHF	0.76	0.76	0.89	0.89	0.83	0.83
Adj. Flow (vph)	95	132	1638	222	229	229
RTOR Reduction (vph)	0	15	0	31	0	0
Lane Group Flow (vph)	95	117	1638	191	229	229
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	11.4	35.3	80.4	91.8	23.9	107.8
Effective Green, g (s)	11.4	35.3	80.4	91.8	23.9	107.8
Actuated g/C Ratio	0.09	0.27	0.62	0.71	0.18	0.83
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	155	429	1774	1117	325	1544
v/s Ratio Prot	c0.05	0.05	c0.57	0.01	c0.13	0.12
v/s Ratio Perm		0.02		0.11		
v/c Ratio	0.61	0.27	0.92	0.17	0.70	0.15
Uniform Delay, d1	57.2	37.2	22.1	6.4	49.7	2.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	0.1	9.6	0.0	5.6	0.2
Delay (s)	62.1	37.4	31.6	6.4	55.3	2.4
Level of Service	E	D	C	A	E	A
Approach Delay (s)	47.7		28.6			28.8
Approach LOS	D		C			C

Intersection Summary			
HCM 2000 Control Delay	30.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.3
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	20	230	130	50	188	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	82	82	72	72
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	307	159	61	261	50

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	159	0	-	0	519	159
Stage 1	-	-	-	-	159	-
Stage 2	-	-	-	-	360	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1420	-	-	-	517	886
Stage 1	-	-	-	-	870	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1420	-	-	-	505	886
Mov Cap-2 Maneuver	-	-	-	-	505	-
Stage 1	-	-	-	-	870	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	20.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1420	-	-	-	542
HCM Lane V/C Ratio	0.019	-	-	-	0.574
HCM Control Delay (s)	7.6	0	-	-	20.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	3.6

Intersection	
Int Delay, s/veh	73.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	408	20	86	130	50	496
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	72	72	85	85	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	567	28	101	153	56	557

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	594	0	936	581
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	355	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	982	-	294	~ 514
Stage 1	-	-	-	-	559	-
Stage 2	-	-	-	-	710	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	982	-	264	~ 514
Mov Cap-2 Maneuver	-	-	-	-	264	-
Stage 1	-	-	-	-	559	-
Stage 2	-	-	-	-	637	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	173.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	473	-	-	982	-
HCM Lane V/C Ratio	1.297	-	-	0.103	-
HCM Control Delay (s)	173.8	-	-	9.1	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	26.3	-	-	0.3	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	141.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	20	874	5	40	186	10	10	10	471
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	85	85	85	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	23	1005	6	47	219	12	11	11	529

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	231	0	0	1010	0	0	1393	1378	1007
Stage 1	-	-	-	-	-	-	1053	1053	-
Stage 2	-	-	-	-	-	-	340	325	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1337	-	-	686	-	-	119	145	~ 292
Stage 1	-	-	-	-	-	-	274	303	-
Stage 2	-	-	-	-	-	-	675	649	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1337	-	-	686	-	-	102	133	~ 292
Mov Cap-2 Maneuver	-	-	-	-	-	-	102	133	-
Stage 1	-	-	-	-	-	-	269	298	-
Stage 2	-	-	-	-	-	-	595	605	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	1.8	$ 495.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	275	1337	-	-	686	-	-	-	402
HCM Lane V/C Ratio	2.006	0.017	-	-	0.069	-	-	-	0.104
HCM Control Delay (s)	$ 495.6	7.7	-	-	10.6	-	-	-	15
HCM Lane LOS	F	A	-	-	B	-	-	-	C
HCM 95th %tile Q(veh)	39.8	0.1	-	-	0.2	-	-	-	0.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	20	5	20
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	60	60	60
Heavy Vehicles, %	2	2	2
Mvmt Flow	33	8	33

Major/Minor	Minor2		
Conflicting Flow All	1643	1375	225
Stage 1	319	319	-
Stage 2	1324	1056	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	80	145	814
Stage 1	693	653	-
Stage 2	192	302	-
Platoon blocked, %			
Mov Cap-1 Maneuver	-	133	814
Mov Cap-2 Maneuver	-	133	-
Stage 1	681	608	-
Stage 2	-	297	-

Approach	SB
HCM Control Delay, s	
HCM LOS	-

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	1385	216	15	15	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	85	85	60	60
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	1592	254	18	25	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	272	0	-	0	1878	263
Stage 1	-	-	-	-	263	-
Stage 2	-	-	-	-	1615	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1291	-	-	-	78	776
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	179	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1291	-	-	-	72	776
Mov Cap-2 Maneuver	-	-	-	-	72	-
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	166	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	48
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1291	-	-	-	132
HCM Lane V/C Ratio	0.009	-	-	-	0.379
HCM Control Delay (s)	7.8	0	-	-	48
HCM Lane LOS	A	A	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	1.6

Intersection	
Int Delay, s/veh	4.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1205	50	50	236	30	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	85	85	69	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1385	57	59	278	43	87

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1443	0	1809	1414
Stage 1	-	-	-	-	1414	-
Stage 2	-	-	-	-	395	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	470	-	87	169
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	681	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	470	-	76	169
Mov Cap-2 Maneuver	-	-	-	-	76	-
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	596	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	65.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	76	169	-	-	470	-
HCM Lane V/C Ratio	0.572	0.515	-	-	0.125	-
HCM Control Delay (s)	102.6	46.9	-	-	13.8	-
HCM Lane LOS	F	E	-	-	B	-
HCM 95th %tile Q(veh)	2.5	2.5	-	-	0.4	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Sunday PM Cumul + P
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	136	137	100.6%	54.9	7.9	D
	Through	732	719	98.2%	63.7	14.8	E
	Right Turn						
	Subtotal	**868**	**856**	**98.6%**	**62.4**	**12.6**	**E**
SB	Left Turn						
	Through	124	135	109.0%	34.7	6.3	C
	Right Turn	172	174	100.9%	3.3	0.2	A
	Subtotal	**296**	**309**	**104.3%**	**16.9**	**3.7**	**B**
EB	Left Turn	1,132	907	80.1%	79.7	9.3	E
	Through	4	2	50.0%	46.5	57.8	D
	Right Turn	632	585	92.6%	12.6	2.9	B
	Subtotal	**1,768**	**1,494**	**84.5%**	**53.3**	**5.1**	**D**
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		**2,932**	**2,659**	**90.7%**	**52.1**	**5.2**	**D**

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	431	350	70	340	612	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	357	1863	1863	1583
Peak-hour factor, PHF	0.85	0.85	0.91	0.91	0.87	0.87
Adj. Flow (vph)	507	412	77	374	703	70
RTOR Reduction (vph)	0	102	0	0	0	38
Lane Group Flow (vph)	507	310	77	374	703	32
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	16.2	16.2	20.9	20.9	20.9	20.9
Effective Green, g (s)	16.2	16.2	20.9	20.9	20.9	20.9
Actuated g/C Ratio	0.36	0.36	0.46	0.46	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	635	568	165	863	863	733
v/s Ratio Prot	c0.29			0.20	c0.38	
v/s Ratio Perm		0.20	0.22			0.02
v/c Ratio	0.80	0.55	0.47	0.43	0.81	0.04
Uniform Delay, d1	13.0	11.5	8.3	8.1	10.4	6.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.9	1.1	2.1	0.4	6.0	0.0
Delay (s)	19.9	12.6	10.4	8.5	16.4	6.7
Level of Service	B	B	B	A	B	A
Approach Delay (s)	16.6			8.8	15.5	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	45.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	648	284	290	206	20	194	60	270	20	60	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1770	3539	1562	3433	3484		1681	1724	1560		1794	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1770	3539	1562	3433	3484		1681	1724	1560		1794	
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.84	0.84	0.84	0.78	0.78	0.78
Adj. Flow (vph)	33	704	309	341	242	24	231	71	321	26	77	26
RTOR Reduction (vph)	0	0	207	0	8	0	0	0	0	0	11	0
Lane Group Flow (vph)	33	704	102	341	258	0	150	152	321	0	118	0
Confl. Peds. (#/hr)			2			1			10			
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	1.9	18.7	18.7	7.7	24.3		11.7	11.7	56.7		3.2	
Effective Green, g (s)	1.9	18.7	18.7	7.7	24.3		11.7	11.7	56.7		3.2	
Actuated g/C Ratio	0.03	0.33	0.33	0.14	0.43		0.21	0.21	1.00		0.06	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	59	1167	515	466	1493		346	355	1560		101	
v/s Ratio Prot	0.02	c0.20		c0.10	0.07		c0.09	0.09			c0.07	
v/s Ratio Perm			0.07						0.21			
v/c Ratio	0.56	0.60	0.20	0.73	0.17		0.43	0.43	0.21		1.17	
Uniform Delay, d1	27.0	15.9	13.6	23.5	10.0		19.6	19.6	0.0		26.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	6.4	0.6	0.1	5.1	0.0		0.6	0.6	0.3		140.7	
Delay (s)	33.4	16.5	13.7	28.6	10.0		20.2	20.2	0.3		167.5	
Level of Service	C	B	B	C	B		C	C	A		F	
Approach Delay (s)		16.2			20.4			10.0			167.5	
Approach LOS		B			C			A			F	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	15.6
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: SR89/SR 89 & Donner Pass Rd

Cumulative + Project Conditions
Summer PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	350	422	426	440	70	335	122	159	70	162	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.96	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1565	1770	1863	1517	1770	1863	1583		3402	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1565	1770	1863	1517	1770	1863	1583		3402	
Peak-hour factor, PHF	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	389	469	501	518	82	372	136	177	78	180	56
RTOR Reduction (vph)	0	0	94	0	0	47	0	0	139	0	13	0
Lane Group Flow (vph)	100	389	375	501	518	35	372	136	38	0	301	0
Confl. Peds. (#/hr)			5			5						
Confl. Bikes (#/hr)			5			5						
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		7	7	
Permitted Phases			2			6			8			
Actuated Green, G (s)	10.6	30.7	60.3	38.1	58.7	58.7	29.6	29.6	29.6		16.9	
Effective Green, g (s)	10.6	30.7	60.3	38.1	58.7	58.7	29.6	29.6	29.6		16.9	
Actuated g/C Ratio	0.08	0.23	0.44	0.28	0.43	0.43	0.22	0.22	0.22		0.12	
Clearance Time (s)	4.5	5.5	5.5	5.0	5.5	5.5	5.5	5.5	5.5		5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	
Lane Grp Cap (vph)	137	419	692	494	802	653	384	404	343		421	
v/s Ratio Prot	0.06	c0.21	0.12	c0.28	0.28		c0.21	0.07			c0.09	
v/s Ratio Perm			0.12			0.02			0.02			
v/c Ratio	0.73	0.93	0.54	1.01	0.65	0.05	0.97	0.34	0.11		0.71	
Uniform Delay, d1	61.5	51.7	27.9	49.1	30.6	22.6	52.9	45.1	42.8		57.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	15.2	26.3	0.5	44.1	1.3	0.0	37.1	0.2	0.1		4.7	
Delay (s)	76.6	78.0	28.3	93.2	32.0	22.6	90.0	45.2	42.9		62.1	
Level of Service	E	E	C	F	C	C	F	D	D		E	
Approach Delay (s)		53.5			59.1			68.9			62.1	
Approach LOS		D			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	59.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	136.3	Sum of lost time (s)	21.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: 89/80WB_C+P_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
3	L	226	3.0	0.346	6.7	LOS A	0.0	0.0	0.00	0.80	27.9
8	T	533	3.0	0.346	6.7	LOS A	0.0	0.0	0.00	0.33	32.0
Approach		759	3.0	0.346	6.7	LOS A	0.0	0.0	0.00	0.47	30.6
East: I-80 WB off-ramp											
1	L	284	3.0	0.462	12.9	LOS B	1.6	41.9	0.58	0.91	22.3
6	T	5	3.0	0.462	12.9	LOS B	1.6	41.9	0.58	0.74	23.7
16	R	168	3.0	0.280	9.7	LOS A	0.8	20.9	0.53	0.75	25.2
Approach		458	3.0	0.462	11.7	LOS B	1.6	41.9	0.56	0.85	23.2
North: HWY 89											
4	T	1147	3.0	1.020	65.9	LOS F	23.2	593.7	1.00	1.90	12.2
14	R	168	3.0	1.020	65.9	LOS F	23.2	593.7	1.00	1.90	12.2
Approach		1316	3.0	1.020	65.9	LOS F	23.2	593.7	1.00	1.90	12.2
All Vehicles		2533	3.0	1.020	38.4	LOS E	23.2	593.7	0.62	1.28	16.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: 89/80EB_C+P_Summer

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: HWY 89											
8	T	706	3.0	0.899	37.3	LOS E	12.5	319.8	1.00	1.30	17.4
18	R	585	3.0	0.899	37.3	LOS E	12.5	319.8	1.00	1.30	17.1
Approach		1292	3.0	0.899	37.3	LOS E	12.5	319.8	1.00	1.30	17.3
North: HWY 89											
7	L	358	3.0	0.652	12.5	LOS B	0.0	0.0	0.00	0.83	27.9
4	T	1074	3.0	0.652	12.5	LOS B	0.0	0.0	0.00	0.38	32.2
Approach		1432	3.0	0.652	12.5	LOS B	0.0	0.0	0.00	0.49	31.0
West: I-80 EB off-ramp											
5	L	53	3.0	0.574	25.3	LOS D	2.1	52.7	0.82	1.06	18.8
2	T	1	3.0	0.574	25.3	LOS D	2.1	52.7	0.82	0.97	19.4
12	R	379	3.0	0.574	24.4	LOS C	2.1	52.7	0.81	1.00	20.0
Approach		433	3.0	0.574	24.5	LOS C	2.1	52.7	0.81	1.00	19.8
All Vehicles		3156	3.0	0.899	24.3	LOS C	12.5	319.8	0.52	0.89	22.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Volume (vph)	410	73	174	817	10	877	510
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Lane Util. Factor	0.97	1.00	1.00	0.95	1.00	*0.77	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1571	1770	3374	1770	2735	1559
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1571	1770	3374	1770	2735	1559
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	488	87	193	908	11	1008	586
RTOR Reduction (vph)	0	26	0	0	0	0	53
Lane Group Flow (vph)	488	61	193	908	11	1008	533
Confl. Peds. (#/hr)		2					2
Heavy Vehicles (%)	2%	2%	2%	7%	2%	7%	2%
Turn Type	Prot	pm+ov	Prot	NA	Prot	NA	pm+ov
Protected Phases	8	1	1	6	5	2	8
Permitted Phases		8					2
Actuated Green, G (s)	14.5	25.1	10.6	40.7	0.8	30.9	45.4
Effective Green, g (s)	14.5	25.1	10.6	40.7	0.8	30.9	45.4
Actuated g/C Ratio	0.21	0.36	0.15	0.58	0.01	0.44	0.65
Clearance Time (s)	4.5	4.0	4.0	5.5	4.0	5.5	4.5
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0	3.0	2.0
Lane Grp Cap (vph)	711	563	268	1961	20	1207	1011
v/s Ratio Prot	c0.14	0.02	c0.11	0.27	0.01	c0.37	0.11
v/s Ratio Perm		0.02					0.23
v/c Ratio	0.69	0.11	0.72	0.46	0.55	0.84	0.53
Uniform Delay, d1	25.6	15.0	28.3	8.4	34.4	17.3	6.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.1	9.2	0.8	28.9	6.9	0.2
Delay (s)	27.9	15.1	37.4	9.2	63.3	24.2	6.8
Level of Service	C	B	D	A	E	C	A
Approach Delay (s)	25.9			14.1		18.1	
Approach LOS	C			B		B	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	128	180	811	203	130	820
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Lane Util. Factor	1.00	1.00	*0.77	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1527	2735	1515	1719	1776
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1527	2735	1515	1719	1776
Peak-hour factor, PHF	0.80	0.80	0.90	0.90	0.87	0.87
Adj. Flow (vph)	160	225	901	226	149	943
RTOR Reduction (vph)	0	38	0	87	0	0
Lane Group Flow (vph)	160	187	901	139	149	943
Confl. Peds. (#/hr)		2		2		
Heavy Vehicles (%)	5%	5%	7%	5%	5%	7%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2		
Actuated Green, G (s)	12.5	22.5	26.0	38.5	10.0	39.5
Effective Green, g (s)	12.5	22.5	26.0	38.5	10.0	39.5
Actuated g/C Ratio	0.20	0.36	0.41	0.61	0.16	0.63
Clearance Time (s)	4.8	3.5	6.0	4.8	3.5	6.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	342	547	1132	928	273	1117
v/s Ratio Prot	c0.09	0.05	0.33	0.03	0.09	c0.53
v/s Ratio Perm		0.07		0.06		
v/c Ratio	0.47	0.34	0.80	0.15	0.55	0.84
Uniform Delay, d1	22.2	14.7	16.1	5.2	24.3	9.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	3.7	0.0	1.2	5.7
Delay (s)	22.6	14.9	19.8	5.2	25.5	15.0
Level of Service	C	B	B	A	C	B
Approach Delay (s)	18.1		16.9			16.4
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	62.8	Sum of lost time (s)	14.3
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	20	150	120	123	160	20
Conflicting Peds, #/hr	10	0	0	10	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	79	79	65	65	79	79
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	190	185	189	203	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	195	0	-	0	436	205
Stage 1	-	-	-	-	195	-
Stage 2	-	-	-	-	241	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1378	-	-	-	578	836
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	799	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1367	-	-	-	557	822
Mov Cap-2 Maneuver	-	-	-	-	557	-
Stage 1	-	-	-	-	831	-
Stage 2	-	-	-	-	776	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	15.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1367	-	-	-	578
HCM Lane V/C Ratio	0.019	-	-	-	0.394
HCM Control Delay (s)	7.7	0	-	-	15.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.9

Intersection	
Int Delay, s/veh	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	290	10	110	243	10	127
Conflicting Peds, #/hr	0	10	10	0	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	75	75	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	337	12	147	324	13	163

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	359	0	970	363
Stage 1	-	-	-	-	353	-
Stage 2	-	-	-	-	617	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1200	-	281	682
Stage 1	-	-	-	-	711	-
Stage 2	-	-	-	-	538	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1190	-	242	671
Mov Cap-2 Maneuver	-	-	-	-	242	-
Stage 1	-	-	-	-	705	-
Stage 2	-	-	-	-	468	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	594	-	-	1190	-
HCM Lane V/C Ratio	0.296	-	-	0.123	-
HCM Control Delay (s)	13.6	-	-	8.4	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.2	-	-	0.4	-

Intersection	
Int Delay, s/veh	14.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	10	397	1	155	333	20	0	0	193
Conflicting Peds, #/hr	2	0	2	2	0	2	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	72	80	80	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	441	1	215	416	25	0	0	268

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	441	0	0	442	0	0	1332	1336	444
Stage 1	-	-	-	-	-	-	464	464	-
Stage 2	-	-	-	-	-	-	868	872	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1119	-	-	1118	-	-	131	153	614
Stage 1	-	-	-	-	-	-	578	564	-
Stage 2	-	-	-	-	-	-	347	368	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1117	-	-	1116	-	-	107	122	613
Mov Cap-2 Maneuver	-	-	-	-	-	-	107	122	-
Stage 1	-	-	-	-	-	-	572	558	-
Stage 2	-	-	-	-	-	-	272	297	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	2.9	15.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	613	1117	-	-	1116	-	-	51	623
HCM Lane V/C Ratio	0.437	0.01	-	-	0.193	-	-	1.07	0.029
HCM Control Delay (s)	15.4	8.3	-	-	9	-	-	276.2	11
HCM Lane LOS	C	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	2.2	0	-	-	0.7	-	-	4.8	0.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	30	0	10
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	0	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	55	55	55
Heavy Vehicles, %	2	2	2
Mvmt Flow	55	0	18

Major/Minor	Minor2		
Conflicting Flow All	1457	1323	431
Stage 1	859	859	-
Stage 2	598	464	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	108	156	624
Stage 1	351	373	-
Stage 2	489	564	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 51	125	623
Mov Cap-2 Maneuver	~ 51	125	-
Stage 1	348	301	-
Stage 2	272	558	-

Approach	SB
HCM Control Delay, s	209.9
HCM LOS	F

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	6	579	488	10	15	15
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	80	80	55	55
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	643	610	12	27	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	623	0	-	0	1273	618
Stage 1	-	-	-	-	616	-
Stage 2	-	-	-	-	657	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	958	-	-	-	185	489
Stage 1	-	-	-	-	539	-
Stage 2	-	-	-	-	516	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	956	-	-	-	183	488
Mov Cap-2 Maneuver	-	-	-	-	183	-
Stage 1	-	-	-	-	539	-
Stage 2	-	-	-	-	510	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	22
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	956	-	-	-	266
HCM Lane V/C Ratio	0.007	-	-	-	0.205
HCM Control Delay (s)	8.8	0	-	-	22
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	634	34	100	515	33	70
Conflicting Peds, #/hr	0	2	2	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	72	72	70	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	737	40	139	715	47	100

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	777	0	1750	759
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	993	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	839	-	94	406
Stage 1	-	-	-	-	463	-
Stage 2	-	-	-	-	359	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	838	-	78	405
Mov Cap-2 Maneuver	-	-	-	-	78	-
Stage 1	-	-	-	-	463	-
Stage 2	-	-	-	-	299	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	45.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	78	405	-	-	838	-
HCM Lane V/C Ratio	0.604	0.247	-	-	0.166	-
HCM Control Delay (s)	105.2	16.8	-	-	10.1	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	2.7	1	-	-	0.6	-

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Squaw Valley
Summer Cumul + P
PM Peak Hour

Intersection 11 **SR 89/Squaw Valley Rd** **Signal**

		Volume (veh/hr)			Total Delay (sec/veh)		
Direction	**Movement**	**Demand**	**Served**	**% Served**	**Average**	**Std. Dev.**	**LOS**
NB	Left Turn	324	208	64.2%	25.4	3.8	C
	Through	644	418	64.9%	5.3	0.6	A
	Right Turn						
	Subtotal	**968**	**626**	**64.7%**	**12.1**	**1.7**	**B**
SB	Left Turn	4	2	40.0%	5.6	8.5	A
	Through	644	408	63.3%	33.8	3.6	C
	Right Turn	356	235	66.0%	11.4	1.8	B
	Subtotal	**1,004**	**644**	**64.1%**	**25.7**	**3.1**	**C**
EB	Left Turn	424	246	58.0%	21.6	2.7	C
	Through	4	2	50.0%	6.3	11.0	A
	Right Turn	336	212	63.0%	3.5	0.6	A
	Subtotal	**764**	**460**	**60.2%**	**13.2**	**1.4**	**B**
WB	Left Turn						
	Through	4	1	20.0%	5.0	11.0	A
	Right Turn						
	Subtotal	**4**	**1**	**20.0%**	**6.3**	**13.8**	**A**
Total		**2,740**	**1,730**	**63.2%**	**17.4**	**1.8**	**B**

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	75	80	70	844	872	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.87
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1763	1776	1776	1385
Flt Permitted	0.95	1.00	0.21	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	396	1776	1776	1385
Peak-hour factor, PHF	0.75	0.75	0.93	0.93	0.93	0.93
Adj. Flow (vph)	100	107	75	908	938	60
RTOR Reduction (vph)	0	93	0	0	0	17
Lane Group Flow (vph)	100	14	75	908	938	43
Confl. Peds. (#/hr)			14			14
Confl. Bikes (#/hr)						164
Heavy Vehicles (%)	2%	2%	2%	7%	7%	2%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	6.8	6.8	36.5	36.5	36.5	36.5
Effective Green, g (s)	6.8	6.8	36.5	36.5	36.5	36.5
Actuated g/C Ratio	0.13	0.13	0.71	0.71	0.71	0.71
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	234	209	281	1263	1263	985
v/s Ratio Prot	c0.06			0.51	c0.53	
v/s Ratio Perm		0.01	0.19			0.03
v/c Ratio	0.43	0.07	0.27	0.72	0.74	0.04
Uniform Delay, d1	20.5	19.5	2.6	4.4	4.5	2.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.1	0.5	2.0	2.4	0.0
Delay (s)	21.7	19.6	3.1	6.4	6.9	2.2
Level of Service	C	B	A	A	A	A
Approach Delay (s)	20.6			6.1	6.6	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	51.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	497	515	430	463	40	321	70	450	30	90	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (prot)	1687	3374	1484	3273	3322		1603	1634	1480		1719	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.99	
Satd. Flow (perm)	1687	3374	1484	3273	3322		1603	1634	1480		1719	
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.89	0.89	0.87	0.87	0.87	0.81	0.81	0.81
Adj. Flow (vph)	43	540	560	483	520	45	369	80	517	37	111	25
RTOR Reduction (vph)	0	0	417	0	7	0	0	0	0	0	6	0
Lane Group Flow (vph)	43	540	143	483	558	0	221	228	517	0	167	0
Confl. Peds. (#/hr)			5			1			23			
Confl. Bikes (#/hr)						22			2			2
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Free	Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						Free			
Actuated Green, G (s)	3.5	18.9	18.9	14.1	29.3		17.3	17.3	74.0		8.3	
Effective Green, g (s)	3.5	18.9	18.9	14.1	29.3		17.3	17.3	74.0		8.3	
Actuated g/C Ratio	0.05	0.26	0.26	0.19	0.40		0.23	0.23	1.00		0.11	
Clearance Time (s)	3.7	3.7	3.7	3.7	3.9		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	79	861	379	623	1315		374	382	1480		192	
v/s Ratio Prot	0.03	c0.16		c0.15	0.17		0.14	c0.14			c0.10	
v/s Ratio Perm			0.10						0.35			
v/c Ratio	0.54	0.63	0.38	0.78	0.42		0.59	0.60	0.35		0.87	
Uniform Delay, d1	34.5	24.4	22.7	28.4	16.2		25.2	25.2	0.0		32.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	4.1	1.0	0.2	5.5	0.1		2.1	2.1	0.7		31.2	
Delay (s)	38.5	25.5	22.9	33.9	16.3		27.3	27.3	0.7		63.5	
Level of Service	D	C	C	C	B		C	C	A		E	
Approach Delay (s)		24.7			24.4			13.0			63.5	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR-89 SB
From/To	Deerfield Dr to W River St
Jurisdiction	Nevada/Placer County
Analysis Year	
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 1005 veh/h
Opposing direction volume, Vo 421 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1058	pc/h	446	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	2.5	mi/h
Average travel speed, ATSd	29.5	mi/h
Percent Free Flow Speed, PFFS	67.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1058	pc/h	443	pc/h
Base percent time-spent-following,(note-4) BPTSFd	74.7	%		
Adjustment for no-passing zones, fnp	21.3			
Percent time-spent-following, PTSFd	89.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.62	
Peak 15-min vehicle-miles of travel, VMT15	53	veh-mi
Peak-hour vehicle-miles of travel, VMT60	201	veh-mi
Peak 15-min total travel time, TT15	1.8	veh-h
Capacity from ATS, CdATS	1690	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1690	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	29.5	mi/h
Percent time-spent-following, PTSFd (from above)	89.7	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1057.9
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.37
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR-89 SB
From/To	W River St to Squaw Valley Rd
Jurisdiction	Placer County
Analysis Year	Cumulative + P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1259 veh/h
Opposing direction volume, Vo 324 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.1	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.978	
Grade adj. factor,(note-1) fg	1.00		0.86	
Directional flow rate,(note-2) vi	1333	pc/h	405	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.3	mi/h
Average travel speed, ATSd	43.9	mi/h
Percent Free Flow Speed, PFFS	73.5	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.6
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.988
Grade adjustment factor,(note-1) fg	1.00	0.87
Directional flow rate,(note-2) vi	1325 pc/h	397 pc/h

Base percent time-spent-following,(note-4) BPTSFd	81.5	%
Adjustment for no-passing zones, fnp	12.6	
Percent time-spent-following, PTSFd	91.2	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.78	
Peak 15-min vehicle-miles of travel, VMT15	2584	veh-mi
Peak-hour vehicle-miles of travel, VMT60	9820	veh-mi
Peak 15-min total travel time, TT15	58.8	veh-h
Capacity from ATS, CdATS	1499	veh/h
Capacity from PTSF, CdPTSF	1512	veh/h
Directional Capacity	1499	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	43.9	mi/h
Percent time-spent-following, PTSFd (from above)	91.2	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1325.3
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	1.96
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	C + P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 803 veh/h
Opposing direction volume, Vo 633 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.6	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.988	
Grade adj. factor,(note-1) fg	1.00		0.98	
Directional flow rate,(note-2) vi	898	pc/h	726	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.5	mi/h
Average travel speed, ATSd	35.9	mi/h
Percent Free Flow Speed, PFFS	71.8	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	892	pc/h	710	pc/h
Base percent time-spent-following,(note-4) BPTSFd	72.4	%		
Adjustment for no-passing zones, fnp	24.5			
Percent time-spent-following, PTSFd	86.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	290	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1044	veh-mi
Peak 15-min total travel time, TT15	8.1	veh-h
Capacity from ATS, CdATS	1646	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1646	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	35.9	mi/h
Percent time-spent-following, PTSFd (from above)	86.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	892.2
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.65
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR-89 NB
From/To	SR 28 to A. Meadows Rd
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	6.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1087 veh/h
Opposing direction volume, Vo 342 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.0	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.980	
Grade adj. factor,(note-1) fg	1.00		0.87	
Directional flow rate,(note-2) vi	1151	pc/h	422	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	49.8	mi/h
Adjustment for no-passing zones, fnp	2.6	mi/h
Average travel speed, ATSd	34.9	mi/h
Percent Free Flow Speed, PFFS	70.2	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.6
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.988
Grade adjustment factor,(note-1) fg	1.00	0.88
Directional flow rate,(note-2) vi	1144 pc/h	414 pc/h
Base percent time-spent-following,(note-4) BPTSFd	77.4 %	
Adjustment for no-passing zones, fnp	24.1	
Percent time-spent-following, PTSFd	95.1 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.68	
Peak 15-min vehicle-miles of travel, VMT15	1058	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4022	veh-mi
Peak 15-min total travel time, TT15	30.3	veh-h
Capacity from ATS, CdATS	1516	veh/h
Capacity from PTSF, CdPTSF	1535	veh/h
Directional Capacity	1516	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	34.9	mi/h
Percent time-spent-following, PTSFd (from above)	95.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1144.2
Effective width of outside lane, We	24.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.82
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/2014
Analysis Time Period	Winter AM
Highway	SR89 NB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	C+P
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.90	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 847 veh/h
Opposing direction volume, Vo 405 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	941	pc/h	453	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h
Average travel speed, ATSd	26.9	mi/h
Percent Free Flow Speed, PFFS	67.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	941	pc/h	450	pc/h
Base percent time-spent-following,(note-4) BPTSFd	71.9	%		
Adjustment for no-passing zones, fnp	22.2			
Percent time-spent-following, PTSFd	86.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.55	
Peak 15-min vehicle-miles of travel, VMT15	71	veh-mi
Peak-hour vehicle-miles of travel, VMT60	254	veh-mi
Peak 15-min total travel time, TT15	2.6	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	26.9	mi/h
Percent time-spent-following, PTSFd (from above)	86.9	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	941.1
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.73
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	4.7	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 1558 veh/h
Opposing direction volume, Vo 380 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.3	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.994	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1731	pc/h	425	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	2.6	mi/h
Average travel speed, ATSd	24.4	mi/h
Percent Free Flow Speed, PFFS	55.8	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1731 pc/h	422 pc/h

Base percent time-spent-following,(note-4) BPTSFd	88.3	%
Adjustment for no-passing zones, fnp	10.7	
Percent time-spent-following, PTSFd	96.9	%

Level of Service and Other Performance Measures

Level of service, LOS	F	
Volume to capacity ratio, v/c	1.02	
Peak 15-min vehicle-miles of travel, VMT15	87	veh-mi
Peak-hour vehicle-miles of travel, VMT60	312	veh-mi
Peak 15-min total travel time, TT15	3.6	veh-h
Capacity from ATS, CdATS	1690	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1690	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	24.4	mi/h
Percent time-spent-following, PTSFd (from above)	96.9	
Level of service, LOSd (from above)	F	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1731.1
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.62
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1656 veh/h
Opposing direction volume, Vo 262 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		2.1	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.978	
Grade adj. factor,(note-1) fg	1.00		0.82	
Directional flow rate,(note-2) vi	1851	pc/h	363	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	2.6	mi/h
Average travel speed, ATSd	40.0	mi/h
Percent Free Flow Speed, PFFS	66.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.986	
Grade adjustment factor,(note-1) fg	1.00		0.85	
Directional flow rate,(note-2) vi	1840	pc/h	347	pc/h
Base percent time-spent-following,(note-4) BPTSFd	89.7	%		
Adjustment for no-passing zones, fnp	10.1			
Percent time-spent-following, PTSFd	98.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	F	
Volume to capacity ratio, v/c	1.09	
Peak 15-min vehicle-miles of travel, VMT15	3588	veh-mi
Peak-hour vehicle-miles of travel, VMT60	12917	veh-mi
Peak 15-min total travel time, TT15	89.7	veh-h
Capacity from ATS, CdATS	1430	veh/h
Capacity from PTSF, CdPTSF	1461	veh/h
Directional Capacity	1430	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	40.0	mi/h
Percent time-spent-following, PTSFd (from above)	98.2	
Level of service, LOSd (from above)	F	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1840.0
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	2.13
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.90	
Shoulder width	8.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 771 veh/h
Opposing direction volume, Vo 665 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.5	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.990	
Grade adj. factor,(note-1) fg	1.00		0.98	
Directional flow rate,(note-2) vi	862	pc/h	762	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h
Average travel speed, ATSd	36.0	mi/h
Percent Free Flow Speed, PFFS	72.0	%

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	5.5	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 962 veh/h
Opposing direction volume, Vo 410 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.9	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.994		0.982	
Grade adj. factor,(note-1) fg	1.00		0.92	
Directional flow rate,(note-2) vi	1019	pc/h	478	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	2.4	mi/h
Average travel speed, ATSd	34.5	mi/h
Percent Free Flow Speed, PFFS	71.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.4	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.992	
Grade adjustment factor,(note-1) fg	1.00		0.92	
Directional flow rate,(note-2) vi	1013	pc/h	473	pc/h
Base percent time-spent-following,(note-4) BPTSFd	74.2	%		
Adjustment for no-passing zones, fnp	21.3			
Percent time-spent-following, PTSFd	88.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	937	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3559	veh-mi
Peak 15-min total travel time, TT15	27.2	veh-h
Capacity from ATS, CdATS	1569	veh/h
Capacity from PTSF, CdPTSF	1585	veh/h
Directional Capacity	1569	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	34.5	mi/h
Percent time-spent-following, PTSFd (from above)	88.7	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1012.6
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	2.99
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		0.99	
Directional flow rate,(note-2) vi	857	pc/h	746	pc/h
Base percent time-spent-following,(note-4) BPTSFd	71.3	%		
Adjustment for no-passing zones, fnp	24.8			
Percent time-spent-following, PTSFd	84.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	278	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1002	veh-mi
Peak 15-min total travel time, TT15	7.7	veh-h
Capacity from ATS, CdATS	1649	veh/h
Capacity from PTSF, CdPTSF	1683	veh/h
Directional Capacity	1649	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.0	mi/h
Percent time-spent-following, PTSFd (from above)	84.6	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	856.7
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	1.63
Bicycle LOS	B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	Fehr & Peers
Date Performed	10/1/2014
Analysis Time Period	Winter PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	C+P
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2			Peak hour factor, PHF	0.85	
Shoulder width	2.0	ft		% Trucks and buses	2	%
Lane width	12.0	ft		% Trucks crawling	0.0	%
Segment length	0.3	mi		Truck crawl speed	0.0	mi/hr
Terrain type	Level			% Recreational vehicles	0	%
Grade: Length	-	mi		% No-passing zones	64	%
Up/down	-	%		Access point density	11	/mi

Analysis direction volume, Vd 634 veh/h
Opposing direction volume, Vo 524 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.998		0.998	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	747	pc/h	618	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h
Average travel speed, ATSd	27.7	mi/h
Percent Free Flow Speed, PFFS	69.9	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	746 pc/h	616 pc/h

Base percent time-spent-following,(note-4) BPTSFd	65.1	%
Adjustment for no-passing zones, fnp	27.0	
Percent time-spent-following, PTSFd	79.9	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.44	
Peak 15-min vehicle-miles of travel, VMT15	56	veh-mi
Peak-hour vehicle-miles of travel, VMT60	190	veh-mi
Peak 15-min total travel time, TT15	2.0	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	27.7	mi/h
Percent time-spent-following, PTSFd (from above)	79.9	
Level of service, LOSd (from above)	D	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	745.9
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.61
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	W River St to Deerfield Dr
Jurisdiction	Nevada/Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	4.7	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.2	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 991 veh/h
Opposing direction volume, Vo 950 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1043	pc/h	1000	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	43.7	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	26.7	mi/h
Percent Free Flow Speed, PFFS	61.2	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1043	pc/h	1000	pc/h
Base percent time-spent-following,(note-4) BPTSFd	78.9	%		
Adjustment for no-passing zones, fnp	18.0			
Percent time-spent-following, PTSFd	88.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.61	
Peak 15-min vehicle-miles of travel, VMT15	52	veh-mi
Peak-hour vehicle-miles of travel, VMT60	198	veh-mi
Peak 15-min total travel time, TT15	1.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.2	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	26.7	mi/h
Percent time-spent-following, PTSFd (from above)	88.1	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1043.2
Effective width of outside lane, We	21.40
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.71
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	Squaw Valley Rd to W River St
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	7.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	55	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd 1014 veh/h
Opposing direction volume, Vo 948 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.979	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1090	pc/h	1019	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	59.8	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATSd	42.5	mi/h
Percent Free Flow Speed, PFFS	71.2	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1067 pc/h	998 pc/h

Base percent time-spent-following,(note-4) BPTSFd	79.5	%
Adjustment for no-passing zones, fnp	16.0	
Percent time-spent-following, PTSFd	87.8	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.64	
Peak 15-min vehicle-miles of travel, VMT15	2081	veh-mi
Peak-hour vehicle-miles of travel, VMT60	7909	veh-mi
Peak 15-min total travel time, TT15	48.9	veh-h
Capacity from ATS, CdATS	1664	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1664	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	7.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	42.5	mi/h
Percent time-spent-following, PTSFd (from above)	87.8	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1067.4
Effective width of outside lane, We	28.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.31
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 NB
From/To	A. Meadows Rd to S. Valley Rd
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	8.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	0	/mi

Analysis direction volume, Vd 928 veh/h
Opposing direction volume, Vo 920 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.979	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	998	pc/h	989	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	0.0	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	33.5	mi/h
Percent Free Flow Speed, PFFS	66.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	977	pc/h	968	pc/h
Base percent time-spent-following,(note-4) BPTSFd	76.7	%		
Adjustment for no-passing zones, fnp	19.7			
Percent time-spent-following, PTSFd	86.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.59	
Peak 15-min vehicle-miles of travel, VMT15	317	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1206	veh-mi
Peak 15-min total travel time, TT15	9.5	veh-h
Capacity from ATS, CdATS	1664	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1664	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	33.5	mi/h
Percent time-spent-following, PTSFd (from above)	86.6	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	976.8
Effective width of outside lane, We	28.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	3.04
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR-89 SB
From/To	A. Meadows Rd to SR 28
Jurisdiction	Placer County
Analysis Year	C+P
Description	Squaw Valley Olympic Village

Input Data

Highway class	Class 1		Peak hour factor, PHF	0.95	
Shoulder width	5.5	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	1	/mi

Analysis direction volume, Vd	952	veh/h
Opposing direction volume, Vo	914	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.3		1.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.979		0.979	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1024	pc/h	983	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	0.3	mi/h
Free-flow speed, FFSd	48.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	31.8	mi/h
Percent Free Flow Speed, PFFS	65.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1002 pc/h	962 pc/h
Base percent time-spent-following,(note-4) BPTSFd	77.4 %	
Adjustment for no-passing zones, fnp	19.2	
Percent time-spent-following, PTSFd	87.2 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	927	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3522	veh-mi
Peak 15-min total travel time, TT15	29.2	veh-h
Capacity from ATS, CdATS	1664	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1664	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	31.8	mi/h
Percent time-spent-following, PTSFd (from above)	87.2	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1002.1
Effective width of outside lane, We	23.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	4.33
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.50

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Fehr & Peers
Agency/Co.	
Date Performed	10/1/2014
Analysis Time Period	Summer PM
Highway	SR89 SB
From/To	At Transit Center
Jurisdiction	Caltrans
Analysis Year	C+P
Description	Squaw Valley Olympic Villlage

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.95	
Shoulder width	2.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	0.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	64	%
Up/down	-	%	Access point density	11	/mi

Analysis direction volume, Vd 1036 veh/h
Opposing direction volume, Vo 841 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1091	pc/h	885	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	2.8	mi/h
Free-flow speed, FFSd	39.7	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATSd	23.5	mi/h
Percent Free Flow Speed, PFFS	59.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1091	pc/h	885	pc/h
Base percent time-spent-following,(note-4) BPTSFd	79.2	%		
Adjustment for no-passing zones, fnp	17.2			
Percent time-spent-following, PTSFd	88.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.64	
Peak 15-min vehicle-miles of travel, VMT15	82	veh-mi
Peak-hour vehicle-miles of travel, VMT60	311	veh-mi
Peak 15-min total travel time, TT15	3.5	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	0.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	23.5	mi/h
Percent time-spent-following, PTSFd (from above)	88.7	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1090.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.26
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	WB	NB	NB	NB	B31	SB	SB	B33
Directions Served	L	LT	LTR	L	T	TR	T	T	R	T
Maximum Queue (ft)	89	108	22	425	508	146	797	384	270	269
Average Queue (ft)	47	75	8	408	424	43	441	286	142	82
95th Queue (ft)	100	118	30	491	708	216	1174	468	376	447
Link Distance (ft)		493	165		427	427	1602	362		906
Upstream Blk Time (%)				35	43	0	2	5		1
Queuing Penalty (veh)				0	0	0	0	0		0
Storage Bay Dist (ft)	460			400					260	
Storage Blk Time (%)				70	3			21	0	
Queuing Penalty (veh)				73	20			163	2	

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	B1	B1	WB	NB	NB	NB	B31	SB
Directions Served	L	LT	T	T	LTR	L	T	TR	T	T
Maximum Queue (ft)	492	574	290	112	35	242	426	458	27	160
Average Queue (ft)	303	334	61	16	6	114	275	284	1	94
95th Queue (ft)	523	577	295	153	33	246	433	463	13	167
Link Distance (ft)		493	972	972	166		426	426	1602	397
Upstream Blk Time (%)	0	4				0	1	1		
Queuing Penalty (veh)	0	0				0	0	0		
Storage Bay Dist (ft)	470					400				
Storage Blk Time (%)	1	6					2			0
Queuing Penalty (veh)	4	37					2			1

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1090.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.26
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
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Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	WB	NB	NB	NB	B31	SB	SB	B33
Directions Served	L	LT	LTR	L	T	TR	T	T	R	T
Maximum Queue (ft)	89	108	22	425	508	146	797	384	270	269
Average Queue (ft)	47	75	8	408	424	43	441	286	142	82
95th Queue (ft)	100	118	30	491	708	216	1174	468	376	447
Link Distance (ft)		493	165		427	427	1602	362		906
Upstream Blk Time (%)				35	43	0	2	5		1
Queuing Penalty (veh)				0	0	0	0	0		0
Storage Bay Dist (ft)	460			400					260	
Storage Blk Time (%)				70	3			21	0	
Queuing Penalty (veh)				73	20			163	2	

Intersection: 11: Squaw Valley Rd & SR 89

Movement	EB	EB	B1	B1	WB	NB	NB	NB	B31	SB
Directions Served	L	LT	T	T	LTR	L	T	TR	T	T
Maximum Queue (ft)	492	574	290	112	35	242	426	458	27	160
Average Queue (ft)	303	334	61	16	6	114	275	284	1	94
95th Queue (ft)	523	577	295	153	33	246	433	463	13	167
Link Distance (ft)		493	972	972	166		426	426	1602	397
Upstream Blk Time (%)	0	4				0	1	1		
Queuing Penalty (veh)	0	0				0	0	0		
Storage Bay Dist (ft)	470					400				
Storage Blk Time (%)	1	6					2			0
Queuing Penalty (veh)	4	37					2			1

Parking Analysis

Village At Squaw Valley Parking Analysis

Prepared for

Squaw Valley USA

Prepared by

LSC Transportation Consultants, Inc.

Village At Squaw Valley
Parking Analysis

Prepared for

Squaw Valley USA

Prepared by

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September 22, 2014

LSC # 137620

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Section I
INTRODUCTION

This document presents an analysis of the parking needs associated with the planned future Village at Squaw Valley in the Squaw Valley base area. This parking analysis encompasses parking demand generated by the following:

- Development land uses
- Ski area employees
- Day skiers
- Village at Squaw Valley retail/restaurant customers and employees not parked beneath the Village
- Olympic House area customers and employees
- Medical Center physicians, staff and patients
- Squaw Valley East employee housing and retail use
- Squaw Valley operational vehicles

Note that parking demand generated by Squaw Valley Preparatory School is not included in this analysis, as the school is a temporary use that would not be in place once the proposed construction begins.

This analysis first identifies the parking demand rate (parking spaces per unit of development). These rates are then applied to the proposed development quantities. In addition, rates are applied to other land uses served by the joint parking area. Existing ski area employee parking needs are estimated based upon employee survey data. Other employees parking needs are based on the peak-period peak-day number of employees on site, as well as survey data. Day skier parking requirements are identified based upon skier counts and survey data. Finally, the overall existing parking estimates are compared with observed parking counts, to validate the overall analysis procedure.

Section II

PARKING DEMAND RATES

This section presents an analysis of parking demand rates that pertain to the specific transportation conditions in Squaw Valley. A summary of the resulting rates is presented in Table 1.

TABLE 1: Village at Squaw Valley Parking Demand Rates

Land Use	Base Rate		Vehicle Occupancy	Non-Auto Travel Mode	Proportion in Employee Housing	Number of Parking Spaces Required Per Unit
Hotel Unit						
1 Bedroom						
Guest	0.75	Space per Unit (1)	--	Note 2		0.75
Employee	0.36	Employees Onsite Per Unit (3)	1.76 (4)	18% (4)	32% (5)	0.11
Total						0.86
2 Bedroom						
Guest	1.00	Space per Unit (1)	--	Note 2		1.00
Employee	0.36	Employees Onsite Per Unit (3)	1.76 (4)	18% (4)	32% (5)	0.11
Total						1.11
3 Bedroom						
Guest	1.25	Space per Unit (1)	--	Note 2		1.25
Employee	0.36	Employees Onsite Per Unit (3)	1.76 (4)	18% (4)	32% (5)	0.11
Total						1.36
Fractional Cabin						
3 Bedroom						
Guest	1.5	Space per Unit (1)		Note 2		1.50
Employee	0.87	Employees Onsite Per Unit (3)	1.76 (4)	18% (4)	32% (5)	0.28
Total						1.78
Retail						
In Village						
Customer	3.33	KSF (5)		83% (6)		0.57
Employee	2.42	Employees/KSF at Peak	1.76	18%		1.13
Total						1.7
In Squaw Valley East	3.33	KSF (5)		0%		3.33
Restaurant						
Customer	10.00	KSF (7)		90% (6)		1.00
Employee	4.69	Employees/KSF at Peak	1.76	18%		2.19
Total						3.19
Conference Space	5.5	Spaces per KSF (8)		75% (1)		1.38
Mountain Adventure Camp						
Guests	13.33	Guests per KSF (9)	2.2 (9)	95% (1)		0.30
Employees	0.49	Employees Onsite at Peak Per KSF (9)	1.76 (4)	18% (4)	32% (5)	0.15
Total						0.45
Seasonal Employee Housing	0.66	Spaces per bed (1)	--	--	--	0.66

Note 1: See text

Note 2: Non-auto regional access reflected in the base rate

Note 3: Based upon forecasted employment by shift on a busy winter day. See text.

Note 4: Per survey of existing Squaw Valley USA employees

Note 5: Based on the proportion of employees in employee housing and prohibited from driving to employment in the Village

Note 6: Per Squaw Valley General Plan

Note 7: Per surveys of existing Village at Squaw Valley customers

Note 8: Per Placer County General Plan

Note 9: Per Urban Land Institute's *Shared Parking*

Note 10: Per Squaw Valley USA

Lodging Uses

Parking demand for condominium/hotel units consists of both guest parking demand and employee parking demand. As employee parking is addressed differently from guest parking demand, it is necessary to evaluate guest and employee parking demand separately.

Guest Parking Demand Rates

The analysis of condominium hotel parking rate is based on the rate of 0.75 spaces per 1 bedroom unit for guests. The *Squaw Valley General Plan* identifies a rate of 1.00 spaces per "room", which includes both guest and employee parking demand. This rate of 0.75 guest spaces per 1 bedroom unit reflects both the strategies identified in the *Village at Squaw Valley Specific Plan* to encourage non-auto visitor access through enhancement of regional access shuttle systems, as well as a focus on family-oriented marketing that will result in greater use of multiple units by a travel party arriving in a single vehicle.

The condominium hotels are proposed to have a substantial number of 2-bedroom and 3-bedroom units with "lock-off" rooms. The *Squaw Valley General Plan* was prepared long before multi-bedroom resort lodging/residential units were common. There is ample evidence that additional bedrooms in a single unit do not generate additional parking demand equal to that of the first bedroom. A review of available literature and studies indicates the following:

- A survey of parking demand was conducted for the Embassy Suites Resort in South Lake Tahoe, which consists of 400 two-room suites. A survey of parking spaces per occupied suite conducted between July 22 and July 31, 1996, indicates that the maximum demand was approximately 0.94 spaces per occupied suite (which accommodated both guests and employees).

- The firm of DMJM Harris, Inc. conducted a study in the peak winter season of 2001-2002 that provides parking lot survey data from eleven mountain destination resorts in Colorado and Utah, as a part of the *Parking Study for Beaver Creek Landing at Avon* (2001). According to this study, the average number of parked vehicles over the surveyed properties at the peak time of demand per occupied dwelling unit (reflecting both employees and guests) was 0.86. It should be noted that many of the properties surveyed included multiple bedroom units, and still had a relatively modest observed parking demand:

    - The Beaver Run Resort and Conference Center in Breckenridge, Colorado consists of a total of 426 units, 121 of which contain at least two bedrooms, but still has a maximum observed parking demand rate of 1.01 vehicles per occupied unit.

    - The River Run project in Keystone, Colorado consists of 402 units, 164 of which contain at least two bedrooms, with a maximum observed parking demand rate of 1.09 per occupied unit.

    - The Silverado II project in Winter Park, Colorado consists solely of 72 two-bedroom units, with a maximum observed parking demand of 1.33.

- The firm of Steven Miner Research and Appraisal conducted a survey of 3,262 members of Interval International (a major nationwide timeshare organization) in 1998. This study, entitled *The Automotive Parking Needs of Timeshare Resorts*, indicated that the average number of spaces needed by size of unit across the country was as follows:

Hotel Room/Efficiency/Studio	1.06 spaces per unit
One-Bedroom	1.16 spaces per unit
Two-Bedroom	1.40 spaces per unit
Three-Bedroom or larger	1.66 spaces per unit

Properties in the West Coast states were found to generate parking slightly less than the national average.

- The following presents a review of existing fractional/timeshare/tourist accommodation parking requirements in other jurisdictions based on the number of bedrooms:

  - Douglas County, Nevada adopted a parking requirement for the Roundhill Timeshare development in Roundhill, Nevada of 1.0 space for each one-bedroom timeshare unit and 1.25 spaces for each two-bedroom unit.

  - The ski town of Breckenridge, Colorado requires that condominium hotel units with more than one bedroom provide 1.1 parking space per 1,000 square feet of floor area within the transit system service area or 1.5 spaces per dwelling unit outside the service area. In addition, condominium hotels with "divisible units," i.e., a lockoff unit with a separate entrance within a multi-unit structure, must provide 0.5 spaces for each divisible room.

  - The City of Sedona, Arizona has a substantially lower parking requirement of 0.5 spaces per room within each lodging unit with no less than one space per unit.

- Other parking requirements based on the number of dwelling units are as follows:

  - The City of South Lake Tahoe requires 1.0 space per timeshare unit.

  - Jackson, Wyoming requires 1.5 parking spaces per timeshare unit.

  - Vail, Colorado requires 0.7 spaces per timeshare unit. In Vail, fractional fee club units (where there are no less than six and no more than ten owners as well as proximity to transit, restaurants, and recreation) share the same requirement of 0.7 per unit.

In summary, for many jurisdictions reviewed, a second bedroom in a lodging unit does not necessitate additional parking space requirements. However, this is misleading as the typical fractional/timeshare development is a hotel type of development, and probably largely reflects that parking codes have not adjusted to the shift from hotel-room type fractional/timeshare units to multiple-bedroom units. Parking requirements for multi-bedroom fractional/timeshare/tourist accommodation units are based on the number of bedrooms.

Based on this review, a guest parking rate for the proposed project is 0.75 space per one-bedroom unit plus 0.25 space per bedroom over one bedroom, for a total of 1.00 guest spaces per two-bedroom unit and 1.25 per three-bedroom unit.

Hotel Employee Rate

The hotel parking rate also needs to reflect parking demand generated by hotel employees. The number of employees associated with the hotel uses (including the restaurant and retail uses within the hotels) was provided by Squaw Valley Real Estate, LLC, based upon an analysis of

employment by shift at existing Village uses. At the time of peak overall parking demand (12 Noon to 2:00 PM) on a peak winter day, the planned hotel uses will result in 286 employees on-site for hospitality uses, 105 for restaurant uses, and 65 for retail uses, for a total of 456 employees. Dividing by the total number of hotel units (including lock-off units locked off), this equates to 0.36 employees onsite per unit.

A survey of 106 Squaw Valley employees conducted in the winter of 2011 indicated that 82 percent arrived by car (either as a driver or a passenger), while 18 percent commuted by other means. Of those arriving by car, the average vehicle occupancy was 1.76 employees per vehicle. In addition, the employee housing proposed in the Squaw Valley East parcel will further reduce net employee parking demand generated by the Village, as employees housed in this area will be prohibited from driving to the Village unless required as part of their job (instead, leaving any private vehicles at the housing area). Squaw Valley Real Estate, LLC forecasts a total of 750 employees on staff in the peak season (including the Mountain Adventure Camp). Compared with the 264 proposed beds in the Squaw Valley East employee housing indicates that 35 percent of employees will be housed at this facility. Some employees will require their car in the Village as part of their job; this is estimate to be no more than 10 percent. Factoring the 35 percent housed in employee housing downward by 10 percent, the provision of employee housing will reduce employee parking demand in the Village area by 32 percent

These figures are applied to the peak employees to estimate the peak parking demand generated by proposed development. Dividing the onsite employees per unit by the employee vehicle occupancy rate and factoring to reflect non-auto commuting and the reduction for employee housing yields an employee parking demand rate of 0.11 spaces per unit.

Total Hotel Rate

Adding the guest and employee rates yields a total parking demand rate for hotel units of 0.86 spaces per 1-bedroom unit, 1.11 spaces per 2-bedroom unit, and 1.36 spaces per 3-bedroom unit. These rates are consistent with or exceed the peak rates observed in the study conducted by DMJM Harris, Inc. of other mountain resort developments. It is also consistent with the *Squaw Valley General Plan & Land Use Ordinance*, the observed parking rate at Embassy Suites in South Lake Tahoe, as well as the parking rate of 1.22 spaces per unit (the majority of which are 2 and 3 bedroom units) applied by Placer County to the Northstar Village project.

Fractional Cabin Rate

The *Squaw Valley General Plan and Land Use Ordinance* identifies a rate of 0.75 spaces per bedroom for other residential uses (such as timeshare and condominium). This rate of 0.75 spaces per bedroom is not sufficient for 1 bedroom units, given that travel parties staying in the fractional cabins are more likely to arrive by car and less likely to use more than one unit than hotel guests. In addition, as discussed above, additional bedrooms in a resort multifamily residential/timeshare units generate a parking demand of 0.25 spaces. In addition, Squaw Valley Real Estate, LLC estimates that the cabin complex will require 27 employees onsite at the time of peak overall demand on a peak winter day. Applying the employee demand factors discussed above, this results in 0.28 employee spaces per unit, or a total of 1.78 spaces per 3-bedroom cabin.

Commercial Rates

The *Squaw Valley General Plan* identifies a rate of 1 space per 300 square feet (or 3.33 spaces per thousand square feet). While this is appropriate for retail space (and identical to the retail rate in the *Placer County Code*), it would not result in adequate parking for restaurant/bar use. As a base rate, the *Placer County Code* rate of 10 spaces per thousand square feet is applied to the restaurant/bar floor area.

A large proportion of the customers at the commercial land uses in the Village can be expected to consist of persons already on-site (with parking demand considered elsewhere in this analysis), such as lodging guests or day skiers. A survey of 191 restaurant and bar customers in the Village at Squaw Valley in the winter of 2011 indicted that 171 (or 90 percent) were also skiing. Similarly, a survey of 70 persons shopping at the Village at Squaw Valley indicated that 58 (or 83 percent) also skied as part of their trip. These proportions were applied to the proposed commercial uses, yielding rates of 0.57 spaces per thousand square feet for retail (or 1 space per 1,754 square feet) and 1.00 spaces per thousand square feet for restaurant (or 1 space per 952 square feet).

A modest amount of retail is also planned for the Squaw Valley East parcel. As this location is not within convenient walk distance of other activity centers or residential areas, and as many of the customers will be generated by pass-by or intercepted auto trips, no reductions for non-auto travel from the base rate of 3.33 spaces per thousand square feet are applied.

Conference Space

Neither the *Squaw Valley General Plan* nor the *Placer County Code* provides a rate for conference facilities. The Urban Land Institute's *Shared Parking* recommends a rate of 5.5 spaces per thousand square feet of floor area, which was applied as a base rate. While in off-peak periods the hotel conference facilities may be used for "local" event with a higher proportion of attendees arriving by car, on peak season days hotel conference facilities are marketed so that the majority of conference attendees are also lodging in the area. It is estimated that 75 percent of conference attendees will be lodged within the immediate Squaw Valley area, and thus will not generate additional peak parking needs. The resulting parking rate for conference space is 1.38 spaces per thousand square feet. (or 1 space per 724 square feet).

Mountain Adventure Camp

The Mountain Adventure Camp is planned to provide an indoor recreational facility, including pools, water activity areas, climbing walls, and other recreational/athletic facilities. As there is no available parking demand standard, a parking rate must be developed based upon expected use levels and activity patterns for guests and employees. Regarding guests, the maximum expected attendance at the Mountain Adventure Camp (1,200 persons, per Squaw Valley USA management) divided by the size of the facility (90 KSF) yields 13.33 guests per thousand square feet. On busy ski days (when overall parking demand is greatest) the Mountain Adventure Camp is expected to generate a large majority of its customers from persons already staying onsite or by extending the length of stay of day skiers (thus not increasing peak parking needs)[1]. It is estimated by Squaw Valley USA that no more than 5 percent of customers on these peak winter days will consist of persons arriving at the site expressly to visit the Mountain

[1] During other seasons when the proportion of customers from outside Squaw Valley may be higher, there will be more than adequate parking not being used by skiers.

Adventure Camp. Multiplying by 5 percent, dividing by an average vehicle occupancy of 2.2 customers per car (per observations of skier vehicle occupancy) and assuming negligible transit access from outside Squaw Valley, this corresponds to a guest demand rate of 0.30 spaces per KSF during a winter peak period.

Squaw Valley USA management estimates that a maximum of 44 employees would be needed to staff the Mountain Adventure Camp at the peak time. This equates to 0.49 employees per KSF. Based upon the surveys of existing Squaw Valley USA employee commute patterns, an 18 percent non-auto commute mode factor, 1.76 average employee commute vehicle occupancy, and 32 percent housed in employee housing (and not driving), the resulting rate of employee spaces per KSF is 0.15. Adding the guest and employee parking demand yields a total parking demand rate of 0.45 spaces per KSF during the peak winter period.

Seasonal Employee Housing

The parking ratio requirement cited in the Squaw Valley General Plan is to provide 0.75 parking spaces per bedroom. The employee housing area proposed for the Squaw Valley East, however, may include a variety of persons per room, and also differs from typical multifamily housing in that seasonal employees have a different auto ownership rate than the general public. This is particularly true of seasonal workers with permanent homes outside the US. To best quantify the appropriate rate, LSC conducted surveys of Squaw Valley employees arriving at work over two morning periods (on April 5 and 6, 2014). Specifically, LSC staff was stationed at two key employee entrance locations (Red Dog and the Clocktower) from 6:30 AM to 8:30 AM on two days, asking if they were seasonal Squaw Valley employees. If so, they were asked if they owned a car in the Tahoe area and their permanent residence location. Responses were grouped to focus on those employees that would potentially use the proposed employee housing, specifically those with a permanent address beyond a reasonable commute distance (Tahoe, Truckee, Reno).

This survey of car ownership indicated that 73 percent of non-international seasonal workers have a car in the Tahoe Region. Among the five international workers surveyed, one indicated that they owned a car in the Tahoe Region. However, this limited sample may overstate the proportion of international workers with a car, as Squaw Valley Human Resource staff estimates that roughly 5 percent of international workers have a car. A reasonable planning estimate is that no more than 10 percent of international workers have a car. Squaw Valley Human Resources staff also indicates that 11 percent of current peak winter seasonal workers are international, while the remaining 89 percent have permanent addresses in the US. Applying these proportions to the 73 percent and 10 percent local auto ownership rates for US / international employees, respectively, yields an overall local auto ownership rate of 0.66 vehicles per resident of seasonal employee housing.

Section III

FUTURE DEVELOPMENT PARKING DEMAND

Village Area

The analysis of parking demand generated by the proposed future Village at Squaw Valley land uses is presented in Table 2. For each parcel and land use category, the land use quantity is multiplied by the pertinent parking generation rate (as provided in Table 1). Note that while the number of condo hotel and fractional cabin units and the total number of bedrooms by parcel has been defined, the specific mix of number of units by number of bedrooms by parcel has not been defined. For purposes of this analysis, an overall distribution of 20 percent 1 bedroom, 60 percent 2 bedroom and 20 percent 3 bedroom units has applied as a general guideline for the condo hotel units, and a distribution of 60 percent 3 bedroom and 40 percent 4 bedroom units for the fractional cabins. As necessary, these distributions were then adjusted to result in the correct total number of bedrooms for each parcel.

Before applying the rates to the condo hotel units, it is necessary to consider the impact of "lock-off" units on the effective number of units, by number of bedrooms[2]. When not used by an owner desiring to use multiple bedrooms, these "lock-off" rooms may be locked off and managed as an individual hotel room. As individual hotel rooms generate greater parking demand than a second (or third) bedroom in a multi-bedroom unit, it is necessary to estimate the functional number of units assuming a particular proportion of individual rooms are locked off. A conservatively high proportion of 75 percent of lock-off rooms locked off is applied.[3] Assigning this probability to the two-bedroom units indicates that, on average, 100 two-bedroom units will be used as 150 one-bedroom units (75 units divided in two) plus 25 two-bedroom units. Similarly (and assuming that the chance of the second door being locked off is independent of the chance that the first door is locked off), 100 3-bedroom units on average will be used as 206 one-bedroom units, 38 two-bedroom units, and 6 three bedroom units. Note that all lodging and residential uses are assumed to be 100 percent occupied.

In total, the proposed Village development is calculated to generate a peak parking demand of 1,279 vehicles, consisting of 1,118 vehicles associated with guests and customers plus 161 vehicles generated by employees.

The development plan would also result in the elimination of approximately 1,600 square feet of food & beverage space, along with 5,930 square feet of retail space. Applying the same rates for customers discussed above, and including spaces for employees, a reduction of 16 parking spaces would result from the elimination of existing uses. The total net impact of the proposed project would be an increase in parking demand in the Village area by 1,263 vehicles.

While the development is proposed to include the mountain maintenance center, this new facility is not expected to change the number of ski area employees on-site. Associated parking demand is therefore discussed in the following section.

[2] No lockoff capability is planned for the fractional cabins.

[3] As a point of reference, parking for the Embassy Suites in South Lake Tahoe, California was calculated assuming only a 50 percent lock-off rate, which has provided more than adequate parking supply.

Squaw Valley East

A similar analysis of parking demand for the land uses in the Squaw Valley East parcel is provided in the bottom portion of Table 2. A shared parking factor is applied to the employee housing parking needs, reflecting that at the peak period of day skier parking (1) some employee vehicles will not be onsite as they will be needed for their work (up to 10 percent, as discussed in Section II), and (2) that some employees will not be working on any particular day and will use their vehicles to travel off-site. Overall, 5 percent are assumed to be off-site at the peak time. While this site will also provide the relocated location of the shipping/receiving area for Squaw Valley, the associated employee parking demand is included in the following section. The peak parking demand for the Squaw Valley East land uses (excluding the shipping/receiving facility) is 183 parking spaces.

TABLE 2: Parking Demand for Village at Squaw Valley Development

Parking Demand Generator	Thousand Square Feet of Conference / Commercial	#Units : Before Lock-Offs	Resulting # Units After Lock-Offs (1)			Total Resulting Units After Lock-Offs	Parking Rate (2)			% Of Demand at Peak Time (3)	Parking Space Demand		
			1 br	2 br	3br		Guest/ Customer	Employee	Total		Guest/ Customer	Employee	Total
Village													
Condo Hotel													
1 bedroom	–	364	364	–	–	1,118	0.75	0.11	0.86	100%	839	123	962
2 bedroom	–	329	494	82	–	129	1.00	0.11	1.11	100%	129	14	143
3 bedroom	–	126	260	47	8	8	1.25	0.11	1.36	100%	10	1	11
Restaurant	28.62	–	--	–	–	–	1.00	Note 4	1.00	100%	29	–	29
Retail 27	.62	–	--	–	–	–	0.57	Note 4	0.57	100%	16	–	16
Meeting Space	12.00	–	--	–	–	–	1.38	Note 4	1.38	100%	17	–	17
Subtotal		819	1,118	129	8	1,255					1,040	138	1,178
Fractional Cabins													
3 bedroom	–	31	--	–	31	31	1.50	0.28	1.50	100%	47	9	56
Restaurant	2.50	–	--	–	–	–	1.00	Note 4	1.00	100%	3	–	3
Retail 1.	00	–	--	–	–	–	0.57	Note 4	0.57	100%	1	–	1
Subtotal		31	0	0	31	31					51	9	60
Mountain Adventure Camp	90.00	–	--	–	–	–	0.30	0.15	0.45	100%	27	14	41
TOTAL		850	1,118	129	39	1,286					1,118	161	1,279
Existing Uses To Be Removed													
Restaurant	-1.60	–	--	–	–	–	1.00	2.19	3.19	100%	-2	-4	-6
Retail	-5.93	–	--	–	–	–	0.57	1.13	1.70	100%	-3	-7	-10
Total											-5	-11	-16
NET CHANGE IN PARKING DEMAND											1,113	150	1,263
Squaw Valley East													
Retail	5.00	–	--	–	–	–	–	–	3.33	100%	--	–	17
Employee Housing	264 beds	–	--	–	–	–	–	–	0.66	95%	--	–	166
TOTAL													183

Note 1: Assuming 75 percent of all lock-off rooms are locked off. This converts 75 percent of 2 bedroom units to two 1-bedroom units while 25 percent remain as 2-bedroom suites, and converts 56.25 percent of 3 bedroom units to three one bedroom units, 37.5 percent to 1 two-bedroom suites plus 1 one-bedroom unit, and maintains 6.25 percent as 3 bedroom suites.

Note 2: See Table 1.

Note 3: Conservatively assuming that all uses generate peak demand at the same time.

Note 4: Employees included in hotel or cabin room employee estimate.

Note 5: No employees onsite at period of peak parking demand

LSC Transportation Consultants Inc. *SVParking Demand.xls*

Section IV
SKI AREA PARKING DEMAND

Squaw Valley USA ski area operations generate parking demand in three categories: day skiers, ski area employees, and ski area operational vehicles.

Day Skier Parking

Parking demand rates for downhill ski areas vary substantially depending on skier access patters. It is necessary to consider the number of skiers that need to be accommodated, factored for vehicle occupancy, non-auto travel, and the proportion on-site at peak times.

The day skier parking demand analysis is intended to identify the number of spaces required on the fifth highest ski day of a typical ski season. This is the level of skier activity that is only exceeded on the busiest four days of the year.[4] Parking demand generated by day skiers was calculated in the following steps:

1. Skier count data by day for the 2008-09, 2009-10, 2010-11, 2011-12 and 2012-13 ski seasons were obtained from Squaw Valley ski operations staff. These counts include a category for employees that are skiing either while on the job, or on their own time. As parking demand for employees skiing while on the job is included elsewhere, the employee skier count was reduced by 40 percent (per Squaw Valley surveys), reflecting that 40 percent of persons recorded as employees are employee skiers are on the job and 60 percent are employees (or family members) skiing on their own time. The resulting skier counts by day for these four seasons are shown in Table 3. These figures reflect the very late start of the 2011-12 ski season, with little appreciable snow until February.

2. These counts were then reviewed to identify the busiest days, as shown in Table 4. Due to the late start of the season, the 2011-12 figures indicate that the demand for skiing was concentrated into fewer days, resulting in relatively high activity on the busiest days, even though overall annual skier activity was lower than average. The average of the 5th-highest skier count over the four years was then identified to be 10,663.

3. On-slope surveys of 293 skiers conducted in the 2011-12 ski season indicated that the proportion of all skiers arriving by transit or by being dropped off was 17 percent, and the proportion arriving by walking was 5 percent (largely those skiers lodged in the base area). The 17 percent figure includes 6 percent that indicated they arrive by TART bus, which is high for non-employee skiers when considered against TART on-board surveys. This figure probably reflects employees arriving by TART that were included in the on-slope skier surveys. To adjust this factor to reflect non-employee skier mode only, and to calibrate the parking analysis against observed parking counts (as discussed below), this figure was reduced to 2 percent, resulting in a total proportion arriving by transit or being dropped off of 13 percent. Applying these reductions, the number of skiers arriving in vehicles parking in the Squaw Valley lots over the course of the 5th-highest ski day is calculated to equal 8,744, as shown in Table 5.

[4] Designing the parking supply to accommodate the parking demand at the peak time of the absolute peak ski day of the year would result in some spaces only used by one car per year.

TABLE 3: Daily Squaw Valley Ski Area Skier Counts: 2008/09 to 2012/13 Seasons

Excludes Employees Skiing While On Duty

	Ski Season (First Half of Season)						Ski Season (Last Half of Season)				
Date	2008-09	2009-10	2010-11	2011-12	2012-13	Date	2008-09	2009-10	2010-11	2011-12	2012-13
21-Nov	0	1,313	1,465	0	45	16-Feb	7,065	7,809	2,860	4,112	8,138
22-Nov	21	677	1,449	0	2,914	17-Feb	5,432	8,247	4,602	7,375	8,738
23-Nov	19	228	1,030	0	4,273	18-Feb	7,212	8,720	6,885	11,710	7,863
24-Nov	11	181	2,878	0	4,485	19-Feb	7,541	8,359	8,980	13,250	4,265
25-Nov	18	239	3,281	0	2,407	20-Feb	8,778	10,060	12,271	9,292	7,752
26-Nov	13	748	5,357	0	695	21-Feb	10,448	6,585	10,736	7,180	7,222
27-Nov	32	899	3,556	0	626	22-Feb	1,145	4,074	8,398	6,239	8,012
28-Nov	55	1,692	4,858	0	122	23-Feb	1,257	2,827	7,443	6,502	11,282
29-Nov	74	1,077	1,489	0	18	24-Feb	1,589	3,117	3,647	6,683	8,402
30-Nov	30	356	1,211	0	0	25-Feb	2,352	4,586	2,284	8,338	2,707
1-Dec	5	334	1,209	0	7	26-Feb	2,105	3,573	12,266	5,331	2,674
2-Dec	8	338	903	0	0	27-Feb	4,263	11,127	11,376	2,247	2,393
3-Dec	12	368	1,387	0	1,308	28-Feb	8,683	10,654	3,946	3,507	2,734
4-Dec	8	545	3,570	0	751	1-Mar	1,796	3,990	3,210	3,214	4,534
5-Dec	22	918	3,620	0	445	2-Mar	637	1,633	967	3,354	9,017
6-Dec	201	527	1,282	0	1,385	3-Mar	1,301	2,333	3,761	9,892	4,201
7-Dec	225	1,024	1,889	0	1,197	4-Mar	1,438	5,928	6,389	14,998	2,700
8-Dec	7	1,160	441	0	4,115	5-Mar	2,887	5,894	10,267	12,215	1,247
9-Dec	9	1,219	748	0	4,022	6-Mar	3,962	11,089	6,370	3,817	2,344
10-Dec	7	881	1,316	0	1,004	7-Mar	6,128	9,133	3,580	3,332	5,195
11-Dec	13	1,211	4,961	0	856	8-Mar	10,425	2,238	3,377	3,832	5,684
12-Dec	11	3,203	5,446	0	1,081	9-Mar	5,423	3,428	3,249	5,737	11,814
13-Dec	518	4,136	1,544	0	1,796	10-Mar	2,746	3,116	1,746	9,488	9,077
14-Dec	574	2,953	410	0	2,027	11-Mar	2,609	3,837	5,064	4,825	3,432
15-Dec	348	1,839	2,819	0	5,081	12-Mar	2,685	2,833	9,134	2,747	3,055
16-Dec	600	1,406	2,436	0	4,316	13-Mar	3,648	11,828	6,168	1,330	2,924
17-Dec	1,648	2,381	2,082	0	710	14-Mar	4,714	9,573	3,058	2,304	3,611
18-Dec	1,308	2,896	2,034	0	2,495	15-Mar	7,547	4,094	607	1,724	4,229
19-Dec	910	6,156	2,151	0	3,158	16-Mar	3,143	3,660	2,276	2,668	8,236
20-Dec	4,090	7,108	6,238	0	2,103	17-Mar	1,820	3,568	4,391	10,990	6,838
21-Dec	3,709	3,404	8,070	0	2,894	18-Mar	2,934	3,332	3,383	9,822	2,727
22-Dec	4,415	8,630	6,582	2,308	3,938	19-Mar	2,954	5,087	6,512	7,081	2,619
23-Dec	5,598	7,539	9,030	2,527	5,067	20-Mar	2,880	9,451	3,711	4,131	2,036
24-Dec	3,287	6,546	8,156	2,510	8,212	21-Mar	4,247	6,878	4,316	4,079	4,381
25-Dec	2,017	6,572	5,005	1,753	5,896	22-Mar	5,851	3,071	4,707	2,761	4,568
26-Dec	7,922	7,972	3,970	1,872	4,059	23-Mar	4,353	3,057	2,382	4,811	8,784
27-Dec	8,623	6,530	9,233	3,021	9,049	24-Mar	3,508	2,746	2,240	9,670	6,388
28-Dec	8,498	9,355	7,718	3,029	10,144	25-Mar	2,714	2,730	3,554	6,899	3,531
29-Dec	9,429	10,115	3,420	2,711	9,857	26-Mar	2,331	4,826	6,287	3,290	3,369
30-Dec	10,334	8,475	11,610	2,403	10,493	27-Mar	2,921	10,203	5,987	2,562	3,531
31-Dec	9,072	9,178	9,818	2,929	9,365	28-Mar	4,448	7,395	4,937	2,875	3,447
1-Jan	7,751	4,986	6,277	1,541	9,189	29-Mar	6,784	1,625	3,343	4,591	4,432
2-Jan	3,879	8,135	5,415	1,486	9,500	30-Mar	3,256	699	3,178	3,646	6,585
3-Jan	10,289	5,162	4,788	1,205	9,719	31-Mar	1,780	4,596	3,389	4,587	2,579
4-Jan	3,912	3,869	4,435	1,037	9,728	1-Apr	1,747	5,579	3,699	11,838	2,563
5-Jan	1,863	3,640	4,422	1,199	11,132	2-Apr	1,374	2,873	5,679	5,801	3,262
6-Jan	2,441	3,485	4,684	1,163	6,776	3-Apr	1,589	8,116	6,906	4,889	3,047
7-Jan	2,878	3,429	5,331	1,797	3,030	4-Apr	2,859	3,019	3,262	3,860	807
8-Jan	2,236	4,074	9,844	2,048	3,288	5-Apr	4,702	3,220	2,576	3,767	4,430
9-Jan	3,194	7,839	9,799	641	2,340	6-Apr	3,479	3,696	2,410	6,210	7,107
10-Jan	7,111	7,673	2,982	601	3,791	7-Apr	2,627	3,329	2,053	8,908	6,185
11-Jan	4,718	2,409	2,386	838	4,304	8-Apr	2,070	3,213	3,571	4,662	3,543
12-Jan	1,799	934	2,689	853	10,853	9-Apr	1,728	4,500	7,356	3,916	3,095
13-Jan	1,941	3,159	1,760	996	7,764	10-Apr	2,790	5,030	7,315	2,781	2,397
14-Jan	1,946	4,186	5,000	2,612	2,565	11-Apr	3,705	2,945	2,446	3,555	2,812
15-Jan	1,929	4,968	8,848	1,903	2,760	12-Apr	5,164	1,826	2,808	5,373	3,266
16-Jan	2,689	9,617	7,951	1,697	2,800	13-Apr	2,831	2,902	1,184	9,196	5,341
17-Jan	8,499	6,267	6,713	682	2,898	14-Apr	1,784	1,941	2,276	9,934	3,885
18-Jan	6,944	4,557	2,471	443	4,577	15-Apr	1,710	2,116	2,260	3,371	2,486
19-Jan	3,187	3,543	2,338	422	10,050	16-Apr	1,825	2,751	4,992	3,017	1,564
20-Jan	1,639	2,532	2,550	516	7,949	17-Apr	2,452	5,685	3,587	2,678	1,322
21-Jan	1,129	3,992	4,238	3,247	7,317	18-Apr	2,664	4,247	1,035	2,640	1,843
22-Jan	876	7,114	9,425	5,272	2,165	19-Apr	3,471	1,489	2,843	5,256	2,623
23-Jan	2,174	12,863	7,133	3,013	1,987	20-Apr	1,245	631	1,464	4,074	4,293
24-Jan	5,381	6,998	2,583	3,738	2,377	21-Apr	865	1,207	1,630	1,258	2,902
25-Jan	5,019	3,000	2,152	3,053	2,217	22-Apr	814	1,769	3,449	1,193	1,127
26-Jan	3,095	2,588	2,141	2,024	10,380	23-Apr	609	2,184	4,066	735	1,019
27-Jan	2,309	3,738	2,439	4,592	7,123	24-Apr	590	4,855	1,637	179	1,368
28-Jan	2,143	3,805	3,952	8,763	2,584	25-Apr	1,051	4,176	734	3,861	1,920
29-Jan	2,599	5,777	7,545	8,640	1,544	26-Apr	1,930	1,258	0	4,366	1,977
30-Jan	3,965	6,710	7,351	2,060	2,155	27-Apr	2,179	62	0	0	3,785
31-Jan	8,152	10,837	3,244	2,147	2,738	28-Apr	136	1,044	0	0	3,348
1-Feb	4,754	3,590	2,349	2,055	4,607	29-Apr	403	2,326	0	0	0
2-Feb	1,871	2,739	2,356	2,847	7,982	30-Apr	497	2,400	0	0	0
3-Feb	1,933	2,797	3,049	3,492	6,515	1-May	218	4,191	0	0	0
4-Feb	1,737	3,479	4,535	6,241	2,547	2-May	388	3,451	0	0	0
5-Feb	1,470	5,678	8,588	6,580	2,046	3-May	424	969	0	0	0
6-Feb	3,254	9,914	7,199	2,345	2,318	4-May	241	994	0	0	0
7-Feb	7,705	9,182	2,599	1,626	2,223	5-May	428	862	0	0	0
8-Feb	5,860	3,834	1,704	2,605	4,903	6-May	625	1,045	0	0	0
9-Feb	3,254	2,546	2,241	3,046	10,605	7-May	845	1,382	0	0	0
10-Feb	2,944	3,509	2,709	3,843	8,040	8-May	983	3,222	0	0	0
11-Feb	2,354	3,314	3,974	7,660	2,859	9-May	885	2,191	0	0	0
12-Feb	4,079	5,697	7,307	7,640	2,641	10-May	683	0	0	0	0
13-Feb	3,758	9,712	6,431	2,858	2,295						
14-Feb	9,250	10,373	695	5,758	3,153	TOTAL	510,614	733,129	674,035	533,384	684,467
15-Feb	6,653	10,245	1,269	3,140	5,332						

SOURCE: Squaw Valley USA

TABLE 4: Review of Busiest Squaw Valley Ski Area Ski Days

Rank	Daily Skier Count by Ski Season 2008-09	2009-10	2010-11	2011-12	2012-13
1 (Busiest Day of the Season)	10,448	12,863	12,271	14,998	11,814
2	10,425	11,828	12,266	13,250	11,282
3	10,334	11,127	11,610	12,215	11,132
4	10,289	11,089	11,376	11,838	10,853
5	9,429	10,837	10,736	11,710	10,605
6	9,250	10,654	10,267	10,990	10,493
7	9,072	10,373	9,844	9,934	10,380
8	8,778	10,245	9,818	9,892	10,144
9	8,683	10,203	9,799	9,822	10,050
10	8,623	10,115	9,425	9,670	9,857
11	8,499	10,060	9,233	9,488	9,728
12	8,498	9,914	9,134	9,292	9,719
13	8,152	9,712	9,030	9,196	9,500
14	7,922	9,617	8,980	8,908	9,365
15	7,751	9,573	8,848	8,763	9,189
Ratio of Peak to Annual	2.0%	1.8%	1.8%	2.8%	1.7%
Ratio of 5th to Annual	1.8%	1.5%	1.6%	2.2%	1.5%
Average of 5th Highest in All 5 Years					10,663

SOURCE: Squaw Valley USA

TABLE 5: Squaw Valley Design Day Skier Parking Demand

5th-Highest Annual Daily Skier Count Over 5 Years (1)	10,663
Reduction for Access Via Transit and Auto Drop-off Modes (2)	13%
Reduction for Access via Walking (2)	5%
Day Skiers Arriving in Cars Parking at Squaw Valley	8,744
Average Skier Vehicle Occupancy (3)	2.20
Total Skier Parking Demand Over Entire Day	3,975
% Of Demand at Peak Time	78%
Peak Skier Parking Demand (# of Vehicles)	3,100

1. See Table 4. Excludes employees skiing while on the job.
2. On-slope survey of 293 skiers conducted in the 2011-12 ski season.
3. Survey of arriving skiers conducted April 1, 2012.
4. Parking turnover count conducted March 10, 2012.

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4. Skier vehicle occupancy is based upon counts conducted by LSC staff on April 1, 2012. Staff observed persons unloading ski/board gear in the prime day skier lots east of the existing Village. A total of 1,859 skiers/boarders were observed to arrive in 859 vehicles, for an average vehicle occupancy of 2.20 skiers/boarders per vehicle parked. Dividing by this figure, the number of day skier vehicles parking in the Squaw Valley lots over the course of the 5th-highest ski day is 3,975.

5. Not all skiers/boarders are on site at the peak time of parking demand. Some (particularly season pass holders) choose to ski in the morning but leave prior to the peak in parking demand (around 1 PM). To identify the proportion of skiers onsite at the peak time, LSC staff conducted a parking turnover count in the central portion of Lot A (an area that is observed to have minimal use by non-skier drivers) on Saturday, March 10, 2012. Tires were chalked from 10 AM to 3 PM[5] and the data analyzed to identify vehicles departing prior to the peak parking period and those arriving afterwards. The ratio of skier vehicles onsite at the peak time to the total skier vehicles observed was found to be 0.78, indicating that 22 percent of skiers over the entire day were not on-site at the peak time. Applying this factor, the total number of day skier vehicles at the peak time on the 5th-highest day is 3,100.

Squaw Valley Ski Area Employees

The Squaw Valley Ski Area Human Resources Department indicates that a maximum of 800 ski area employees are on-site at peak times (including National Ski Patrollers). The proposed development is not expected by Squaw Valley USA staff to change this figure. Factoring by the proportion of non-auto commuters (18 percent) and the average vehicle occupancy (1.76) based on the 2011 winter employee survey, these employees generate a maximum parking demand of 373 vehicles, as shown in Table 6.

TABLE 6: Ski Area Employee Parking Demand

Description	Total Employees At Peak Time (1)	Vehicle Occupancy (2)	Reduction for Access Via Transit, Walking and Auto Drop-off Modes (2)	Peak Parking Demand (# of Vehicles)
Ski Area Employees	800	1.76	18%	373

Note 1: Source – Squaw Valley USA Human Resources Dept.
Note 2: Based on survey of 106 Squaw Valley employees conducted in Winter 2011
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Squaw Valley Operational Vehicles

As part of the ski operations, Squaw Valley staff indicates that there are up to ten additional company-owned vehicles parked within the shared parking areas.

Total Ski Area Parking Demand

In sum, the ski area operations generate a parking demand of 3,483 vehicles on the average 5th-highest ski day of the year.

[5] The number of skiers departing prior to 10 AM or arriving after 3 PM was assumed to be negligible.

Section V

PARKING DEMAND OF OTHER LAND USES USING JOINT PARKING

There are several additional land uses that result in parking demand that are accommodated (wholly or in part) on joint Squaw Valley parking facilities, and which therefore must be included in the analysis.

Olympic House Area and Existing Village at Squaw Valley Parking Demand for Squaw Valley Parking

The Olympic House area contains a variety of restaurant uses (such as Le Chamois and Bar One) and retail uses (such as Squaw Valley Sports and Wildflower) that use Squaw Valley surface parking lots to accommodate their parking demand. The existing Village at Squaw Valley generates parking demand for overnight guests, and for employees/customers of restaurants (such as the Auld Dubliner) and retail stores (such as Tait's Board Shop). The underground parking area beneath the existing Village at Squaw Valley is used to accommodate the parking demand of Village overnight guests, and two vehicles for every one of the 32 commercial tenants (along with skier valet parking).

Employee parking demand for both of these areas is calculated in Table 7. The numbers of employees were calculated based upon an inventory of commercial tenants and their specific land use category, factored by the employees per thousand square feet calculated from ITE Trip Generation data. The same non-auto travel mode factor and vehicle occupancy rate used in Tables 1 are applied. Considering the strong concentration of customer activity (and thus staffing needs) around the end of the ski day, a factor of 80 percent of all employees onsite at the peak time is assumed. The employee parking that is accommodated beneath the Village at Squaw Valley is then subtracted, to yield the number of employee vehicles that are assumed to remain to be accommodated in Squaw Valley parking areas (86).

TABLE 7: Existing Squaw Valley Village and Olympic House Employee Parking Demand

Description	Total Employees Over Entire Day (1)	Vehicle Occupancy (2)	Reduction for Access Via Transit and Auto Drop-off Modes (2)	% of Demand at Peak Times (3)	Parking Demand	Parking Onsite(4)	Parking In Squaw Valley Facilities
Existing Village Employees	192	1.76	18%	80%	72	64	8
Olympic House Employees	209	1.76	18%	80%	78	0	78
Total							86

Note 1: Development floor area (provided by Hart Howerton) factored by average employees per KSF rates (based on ITE Trip Generation Manual).
Note 2: Based on survey of 106 Squaw Valley employees conducted in Winter 2011.
Note 3: See text.
Note 4: Each of the 32 commercial tenants are allowed two parking spaces in underground parking structure.

The customer parking demand is presented in Table 8. A base rate of 1 space per 300 square feet of retail space and 1 space per 100 square feet of restaurant space is applied to the existing floor area totals. The factors for customers already onsite (as discussed above regarding Table 1) are also applied. A total parking demand of 83 spaces is identified, all of which is assumed to need to be served by Squaw Valley parking facilities.

TABLE 8: Existing Squaw Valley Village and Olympic House Winter Customer Parking Demand

	Thousand Square Feet of Floor Area	Parking Rate (1)	% of Demand at Peak Times	Total Parking Demand	Onsite Parking	Off-Site Parking Demand
Existing Village at Squaw Valley						
Restaurant Customers	24.1	1.00	100%	24	0	24
Retail Customers	30.5	0.57	100%	17	0	17
Subtotal						41
Olympic House						
Restaurant	30.2	1.00	100%	30	0	30
Retail	20.9	0.57	100%	12	0	12
Subtotal						42
Total						83

Note 1: Per Table 1

In total, 169 parking spaces are required in Squaw Valley parking facilities to accommodate the peak parking needs of the Village at Squaw Valley and the Olympic House areas.

Medical Clinic Parking

Staff at the Medical Clinic on Squaw Valley South Road (just south of the existing Village at Squaw Valley) indicates that, at peak, up to 8 parking spaces are required for Clinic physicians, staff, patients and visitors. The Clinic is planned to be expanded as part of the development project, in order to provide additional space to allow more patients with minor injuries to be treated at the Clinic rather than moved to another medical facility. While this is not expected to increase staff, it could result in a modest increase the number of visitor and guest vehicles associated with the clinic. A total of 12 parking spaces are assumed for the clinic in the future.

Total Demand Generated by Other Uses

In total, these other land uses using joint Squaw Valley parking area generate a demand for 181 spaces.

Section VI

SUMMARY OF VILLAGE PARKING DEMAND

Summary of Parking Demand

Table 9 summarizes the various elements of parking demand for the Squaw Valley parking areas. As shown, the existing parking demand for the 5th-highest "design day" is 3,660 parked vehicles. Of these, 85 percent are day skier vehicles. At buildout, the total parking demand would be 5,110, consisting of 4,927 at the Village and 183 at Squaw Valley East.

TABLE 9: Summary of Demand for Squaw Valley Parking at Buildout

Category	Existing	Buildout
Village Development Guests	--	1,118
Village Development Employees	--	161
Ski Area Employees	373	373
Existing Village & Olympic House Employees	86	86
Existing Village & Olympic House Customers	83	83
Existing Land Uses Removed	--	-16
Medical Clinic	8	12
Squaw Valley Operations Vehicles	10	10
Day Skiers (5th Highest of 4 Years)	3,100	3,100
Subtotal: Village	*3,660*	*4,927*
Squaw Valley East Employee Housing & Retail	--	183
Total	3,660	5,110

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Comparison with Observed Parking Counts

The extensive parking counts conducted over the 2011-12 ski season provides an opportunity to ensure that the parking demand procedure detailed in this memo is consistent with observed parking counts. As shown in Table 10, the parking and skier counts for four peak days in 2012 were evaluated. Note that all of these days reflect a total daily skier count (excluding skiing employees on duty) that is greater than the 5th-highest average design day. The top portion of Table 10 indicates the total observed parking on each of the four days, while the bottom portion presents the peak parking demand estimated based on this methodology. Totaling the difference over the four days, the demand methodology parking demand estimate differs from the total observed parking by only 165 vehicles. Considering the individual days, the methodology overestimates demand on two days, and underestimates demand on the other two days. This variation is probably due in large part to differences in average skier vehicle occupancy. For instance, on "powder days" after a large snowfall, vehicle occupancy is informally observed to drop, as a high number of season pass-holders arrive in single-occupant vehicles. On other days that are convenient for family vacations, vehicle occupancy is reported to relatively high. Comparing the total over the four days, the ratio of the estimated demand to

the observed counts is 0.99, indicating that the methodology overall calibrates well against the observed parking counts.

TABLE 10: Comparison of Calculated Parking Demand With Existing Counts

		3/3/2012 Saturday	2/19/2012 Sunday	2/18/2012 Saturday	3/4/2012 Sunday	
Total Squaw Valley Observed Parking At Peak (Early Afternoon)						
Parking Area						
A	Main Lot North of the Village	842	832	846	834	
B	Main Southern Lot Near Snowmaking, Red Wolf	831	631	602	791	
C	Village Lot North	708	756	678	721	
D	Far East, Around the Cantina	655	487	302	623	
E	Poulsen Unpaved Lot	261	49	22	273	
F	Poulsen Triangle, including onstreet parking	104	0	0	105	
G	Squaw Valley Road onstreet parking	452	51	11	322	
H	Central Reservations	502	387	272	519	
I	(H2) Employee	288	281	212	237	
J1	"Tennis Courts"	133	13	4	22	
J2	Construction Yard	41	2	4	1	
L	Preferred Parking Structure	305	173	142	242	
M	Olympic Valley Lodge	93	51	46	82	
P2	Squaw Valley Employees Beneath Village	100	100	100	100	
	West End of Squaw Peak Road	20	20	20	20	
Valet	Far West Portion Beneath Village	97	82	25	47	
Total		**5,432**	**3,915**	**3,286**	**4,939**	
Existing Demand						
Ski Area Employees		373	373	373	373	
Squaw Company Vehicles		10	10	10	10	
Village at Squaw Valley Employees Not Parked Beneath Village		8	8	8	8	
Village at Squaw Valley Customers (Not Skiing)		41	41	41	41	
Medical Clinic		8	8	8	8	
Olympic House Area Employees		78	78	78	78	
Olympic House Area Customers (Not Skiing)		42	42	42	42	
Day Skier Parking						
Number of Skiers (Non-Employee) Over Entire Day		14,998	13,250	11,710	12,215	
Vehicle Occupancy		2.2	2.2	2.2	2.2	
Reduction for Access Via Transit and Auto Drop-off Modes		13%	13%	13%	13%	
Reduction for Access via Walking		5%	5%	5%	5%	
% of Demand at Peak Times		78%	78%	78%	78%	
Number of Day Skier Vehicles Parked at Peak		4,360	3,852	3,404	3,551	
TOTAL DEMAND		**4,920**	**4,412**	**3,964**	**4,111**	
						Sum over 4 Days
Demand Model Minus Observed Parking		-512	497	678	-828	-165
	Ratio of Estimated to Observed	0.91	1.13	1.21	0.83	0.99
LSC Transportation Consultants, Inc.						

Another way of comparing the demand estimates with the observed counts is to evaluate how many days during the 2011-12 ski season the number of estimated day skier vehicles exceeds the design value of 3,104. (As it is not possible to differentiate day skiers from other users across the entire parking area, it is not possible to directly count all day skier vehicles.) This analysis was conducted in the following steps:

1. The parking counts were reviewed and summed, for all parking areas available to day skiers and employees. As the employee parking area along the westernmost portion of Squaw Peak Road ("Squaw Peak Way") was not included in the counts, a value equal to the capacity of this area (20 vehicles) were added to the counts, reflecting the assumption that this area was full on all peak days.

2. The existing parking demand estimate for groups other than day skiers (560), as shown in Table 9, was subtracted. The remaining parked vehicles are considered to be the day skiers.

3. These estimates of day skiers were ranked, and compared with the design value of 3,104.

As shown in Table 11, this analysis indicates that the day skier parking design value would be exceeded on a total of five days over the 2011-12 ski season. On the 5th-highest day of that season, the parking supply would have been exceeded by 150 vehicles, while on the 6th-highest day the parking supply would have provided 298 excess spaces. It should also be noted that this 5th-highest day in the 2011-12 ski season was relatively high (873 more daily skiers than on the 5th-highest day of any of the previous three seasons, or 10 percent higher than the average 5th-highest day over the four seasons), due to the very late start of the season and the resulting pent-up demand for skiing. In general, this review indicates that this day skier parking capacity matches the intent of the design criteria to accommodate parking demand on the 5th-highest day.

TABLE 11: Comparison of Peak Observed Parking in 2011-12 With Estimate of Skier Parking Demand

Rank of Day Based on Observed Parking In Skier/Employee Parking Areas	Parked Vehicles(1)	Estimated Non-Skier Parking Demand	Estimated Day Skier Vehicles	Design Value for Day Skier Parking	Design Value Minus Demand	Does Design Value Exceed Day Skier Demand?
1	5,566	560	5,006	3,104	-1,902	No
2	5,353	560	4,793	3,104	-1,689	No
3	5,052	560	4,492	3,104	-1,388	No
4	4,025	560	3,465	3,104	-361	No
5	3,814	560	3,254	3,104	-150	No
6	3,366	560	2,806	3,104	298	Yes
7	3,246	560	2,686	3,104	418	Yes
8	3,190	560	2,630	3,104	474	Yes
9	2,925	560	2,365	3,104	739	Yes
10	2,908	560	2,348	3,104	756	Yes

Note 1: LSC counts. Excludes cars parked in Red Wolf Lodge and Village Parking Level 1 that were included in counts, but are not available to skiers or employees. Includes 20 additional cars estimated to be parked along the western end of Squaw Peak Road, not included in counts.