

Phone:
E-mail:

Fax:

Operational Analysis

Analyst: DLL
 Agency or Company: DMJM Harris
 Date Performed: 5/30/2007
 Analysis Time Period: PM Peak
 Freeway/Direction: I-680 Southbound
 From/To: Crow Canyon / Bollinger Canyon
 Jurisdiction:
 Analysis Year: ~~Background 2020 + Flex Retail~~
 Description: Bishop Ranch 2

Flow Inputs and Adjustments

Volume, V	9264	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	2573	v
Trucks and buses	0	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	1.000	
Driver population factor, fp	1.00	
Flow rate, vp	2573	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	4	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	1.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2573	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	4	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone:
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Operational Analysis

Analyst: DLL
 Agency or Company: DMJM Harris
 Date Performed: 5/30/2007
 Analysis Time Period: PM Peak
 Freeway/Direction: I-680 Southbound
 From/To: Bollinger Canyon/Alcosta Blvd
 Jurisdiction:
 Analysis Year: ~~Background 2020 + Flex-Retail~~
 Description: Bishop Ranch 2

Flow Inputs and Adjustments

Volume, V	10323	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	2868	v
Trucks and buses	0	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	1.000	
Driver population factor, fp	1.00	
Flow rate, vp	3823	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3823	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

I-680/BOLLINGER CANYON ROAD INTERCHANGE

Existing

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: Northbound Off-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Existing
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	6521	vph	

Off Ramp Data

Side of freeway	Right		
Number of lanes in ramp	2		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	1926	vph	
Length of first accel/decel lane	900	ft	
Length of second accel/decel lane	0	ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6521	1926		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1811	535		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7246	2140		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.450 Using Equation 0
FD

Bollinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4438 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7246	7050	Yes
v_{12}	4438	4400	Yes
$v_{FO} = v_F - v_R$	5106	7050	No
v_R	2140	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 26.2 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D = 0.621
Space mean speed in ramp influence area,	$S_R = 50.7 \text{ mph}$
Space mean speed in outer lanes,	$S_O = 64.3 \text{ mph}$
Space mean speed for all vehicles,	$S = 55.2 \text{ mph}$

Bollinger 1680 NB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: Fax:
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Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Existing
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4595	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	386	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4595	386		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1276	107		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	5106	429		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_{F, FM} (P) = 3052 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	5535	7050	No
v_{R12}	3481	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{F0} - 0.00627 L_A = 27.9 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	$M_S = 0.397$
Space mean speed in ramp influence area,	$S_R = 55.9 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 59.4 \text{ mph}$
Space mean speed for all vehicles,	$S = 57.1 \text{ mph}$

Existing AM Bollinger I-680 SB Off Ramp Analysis.txt

HCS2000: Ramps and Ramp Junctions Release 4.1f

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Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	6984	vph	

Off Ramp Data

Side of freeway	Right		
Number of lanes in ramp	2		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	993	vph	
Length of first accel/decel lane	1750	ft	
Length of second accel/decel lane	0	ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6984	993		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1940	276		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7760	1103		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

Existing AM Bollinger I-680 SB Off Ramp Analysis.txt

$$V_{12} = V_R + (V_F - V_R) P = 4099 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7760	7050	Yes
V_{12}	4099	4400	No
$V_{F0} = V_F - V_R$	6657	7050	No
V_R	1103	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 8.0 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.527$	
Space mean speed in ramp influence area,	$S_R = 52.9$	mph
Space mean speed in outer lanes,	$S_0 = 60.9$	mph
Space mean speed for all vehicles,	$S = 56.4$	mph

Bollinger I680 SB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: Fax:
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Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Existing
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5991	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	834	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5991	834		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1664	232		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	6657	927		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 SB On Ramp (Clover).txt
 $v_{12} = v_{F, FM} (P) = 3979 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	7584	7050	Yes
v_{R12}	4906	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 38.8 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 0.797$	
Space mean speed in ramp influence area,	$S_R = 46.7$	mph
Space mean speed in outer lanes,	$S_0 = 56.2$	mph
Space mean speed for all vehicles,	$S = 49.6$	mph

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 E-mail: _____

Merge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6742	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	482	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6742	482		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1873	134		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7491	536		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
 EQ
 P = 0.596 Using Equation 1
 FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F (P_{FM}) = 4468 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	8027	7050	Yes
v_{R12}	5004	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 40.0 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 0.855$
Space mean speed in ramp influence area,	$S_R = 45.3 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 54.1 \text{ mph}$
Space mean speed for all vehicles,	$S = 48.3 \text{ mph}$

Phone: _____ Fax: _____
 E-mail: _____

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Northbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5870	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1362	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5870	1362		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1631	378		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	6522	1513		pcph

Estimation of V12 Diverge Areas

L = _____ (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

Bollinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3767 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6522	7050	No
v_{12}	3767	4400	No
$v_{FO} = v_F - v_R$	5009	7050	No
v_R	1513	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 20.4 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	$D_S = 0.564$	
Space mean speed in ramp influence area,	$S_R = 52.0$	mph
Space mean speed in outer lanes,	$S_O = 64.5$	mph
Space mean speed for all vehicles,	$S = 56.6$	mph

Bollinger 1680 NB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon (Hook)
Jurisdiction:
Analysis Year: Existing
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4508	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	248	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4508	248		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1252	69		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	5009	276		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_{F, FM} (P) = 2994 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	5285	7050	No
v_{R12}	3270	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 26.3 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	$M_S = 0.373$	
Space mean speed in ramp influence area,	$S_R = 56.4$	mph
Space mean speed in outer lanes,	$S_0 = 59.5$	mph
Space mean speed for all vehicles,	$S = 57.6$	mph

Existing PM Bollinger-I680 SB Off Ramp Analysis.txt

HCS2000: Ramps and Ramp Junctions Release 4.1F

Phone:
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Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7534	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1182	vph
Length of first accel/decel lane	1750	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7534	1182		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2093	328		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	8371	1313		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

$$v_{12} = v_R + (v_F - v_R) P = 4489 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8371	7050	Yes
v_{12}	4489	4400	Yes
$v_{F0} = v_F - v_R$	7058	7050	Yes
v_R	1313	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 11.4 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.546$	
Space mean speed in ramp influence area,	$S_R = 52.4$	mph
Space mean speed in outer lanes,	$S_0 = 60.1$	mph
Space mean speed for all vehicles,	$S = 55.7$	mph

Phone: _____ Fax: _____
 E-mail: _____

_____ Merge Analysis _____

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: I-680 Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon (Hook)
 Jurisdiction:
 Analysis Year: Existing
 Description: Bishop Ranch 2

_____ Freeway Data _____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6352	vph

_____ On Ramp Data _____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1445	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

_____ Adjacent Ramp Data (if one exists) _____

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

_____ Conversion to pc/h Under Base Conditions _____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6352	1445		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1764	401		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	7058	1606		pcph

_____ Estimation of V12 Merge Areas _____

L = _____ (Equation 25-2 or 25-3)
 EQ
 P = 0.598 Using Equation 1
 FM

Bollinger 1680 SB On Ramp (Clover).txt
 $v_{12} = v_F (P_{FM}) = 4218 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	8664	7050	Yes
v_{R12}	5824	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 45.6 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 1.590$	
Space mean speed in ramp influence area,	$S_R = 28.4$	mph
Space mean speed in outer lanes,	$S_0 = 55.2$	mph
Space mean speed for all vehicles,	$S = 33.8$	mph

Phone: _____ Fax: _____
 E-mail: _____

Merge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7653	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	504	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7653	504		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2126	140		
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade				%
Length				mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	8503	560		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
 EQ
 P = 0.596 Using Equation 1
 FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F \left(\frac{P}{FM} \right) = 5071 \text{ pc/h}$$

Capacity Checks

v_{F0}	Actual 9063	Maximum 7050	LOS F? Yes
v_{R12}	5631	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.9 \text{ pc/mi/ln}$$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 1.362$
Space mean speed in ramp influence area,	$S_R = 33.7 \text{ mph}$
Space mean speed in outer lanes,	$S_O = 51.7 \text{ mph}$
Space mean speed for all vehicles,	$S = 38.8 \text{ mph}$

I-680/BOLLINGER CANYON ROAD INTERCHANGE

Existing + Project

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: Northbound Off-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Existing + Flex Retail Project
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6796	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2201	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6796	2201		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1888	611		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7551	2446		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.450 Using Equation 0
FD

Bollinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4743 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7551	7050	Yes
v_{12}	4743	4400	Yes
$v_{F0} = v_F - v_R$	5105	7050	No
v_R	2446	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 28.8 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.648$	
Space mean speed in ramp influence area,	$S_R = 50.1$	mph
Space mean speed in outer lanes,	$S_0 = 64.3$	mph
Space mean speed for all vehicles,	$S = 54.6$	mph

Bollinger I680 NB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Existing + Flex Retail Project
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	4595	vph	

On Ramp Data

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	386	vph	
Length of first accel/decel lane	720	ft	
Length of second accel/decel lane		ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4595	386		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1276	107		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	5106	429		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt

$$v_{12} = v_F(P_{FM}) = 3052 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v _{F0}	5535	7050	No
v _{R12}	3481	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.9 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M _S = 0.397
Space mean speed in ramp influence area,	S _R = 55.9 mph
Space mean speed in outer lanes,	S _O = 59.4 mph
Space mean speed for all vehicles,	S = 57.1 mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing + Flex Retail Project
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7114	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1123	vph
Length of first accel/decel lane	1750	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7114	1123		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1976	312		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7904	1248		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

$$V_{12} = V_R + (V_F - V_R) P_{FD} = 4243 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7904	7050	Yes
V_{12}	4243	4400	No
$V_{FO} = V_F - V_R$	6656	7050	No
V_R	1248	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 9.2 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.540$	
Space mean speed in ramp influence area,	$S_R = 52.6$	mph
Space mean speed in outer lanes,	$S_O = 60.9$	mph
Space mean speed for all vehicles,	$S = 56.1$	mph

Bollinger 1680 SB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Existing + Flex Retail Project
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5991	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	948	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5991	948		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1664	263		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length	mi	mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	6657	1053		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 SB On Ramp (Clover).txt

$$v_{12} = v_F (P_{FM}) = 3979 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v _{F0}	7710	7050	Yes
v _{R12}	5032	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 39.7 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M _S = 0.868
Space mean speed in ramp influence area,	S _R = 45.0 mph
Space mean speed in outer lanes,	S _O = 56.2 mph
Space mean speed for all vehicles,	S = 48.4 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing + Flex Retail Project
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6845	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	482	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6845	482		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1901	134		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	7606	536		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
 EQ
 P = 0.596 Using Equation 1
 FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F (P_{FM}) = 4536 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v _{F0}	8142	7050	Yes
v _{R12}	5072	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 40.6 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M = 0.896
Space mean speed in ramp influence area,	S _R = 44.4 mph
Space mean speed in outer lanes,	S _O = 53.8 mph
Space mean speed for all vehicles,	S = 47.5 mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Northbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing + Flex Retail Project
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	6126	vph	

Off Ramp Data

Side of freeway	Right		
Number of lanes in ramp	2		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	1618	vph	
Length of first accel/decel lane	900	ft	
Length of second accel/decel lane	0	ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6126	1618		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1702	449		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicle PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	1.000		1.000	
Driver population factor, fP	1.00		1.00	
Flow rate, vp	6807	1798		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

Bollinger-I680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4052 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6807	7050	No
v_{12}	4052	4400	No
$v_{FO} = v_F - v_R$	5009	7050	No
v_R	1798	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 22.9 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	$D = 0.590$	
Space mean speed in ramp influence area,	$S_S = 51.4$	mph
Space mean speed in outer lanes,	$S_R = 64.5$	mph
Space mean speed for all vehicles,	$S_0 = 56.0$	mph

Bollinger 1680 NB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Existing + Flex Retail Project
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4508	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	248	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4508	248		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1252	69		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	5009	276		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_F (P_{FM}) = 2994 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	5285	7050	No
v_{R12}	3270	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.3 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	$M_S = 0.373$	
Space mean speed in ramp influence area,	$S_R = 56.4$	mph
Space mean speed in outer lanes,	$S_O = 59.5$	mph
Space mean speed for all vehicles,	$S = 57.6$	mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing + Flex Retail Project
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7657	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1305	vph
Length of first accel/decel lane	1750	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7657	1305		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2127	363		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00	0.00	%	%
Length	0.00	0.00	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	8508	1450		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

$$v_{12} = v_R + (v_F - v_R) P = 4626 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8508	7050	Yes
v_{12}	4626	4400	Yes
$v_{FO} = v_F - v_R$	7058	7050	Yes
v_R	1450	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 12.5 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.558$	
Space mean speed in ramp influence area,	$S_R = 52.2$	mph
Space mean speed in outer lanes,	$S_O = 60.1$	mph
Space mean speed for all vehicles,	$S = 55.5$	mph

Phone: _____ Fax: _____
 E-mail: _____

_____ Merge Analysis _____

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: I-680 Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon(Hook)
 Jurisdiction:
 Analysis Year: Existing + Flex Retail Project
 Description: Bishop Ranch 2

_____ Freeway Data _____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6352	vph

_____ On Ramp Data _____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1820	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

_____ Adjacent Ramp Data (if one exists) _____

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

_____ Conversion to pc/h Under Base Conditions _____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6352	1820		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1764	506		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7058	2022		pcph

_____ Estimation of V12 Merge Areas _____

L = _____ (Equation 25-2 or 25-3)
 EQ
 P = 0.598 Using Equation 1
 FM

Bollinger 1680 SB On Ramp (Clover).txt

$$v_{12} = v_{F, FM} (P_{12}) = 4218 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v _{F0}	9080	7050	Yes
v _{R12}	6240	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 48.7 \text{ pc/mi/ln}$$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M _S = 2.271
Space mean speed in ramp influence area,	S _R = 12.8 mph
Space mean speed in outer lanes,	S _O = 55.2 mph
Space mean speed for all vehicles,	S = 16.8 mph

Phone: _____ Fax: _____
 E-mail: _____

_____Merge Analysis_____

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Existing + Flex Retail Project
 Description: Bishop Ranch 2

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7990	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	504	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7990	504		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2219	140		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fhv	1.000	1.000		
Driver population factor, fp	1.00	1.00		
Flow rate, vp	8878	560		pcph

_____Estimation of V12 Merge Areas_____

L = _____ (Equation 25-2 or 25-3)
 EQ
 P = 0.596 Using Equation 1
 FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F (P_{FM}) = 5295 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	9438	7050	Yes
v_{R12}	5855	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 46.7 \text{ pc/mi/ln}$$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 1.635$
Space mean speed in ramp influence area,	$S_R = 27.4 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 50.8 \text{ mph}$
Space mean speed for all vehicles,	$S = 33.2 \text{ mph}$

I-680/BOLLINGER CANYON ROAD INTERCHANGE

2020

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: Northbound Off-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7927	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2248	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7927	2248		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2202	624		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	8808	2498		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.450 Using Equation 0
FD

Bollinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P = 5337 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8808	7050	Yes
v_{12}	5337	4400	Yes
$v_{FO} = v_F - v_R$	6310	7050	No
v_R	2498	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 34.0 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.653$	
Space mean speed in ramp influence area,	$S_R = 50.0$	mph
Space mean speed in outer lanes,	$S_O = 61.7$	mph
Space mean speed for all vehicles,	$S = 54.0$	mph

Bollinger 1680 NB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5517	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	577	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5517	577		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1533	160		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	6130	641		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_{F0} (P_{FM}) = 3664 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	6771	7050	No
v_{R12}	4305	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{F0} - 0.00627 L_A = 34.2 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	$M_S = 0.559$	
Space mean speed in ramp influence area,	$S_R = 52.1$	mph
Space mean speed in outer lanes,	$S_O = 57.5$	mph
Space mean speed for all vehicles,	$S = 54.0$	mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Background 2020
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8961	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1158	vph
Length of first accel/decel lane	1750	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8961	1158		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2489	322		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	9957	1287		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	9957	7050	Yes
v_{12}	5188	4400	Yes
$v_{F0} = v_F - v_R$	8670	7050	Yes
v_R	1287	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 17.4$ pc/mi/ln
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.544$	
Space mean speed in ramp influence area,	$S_R = 52.5$	mph
Space mean speed in outer lanes,	$S_0 = 56.6$	mph
Space mean speed for all vehicles,	$S = 54.4$	mph

Bollinger 1680 SB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7803	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	950	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7803	950		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2168	264		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	8670	1056		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 SB On Ramp (Clover).txt

$$v_{12} = v_{F, FM} (P_{FM}) = 5182 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	9726	7050	Yes
v_{R12}	6238	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 49.1 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 2.267$
Space mean speed in ramp influence area,	$S_R = 12.9 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 51.3 \text{ mph}$
Space mean speed for all vehicles,	$S = 17.6 \text{ mph}$

Phone: Fax:
E-mail:

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	8658	vph	

On Ramp Data

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	562	vph	
Length of first accel/decel lane	675	ft	
Length of second accel/decel lane		ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8658	562		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2405	156		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fhv	1.000	1.000		
Driver population factor, fp	1.00	1.00		
Flow rate, vp	9620	624		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.596 Using Equation 1
FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F (P_{FM}) = 5737 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	10244	7050	Yes
v_{R12}	6361	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 50.6 \text{ pc/mi/ln}$$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 2.531$
Space mean speed in ramp influence area,	$S_R = 6.8 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 49.0 \text{ mph}$
Space mean speed for all vehicles,	$S = 10.1 \text{ mph}$

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Northbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Background 2020
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	7074	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1588	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7074	1588		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1965	441		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00	%	0.00	%
Length	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7860	1764		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

Bollinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4507 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7860	7050	Yes
v_{12}	4507	4400	Yes
$v_{F0} = v_F - v_R$	6096	7050	No
v_R	1764	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 26.8 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.587$	
Space mean speed in ramp influence area,	$S_R = 51.5$	mph
Space mean speed in outer lanes,	$S_0 = 62.1$	mph
Space mean speed for all vehicles,	$S = 55.6$	mph

Bollinger I680 NB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5486	vph	

On Ramp Data

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	380	vph	
Length of first accel/decel lane	720	ft	
Length of second accel/decel lane		ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5486	380		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1524	106		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	6096	422		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_F(P_{FM}) = 3643 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	6518	7050	No
v_{R12}	4065	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 32.5 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	$M_S = 0.498$	
Space mean speed in ramp influence area,	$S_R = 53.5$	mph
Space mean speed in outer lanes,	$S_0 = 57.6$	mph
Space mean speed for all vehicles,	$S = 55.0$	mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Background 2020
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	9283	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1250	vph
Length of first accel/decel lane	1750	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	9283	1250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2579	347		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	10314	1389		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	10314	7050	Yes
V_{12}	5405	4400	Yes
$V_{FO} = V_F - V_R$	8925	7050	Yes
V_R	1389	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 19.2$ pc/mi/ln
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.553$	
Space mean speed in ramp influence area,	$S_R = 52.3$	mph
Space mean speed in outer lanes,	$S_O = 56.1$	mph
Space mean speed for all vehicles,	$S = 54.0$	mph

Bollinger 1680 SB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: I-680 Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8033	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1665	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8033	1665		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2231	463		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	8926	1850		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ = _____
P = 0.598 Using Equation 1
FM = _____

Bollinger 1680 SB On Ramp (Clover).txt
 $v_{12} = v_{F, FM} (P) = 5335 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	10776	7050	Yes
v_{R12}	7185	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 56.2 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 5.417$	
Space mean speed in ramp influence area,	$S_R = -59.6$	mph
Space mean speed in outer lanes,	$S_0 = 50.7$	mph
Space mean speed for all vehicles,	$S =$	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Background 2020
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	9531	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	588	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	9531	588		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2648	163		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	10590	653		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.596 Using Equation 1
FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F (P_{FM}) = 6316 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v _{F0}	11243	7050	Yes
v _{R12}	6969	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 55.3 \text{ pc/mi/ln}$$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M _S = 4.420
Space mean speed in ramp influence area,	S _R = -36.7 mph
Space mean speed in outer lanes,	S ₀ = 46.6 mph
Space mean speed for all vehicles,	S = mph

I-680/BOLLINGER CANYON ROAD INTERCHANGE

2020 + Project

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: Northbound Off-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Background-2020 + Flex Retail
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8072	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2393	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8072	2393		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2242	665		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	8969	2659		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.450 Using Equation 0
FD

Bollinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 5498 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8969	7050	Yes
v_{12}	5498	4400	Yes
$v_{F0} = v_F - v_R$	6310	7050	No
v_R	2659	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 35.3 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.667$	
Space mean speed in ramp influence area,	$S_R = 49.7$	mph
Space mean speed in outer lanes,	$S_0 = 61.7$	mph
Space mean speed for all vehicles,	$S = 53.7$	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: I-680 Northbound
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Background 2020 + Flex Retail
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	5517	vph	

On Ramp Data

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	577	vph	
Length of first accel/decel lane	720	ft	
Length of second accel/decel lane		ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5517	577		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1533	160		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	6130	641		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.598 Using Equation 1
FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_{F, FM} (P) = 3664 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	6771	7050	No
v_{R12}	4305	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 34.2 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	$M_S = 0.559$	
Space mean speed in ramp influence area,	$S_R = 52.1$	mph
Space mean speed in outer lanes,	$S_O = 57.5$	mph
Space mean speed for all vehicles,	$S = 54.0$	mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Background 2020 + Flex Retail
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	9030	vph	

Off Ramp Data

Side of freeway	Right		
Number of lanes in ramp	2		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	1227	vph	
Length of first accel/decel lane	1750	ft	
Length of second accel/decel lane	0	ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	9030	1227		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2508	341		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	10033	1363		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 5264 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	10033	7050	Yes
v_{12}	5264	4400	Yes
$v_{FO} = v_F - v_R$	8670	7050	Yes
v_R	1363	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 18.0 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.551$	
Space mean speed in ramp influence area,	$S_S = 52.3$	mph
Space mean speed in outer lanes,	$S_R = 56.6$	mph
Space mean speed for all vehicles,	$S_O = 54.3$	mph

Phone:
E-mail:

Fax:

Merge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: AM Peak
 Freeway/Dir of Travel: I-680 Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon(Hook)
 Jurisdiction:
 Analysis Year: Background-2020 + Flex Retail
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7803	vph	

On Ramp Data

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	35.0	mph	
Volume on ramp	1048	vph	
Length of first accel/decel lane	720	ft	
Length of second accel/decel lane		ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7803	1048		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2168	291		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	8670	1164		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
 EQ
 P = 0.598 Using Equation 1
 FM

Bollinger 1680 SB On Ramp (Clover).txt
 $v_{12} = v_{F, FM} (P) = 5182 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	9834	7050	Yes
v_{R12}	6346	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 49.9 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M = 2.494$	
Space mean speed in ramp influence area,	$S_R = 7.6$	mph
Space mean speed in outer lanes,	$S_0 = 51.3$	mph
Space mean speed for all vehicles,	$S = 10.9$	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: AM Peak
Freeway/Dir of Travel: Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Background 2020 + Flex Retail
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8746	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	562	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8746	562		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2429	156		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	9718	624		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.596 Using Equation 1
FM

Bollinger 1680 SB On Ramp.txt

$$v_{12} = v_F (P_{FM}) = 5796 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	10342	7050	Yes
v_{R12}	6420	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 51.0 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M = 2.668$
Space mean speed in ramp influence area,	$S_S = 3.6 \text{ mph}$
Space mean speed in outer lanes,	$S_R = 48.7 \text{ mph}$
Space mean speed for all vehicles,	$S_O = 5.6 \text{ mph}$

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: Northbound Off-Ramp
Junction: I-680 @ Bollinger Canyon
Jurisdiction:
Analysis Year: Background 2020 + Flex-Retail
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	7313	vph	

Off Ramp Data

Side of freeway	Right		
Number of lanes in ramp	2		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	1827	vph	
Length of first accel/decel lane	900	ft	
Length of second accel/decel lane	0	ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7313	1827		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2031	508		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	8126	2030		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.450 Using Equation 0
FD

Boillinger-1680 NB Off Ramp.txt

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4773 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8126	7050	Yes
v_{12}	4773	4400	Yes
$v_{FO} = v_F - v_R$	6096	7050	No
v_R	2030	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 29.1 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.611$	
Space mean speed in ramp influence area,	$S_R = 51.0$	mph
Space mean speed in outer lanes,	$S_O = 62.1$	mph
Space mean speed for all vehicles,	$S = 55.0$	mph

Phone:
E-mail:

Fax:

Merge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: I-680 Northbound
 Junction: I-680 @ Bollinger Canyon(Hook)
 Jurisdiction:
 Analysis Year: Background 2020 + Flex Retail
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5486	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	380	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5486	380		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1524	106		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade		%	%	%
Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	6096	422		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
 EQ
 P = 0.598 Using Equation 1
 FM

Bollinger 1680 NB On Ramp (Clover).txt
 $v_{12} = v_{F \rightarrow FM} (P_{12}) = 3643 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{F0}	6518	7050	No
v_{R12}	4065	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_{R12} + 0.0078 v_{12} - 0.00627 L_A = 32.5 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	$M_S = 0.498$	
Space mean speed in ramp influence area,	$S_R = 53.5$	mph
Space mean speed in outer lanes,	$S_0 = 57.6$	mph
Space mean speed for all vehicles,	$S = 55.0$	mph

Phone:
E-mail:

Fax:

Diverge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound Off-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction:
 Analysis Year: Background 2020 + Flex Retail
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Diverge		
Number of lanes in freeway	3		
Free-flow speed on freeway	65.0	mph	
Volume on freeway	9401	vph	

Off Ramp Data

Side of freeway	Right		
Number of lanes in ramp	2		
Free-Flow speed on ramp	35.0	mph	
Volume on ramp	1368	vph	
Length of first accel/decel lane	1750	ft	
Length of second accel/decel lane	0	ft	

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No		
Volume on adjacent ramp		vph	
Position of adjacent ramp			
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	9401	1368		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2611	380		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, FHV	1.000	1.000		
Driver population factor, FP	1.00	1.00		
Flow rate, vp	10446	1520		pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
 EQ
 P = 0.450 Using Equation 0
 FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 5537 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	10446	7050	Yes
v_{12}	5537	4400	Yes
$v_{FO} = v_F - v_R$	8926	7050	Yes
v_R	1520	3800	No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 20.4 \text{ pc/mi/ln}$$

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D = 0.565$	
Space mean speed in ramp influence area,	$S_R = 52.0$	mph
Space mean speed in outer lanes,	$S_0 = 56.1$	mph
Space mean speed for all vehicles,	$S = 53.8$	mph

Bollinger I680 SB On Ramp (Clover).txt
HCS2000: Ramps and Ramp Junctions Release 4.1f

Phone: _____ Fax: _____
E-mail: _____

Merge Analysis

Analyst: DLL
Agency/Co.: DMJM Harris
Date performed: 5/10/2007
Analysis time period: PM Peak
Freeway/Dir of Travel: I-680 Southbound On-Ramp
Junction: I-680 @ Bollinger Canyon(Hook)
Jurisdiction:
Analysis Year: Background 2020 + Flex Retail
Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	8033	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1932	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8033	1932		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	2231	537		
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade			%	%
Length			mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fhv	1.000	1.000		
Driver population factor, fp	1.00	1.00		
Flow rate, vp	8926	2147		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
EQ = _____
P = 0.598 Using Equation 1
FM = _____

Bollinger I680 SB On Ramp (Clover).txt
 $v = v(P) = 5335$ pc/h
 12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	11073	7050	Yes
FO			
v	7482	4600	Yes
R12			

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 58.3$ pc/mi/ln
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M = 7.196
Space mean speed in ramp influence area,	S = -100.5 mph
Space mean speed in outer lanes,	S = 50.7 mph
Space mean speed for all vehicles,	S = mph

Phone: _____ Fax: _____
 E-mail: _____

Merge Analysis

Analyst: DLL
 Agency/Co.: DMJM Harris
 Date performed: 5/10/2007
 Analysis time period: PM Peak
 Freeway/Dir of Travel: Southbound On-Ramp
 Junction: I-680 @ Bollinger Canyon
 Jurisdiction: _____
 Analysis Year: Background 2020 + Flex Retail
 Description: Bishop Ranch 2

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	9794	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	588	vph
Length of first accel/decel lane	675	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	9794	588		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, V15	2721	163		
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade				%
Length				mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	10882	653		pcph

Estimation of V12 Merge Areas

L = _____ (Equation 25-2 or 25-3)
 EQ
 P = 0.596 Using Equation 1
 FM

Bollinger I680 SB On Ramp.txt
 $v_{12} = v_{FM} (P_{FM}) = 6490 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	11535	7050	Yes
v_{R12}	7143	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 56.7 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 5.208$	
Space mean speed in ramp influence area,	$S_R = -54.8$	mph
Space mean speed in outer lanes,	$S_O = 45.9$	mph
Space mean speed for all vehicles,	$S =$	mph

DMJM Harris
1570 The Alameda #222, San Jose, CA 95126
T 408.298.2929 F 408.298.2970 www.dmjmharris.com

Memorandum

To: Peter Oswald
From: Dennis A. Struecker 
Date: July 31, 2007
Subject: Supplemental Traffic Analysis Conversion of Center Street from Automobile Access to Pedestrian Access Only
Project No. 60021115

P:\2004\60021115 Bishop Ranch 2 404018x0\Close Center Street Option\Supplemental TA Memo.doc

INTRODUCTION

The City of San Ramon Architectural Review Board has requested an alternative to the original project design. The design alternative eliminates automobile access along Center Street through the heart of the project. Instead, Center Street would be a pedestrian corridor only. The two internal streets crossing Center Street, East Street and West Street, would remain open to automobile traffic to provide access to parking structures, loading docks, and in particular the hotel parcel. Removal of automobile access on West Street would make access to the hotel difficult. The proposed pedestrian treatments originally proposed at West Street's crossing of Center Street, Center Street's crossing of Camino Ramon, and East Street's crossing of Center Street would be maintained with the closure of Center Street to automobile traffic.

TRAFFIC OPERATIONAL CHANGES

The removal of automobile traffic from Center Street would modify the traffic operations on intersections immediately adjacent to the project. These modifications would include intersection level of service and intersection queuing. There would be no change to intersection level of service and intersection queuing for intersections located away from the immediate project area as a result of the closure of Center Street.

Table 1 shows the level of service for the six intersections surrounding the project site with Center Street open to automobile traffic and with it closed. The level of service between the two options changes at two locations, Bollinger Canyon Road/Sunset Drive and Bollinger Canyon Road/Bishop Ranch 1 East. During the AM peak hour the level of service at Bollinger Canyon Road/Sunset Drive improves from level D to level C with the elimination of automobile access on Center Street. The rounded volume to capacity ratio however remains at 0.80. During the PM peak hour the level of service at Bollinger Canyon Road/Bishop Ranch 1 East changes from

Table 1 2020 Level of Service Plus Flex Retail Pedestrian Option

Intersection	2020 + Flex Retail Project Condition (CIP Geo + Project Mitigation)				2020 + Flex Retail Project Condition Pedestrian Option (CIP Geo + Project Mitigation)				V/C Ratio Difference	
	AM Peak Hour		AM Peak Hour		AM Peak Hour		AM Peak Hour			
	V/C Ratio	V/C Ratio	V/C Ratio	V/C Ratio	V/C Ratio	LOS	V/C Ratio	LOS	AM	PM
8. Camino Ramon/Bishop Drive	0.53	A	0.62	B	0.54	A	0.68	B	0.01	0.06
12. Bollinger Canyon Rd/Sunset/Chevron Park W.	0.80 (0.80) ¹	D (D) ¹	1.05 (0.87) ¹	F (D) ¹	0.80 (0.80) ¹	C (C) ¹	1.04 (0.86) ¹	F (D) ¹	(0.00) (0.00)	(0.01) (0.01)
13. Bollinger Canyon Rd./Camino Ramon	0.69	B	0.66	B	0.69	B	0.66	B	0.00	0.00
14. Bollinger Canyon Rd./Bishop Ranch 1 E	0.39	A	0.80	C	0.39	A	0.81	D	0.00	0.01
26. Sunset Drive/Shops at Bishop Ranch	0.23	A	0.55	A	0.21	A	0.48	A	(0.02)	(0.07)
27. Bishop Drive/Sunset Drive	0.44	A	0.66	B	0.44	A	0.67	B	0.00	0.01

¹ Values with one free southbound right turn lane.

C to D with the closure of Center Street to automobile traffic. While the level of service does not change at Bollinger Canyon Road/Sunset Drive during the PM peak hour and at Sunset Drive/Shops at Bishop Ranch during both peak hours, the volume to capacity ratios decreases (improves) slightly with the elimination of automobile access at Center Street. None of the level of service changes eliminates any of the previously identified significant impacts or creates any new significant impacts. The intersection of Bollinger Canyon Road and Sunset Drive will be significantly impacted in the PM peak hour by the project with or without Center Street open to automobile traffic. The mitigation of a free southbound right turn lane on Sunset Drive to northbound I-680 remains necessary with this design option.

Table 2 shows the intersection queuing for six intersections surrounding the project site with Center Street open to automobile traffic and with it closed. Queuing lengths change slightly at various locations. The southbound left turn queue on Sunset Drive at Bollinger Canyon Road decreases from the queue lengths projected with Center Street open to automobile traffic. However, the queue exceeds the available storage length and a second left turn would be necessary to accommodate the projected queue. The eastbound left turn queue on Bollinger Canyon Road at Sunset Drive would not be affected by the changes to Center Street and the left turn pocket at this intersection will need to be extended to accommodate the queue. Also, the westbound queue at Bishop Drive/Sunset Drive would increase slightly with the closure of Center Street to automobiles. However, the queue could still be accommodated in the storage area between Bishop Drive and West Street. None of the intersection queuing changes eliminates any of the previously identified significant impacts or creates any new significant impacts. All mitigation necessary for the original project design will be required with the removal of automobile traffic from Center Street.

Table 2 2020 Intersection Queuing Pedestrian Option

#	Intersection	Movement	2020 + Project 95 th Percentile (ft)			2020 + Project (Pedestrian Option) 95 th Percentile (ft)		
			AM	PM	Available (ft)	AM	PM	Available (ft)
8	Bishop Drive @ Camino Ramon	Southbound Left	30	#147	180	30	#164	180
		Westbound Left	25	98	200	26	#142	200
		Eastbound Left	33	67	180	34	68	180
12	Bollinger Canyon Road @ Sunset Drive	Southbound Through-Left	#247 (132) ¹	218 *(117) ¹	170	#196 (118) ¹	*117 *(64) ¹	170
		Eastbound Left	#883	#581	600	#883	#581	600
		Westbound Left	169	38	250	169	38	250
		Southbound Left	#113	#338	490	#113	#338	490
13	Bollinger Canyon Road @ Camino Ramon	Northbound Left	27	217	445	27	217	445
		Westbound Left	57	28	225	57	28	225
		Eastbound Left	#416	#278	500	#416	#278	500
		Southbound Left	27	#173	345	31	#208	345
14	Bollinger Canyon Road @ Bishop Drive	Northbound Left	20	#156	325	20	149	325
		Westbound Left	52	35	150	52	35	150
		Eastbound Left	6	15	200	6	15	200
		Southbound Left	*20	*30	80	N/A	N/A	N/A
26	Sunset Drive @ Center Street	Northbound Left	*122	*92	150	*122	*88	150
		Westbound Left	35	93	100	N/A	N/A	N/A
		Northbound Left	44	212	280	39	214	280
27	Sunset Drive @ Bishop Drive	Westbound Left	110	348	365	110	354	365

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

* Volume for 95th percentile queue is metered by upstream signal.

¹ Assumes the addition of a southbound left turn lane.