APPENDIX D

FREEWAY DIVERGE CALCULATION SHEETS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7370	0.92	Rolling	4	2	0.926	1.00	8652
Ramp	1300	0.92	Rolling	2	2	0.952	1.00	1484
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2898 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6922	9400	No
V_{12}	2898	4400:All	No
$V_{FO} = V_F - V_R$	5438	9400	No
V_R	1484	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -2.3 (pc/mi/ln) D_R = 0.01094 V_F/N

LOS = A (Exhibit 25-4) = 0.01094 6922/5

Speed Estimation

D_s = 0.562 (Exhibit 25-19) = 15.08

S_R= 52.1 mph (Exhibit 25-19) LOS: B

S_0= 67.4 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8050	0.92	Level	4	2	0.977	1.00	8960
Ramp	1400	0.92	Level	2	2	0.986	1.00	1543
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3005 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7168	9400	No
V_{12}	3005	4400:All	No
$V_{FO} = V_F - V_R$	5625	9400	No
V_R	1543	3800	No

Level of Service Determination (If not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (If not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -1.4 (pc/mi/ln) DR = 0.01097 VF IN

LOS = A (Exhibit 25-4) = 0.01097 7168 15

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.567 (Exhibit 25-19) = 15.62

S_R = 52.0 mph (Exhibit 25-19) LOS: B

S_0 = 67.1 mph (Exhibit 25-19)

S = 59.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8180	0.92	Rolling	4	2	0.926	1.00	9603
Ramp	1000	0.92	Rolling	2	2	0.952	1.00	1141
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3993 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7683	9400	No
V_{12}	3993	4400:All	No
$V_{FO} = V_F - V_R$	6542	9400	No
V_R	1141	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 25.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.531 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 68.0 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8500	0.92	Level	4	2	0.977	1.00	9461
Ramp	1050	0.92	Level	2	2	0.986	1.00	1157
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3953 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7569	9400	No
V_{12}	3953	4400:All	No
$V_{FO} = V_F - V_R$	6412	9400	No
V_R	1157	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 24.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.532 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 68.2 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	Del Mar Hts Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

7530 in 6 lanes (ok)

6275 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6275	0.92	Grade	4	2	0.977	1.00	6984
Ramp	1200	0.92	Grade	2	2	0.986	1.00	1323
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2523 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5937	9400	No
V_{12}	2523	4400:All	No
$V_{FO} = V_F - V_R$	4614	9400	No
V_R	1323	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -5.6 (pc/mi/ln) $D_R = 0.0109 \times V_F/N$

LOS = A (Exhibit 25-4) $= 0.0109 \times 5937/5$

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.547 (Exhibit 25-19) = 12.94

S_R = 52.4 mph (Exhibit 25-19) LOS : B

S_0 = 68.5 mph (Exhibit 25-19)

S = 60.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

7950 in 6 lanes or

6625 in 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6625	0.92	Grade	4	2	0.977	1.00	7374
Ramp	1150	0.92	Grade	2	2	0.986	1.00	1267
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2472 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5900	9400	No
V_{12}	2472	4400:All	No
$V_{FO} = V_F - V_R$	4633	9400	No
V_R	1267	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -6.0 (pc/mi/ln) $D_R = 0.0109 * V_f/N$

LOS = A (Exhibit 25-4) $= 0.0109 * 5900/5$

Speed Estimation

D_s = 0.542 (Exhibit 25-19) = 12.86

S_R = 52.5 mph (Exhibit 25-19) LOS : B

S_0 = 68.5 mph (Exhibit 25-19)

S = 60.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7190	0.92	Level	4	2	0.977	1.00	8003
Ramp	800	0.92	Level	2	2	0.986	1.00	882
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3289 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6403	9400	No
V_{12}	3289	4400:All	No
$V_{FO} = V_F - V_R$	5521	9400	No
V_R	882	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 19.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.507 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 69.1 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7170	0.92	Level	4	2	0.977	1.00	7981
Ramp	810	0.92	Level	2	2	0.986	1.00	893
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3288 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6385	9400	No
V_{12}	3288	4400:All	No
$V_{FO} = V_F - V_R$	5492	9400	No
V_R	893	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 19.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.508 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 69.2 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6170	0.92	Level	4	2	0.977	1.00	6867
Ramp	750	0.92	Level	2	2	0.986	1.00	827
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2130 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5837	9400	No
V_{12}	2130	4400:All	No
$V_{FO} = V_F - V_R$	5010	9400	No
V_R	827	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 9.1 (pc/mi/ln) DR = 0.0109 * VF IN

LOS = A (Exhibit 25-4) = 0.0109 * 5837 / 5

Speed Estimation

D_s = 0.502 (Exhibit 25-19) = 12.72

S_R = 53.4 mph (Exhibit 25-19) LOS = B

S_0 = 68.0 mph (Exhibit 25-19)

S = 61.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5670	0.92	Level	4	2	0.977	1.00	6311
Ramp	800	0.92	Level	2	2	0.986	1.00	882
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2048 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5365	9400	No
V_{12}	2048	4400:All	No
$V_{FO} = V_F - V_R$	4483	9400	No
V_R	882	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 8.4 (pc/mi/ln) $D_R = 0.0109 * V_F / N$

LOS = A (Exhibit 25-4) $= 0.0109 * 5365 / 5$

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.507 (Exhibit 25-19) $= 11.69$

S_R = 53.3 mph (Exhibit 25-19) LOS: B

S_0 = 68.7 mph (Exhibit 25-19)

S = 61.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5900	0.92	Level	4	2	0.977	1.00	6567
Ramp	750	0.92	Level	2	2	0.986	1.00	827
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3330 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6567	9400	No
V_{12}	3330	4400:All	No
$V_{FO} = V_F - V_R$	5740	9400	No
V_R	827	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 31.5 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

D_s = 0.502 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 68.9 mph (Exhibit 25-19)

S = 60.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3800	0.92	Level	4	2	0.977	1.00	4230
Ramp	400	0.92	Level	2	2	0.986	1.00	441
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2093 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4230	9400	No
V_{12}	2093	4400:All	No
$V_{FO} = V_F - V_R$	3789	9400	No
V_R	441	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 20.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.468 (Exhibit 25-19)

S_R= 54.2 mph (Exhibit 25-19)

S_0= 71.0 mph (Exhibit 25-19)

S = 61.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3150	0.92	Level	4	2	0.977	1.00	3506
Ramp	650	0.92	Level	2	2	0.986	1.00	716
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 1932 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3506	9400	No
V_{12}	1932	4400:All	No
$V_{FO} = V_F - V_R$	2790	9400	No
V_R	716	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 19.5 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6300	0.92	Level	4	2	0.977	1.00	7012
Ramp	900	0.92	Level	2	2	0.986	1.00	992
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3617 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7012	9400	No
V_{12}	3617	4400:All	No
$V_{FO} = V_F - V_R$	6020	9400	No
V_R	992	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 34.0 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

D_s = 0.517 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= 68.6 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 2000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 942 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1770	0.92	Level	4	2	0.977	1.00	1970
Ramp	760	0.92	Level	2	2	0.986	1.00	838
UpStream								
DownStream	942	0.90	Level	0	0	1.000	1.00	1047

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 1970 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	1970	4700	No
V_{12}	1970	4400:All	No
$V_{FO} = V_F - V_R$	1132	4700	No
V_R	838	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 21.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.503 (Exhibit 25-19)

S_R = 53.4 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 53.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 2000 ft

V_D = 1511 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3600	0.92	Level	4	2	0.977	1.00	4007
Ramp	920	0.92	Level	2	2	0.986	1.00	1014
UpStream								
DownStream	1511	0.90	Level	0	0	1.000	1.00	1679

Merge Areas | Diverge Areas

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 4007 pc/h

Capacity Checks (Merge Areas)

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks (Diverge Areas)

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4007	4700	No
V_{12}	4007	4400:All	No
$V_{FO} = V_F - V_R$	2993	4700	No
V_R	1014	2000	No

Level of Service Determination (if not F) (Merge Areas)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F) (Diverge Areas)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 38.7 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation (Merge Areas)

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation (Diverge Areas)

D_s = 0.519 (Exhibit 25-19)

S_R = 53.1 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 53.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 641 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5234	0.92	Level	4	2	0.977	1.00	5826
Ramp	581	0.92	Level	2	2	0.986	1.00	640
UpStream								
DownStream	641	0.90	Level	0	0	1.000	1.00	712

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.585 using Equation (Exhibit 25-11)

V_{12} = 3673 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5826	7050	No
V_{12}	3673	4400:All	No
$V_{FO} = V_F - V_R$	5186	~~7050~~ 4700	No
V_R	640	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 22.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.486 (Exhibit 25-19)

S_R= 53.8 mph (Exhibit 25-19)

S_0= 66.8 mph (Exhibit 25-19)

S = 58.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 738 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2030	0.92	Level	4	2	0.977	1.00	2259
Ramp	296	0.92	Level	2	2	0.986	1.00	326
UpStream								
DownStream	738	0.90	Level	0	0	1.000	1.00	820

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.689 using Equation (Exhibit 25-11)

V_{12} = 1657 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2259	7050	No
V_{12}	1657	4400:All	No
$V_{FO} = V_F - V_R$	1933	~~7050~~ 4700	No
V_R	326	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 5.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.457 (Exhibit 25-19)

S_R = 54.5 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 58.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2017	0.92	Level	4	2	0.977	1.00	2245
Ramp	465	0.92	Level	2	2	0.986	1.00	513
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 1292 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2245	7050	No
V_{12}	1292	4400:All	No
$V_{FO} = V_F - V_R$	1732	~~7050~~ 4700	No
V_R	513	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -16.1 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.474 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3673	0.92	Level	4	2	0.977	1.00	4088
Ramp	536	0.92	Level	2	2	0.986	1.00	591
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 2165 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4088	7050	No
V_{12}	2165	4400:All	No
$V_{FO} = V_F - V_R$	3497	~~7050~~ 4700	No
V_R	591	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -8.6 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.481 (Exhibit 25-19)

S_R = 53.9 mph (Exhibit 25-19)

S_0 = 67.7 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4369	0.92	Level	4	2	0.977	1.00	4863
Ramp	261	0.92	Level	2	2	0.986	1.00	288
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 2347 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4863	7050	No
V_{12}	2347	4400:All	No
$V_{FO} = V_F - V_R$	4575	~~7050~~ 4700	No
V_R	288	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -7.1 (pc/mi/ln) since 4575/4700 : 0.97 v/c

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.454 (Exhibit 25-19) LOS E

S_R = 54.6 mph (Exhibit 25-19)

S_0 = 65.4 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1593	0.92	Level	4	2	0.977	1.00	1773
Ramp	195	0.92	Level	2	2	0.986	1.00	215
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 916 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	1773	7050	No
V_{12}	916	4400:All	No
$V_{FO} = V_F - V_R$	1558	~~7050~~ 4400	No
V_R	215	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -19.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.447 (Exhibit 25-19)

S_R= 54.7 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 61.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3626	0.92	Level	4	2	0.977	1.00	4036
Ramp	73	0.92	Level	2	2	0.986	1.00	80
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 4036 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4036	4700	No
V_{12}	4036	4400:All	No
$V_{FO} = V_F - V_R$	3956	4700	No
V_R	80	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 37.6 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.435 (Exhibit 25-19)

S_R= 55.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 55.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	Existing PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1316	0.92	Level	4	2	0.977	1.00	1465
Ramp	42	0.92	Level	2	2	0.986	1.00	46
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 1465 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	1465	4700	No
V_{12}	1465	4400:All	No
$V_{FO} = V_F - V_R$	1419	4700	No
V_R	46	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 15.5 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.432 (Exhibit 25-19)

S_R= 55.1 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 55.1 mph (Exhibit 25-15)

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Same for Run B or Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling
9260 in 6 lanes or
7716 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7716	0.92	Rolling	4	2	0.926	1.00	9058
Ramp	960	0.92	Rolling	2	2	0.952	1.00	1096
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.260 using Equation (Exhibit 25-11)
V_{12} = 2695 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7247	9400	No
V_{12}	2695	4400:All	No
$V_{FO} = V_F - V_R$	6151	9400	No
V_R	1096	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -4.1 (pc/mi/ln) D_R = 0.0109 * V_F/N
LOS = A (Exhibit 25-4) = 0.0109 * 7247 / 5

Speed Estimation

D_s = 0.527 (Exhibit 25-19) = 15.79
S_R = 52.9 mph (Exhibit 25-19) : LOS = B
S_0 = 66.3 mph (Exhibit 25-19)
S = 60.6 mph (Exhibit 25-15)

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Same for Run B and Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

7940 in 6 lanes (or)
6616 in 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6616	0.92	Level	4	2	0.977	1.00	7364
Ramp	970	0.92	Level	2	2	0.986	1.00	1069
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2323 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5892	9400	No
V_{12}	2323	4400:All	No
$V_{FO} = V_F - V_R$	4823	9400	No
V_R	1069	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -7.3 (pc/mi/ln) D_R = 0.0109 * VF/N

LOS = A (Exhibit 25-4) = 0.0109 * 5892/5

Speed Estimation

D_s = 0.524 (Exhibit 25-19) = 12.84

S_R= 52.9 mph (Exhibit 25-19) LOS: B

S_0= 68.2 mph (Exhibit 25-19)

S = 61.3 mph (Exhibit 25-15)

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Same for Run B.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

7804 in 6 lanes (or)

6503 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6503	0.92	Rolling	4	2	0.926	1.00	7634
Ramp	1360	0.92	Rolling	2	2	0.952	1.00	1552
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2737 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6108	9400	No
V_{12}	2737	4400:All	No
$V_{FO} = V_F - V_R$	4556	9400	No
V_R	1552	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -3.7 (pc/mi/ln) $V_R = 0.0109 * V_F / N$

LOS = A (Exhibit 25-4) $= 0.0109 * 6108/5$

Speed Estimation

D_s = 0.568 (Exhibit 25-19) = 13.31

S_R = 51.9 mph (Exhibit 25-19) ⇒ B.

S_0 = 68.6 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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Same for Run B.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	10,348 uni 6 lanes con	☐ Yes ☐ On
☑ No ☐ Off	8 623 uni 5 lanes	☑ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8623	0.92	Level	4	2	0.977	1.00	9598
Ramp	1650	0.92	Level	2	2	0.986	1.00	1819
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3343 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7679	9400	No
V_{12}	3343	4400:All	No
$V_{FO} = V_F - V_R$	5860	9400	No
V_R	1819	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 1.5 (pc/mi/ln) DR: 0.0109 * VF/N

LOS = A (Exhibit 25-4) = 0.0109 * 7679 / 5

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.592 (Exhibit 25-19) = 16.74

S_R = 51.4 mph (Exhibit 25-19) LOS: B

S_0 = 66.7 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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Same for Run B & Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

10,000 wi 6 lanes (or)
8333 wi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8333	0.92	Rolling	4	2	0.926	1.00	9782
Ramp	1440	0.92	Rolling	2	2	0.952	1.00	1643
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3251 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7826	9400	No
V_{12}	3251	4400:All	No
$V_{FO} = V_F - V_R$	6183	9400	No
V_R	1643	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 0.7 (pc/mi/ln) DR = 0.019 x VF/N

LOS = A (Exhibit 25-4) = 0.019 x 7826/5

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.576 (Exhibit 25-19) = 17.06

S_R = 51.8 mph (Exhibit 25-19) ⇒ LOS = B

S_0 = 66.3 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-15)

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Same for Run B + Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level
8470 mi 6 lanes
7058 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7058	0.92	Level	4	2	0.977	1.00	7856
Ramp	1453	0.92	Level	2	2	0.986	1.00	1601
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.260 using Equation (Exhibit 25-11)
V_{12} = 2819 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6285	9400	No
V_{12}	2819	4400:All	No
$V_{FO} = V_F - V_R$	4684	9400	No
V_R	1601	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -3.0 (pc/mi/ln) DR = 0.0109 * VF/N
LOS = A (Exhibit 25-4) = 0.0109 * 6285 / 5

Speed Estimation

D_s = 0.572 (Exhibit 25-19) 13.70
S_R= 51.8 mph (Exhibit 25-19) LOS: B
S_0= 68.4 mph (Exhibit 25-19)
S = 59.8 mph (Exhibit 25-15)

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Same for Run B.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	Del Mar Hts Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

7843 on 6 lanes low

6535 on 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6535	0.92	Grade	4	2	0.977	1.00	7274
Ramp	1480	0.92	Grade	2	2	0.986	1.00	1631
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2720 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5820	9400	No
V_{12}	2720	4400:All	No
$V_{FO} = V_F - V_R$	4189	9400	No
V_R	1631	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = ~~-3.9 (pc/mi/ln)~~ DR = 0.0109 x V_f/N = 0.0109 x 5820/5

LOS = ~~A~~ (Exhibit 25-4)

Speed Estimation

D_s = 0.575 (Exhibit 25-19) = 12.68

S_R= 51.8 mph (Exhibit 25-19) LOS: B

S_0= 69.2 mph (Exhibit 25-19)

S = 59.8 mph (Exhibit 25-15)

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Same for Run B.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

10,348 mi 6 lanes on

8506 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8506	0.92	Grade	4	2	0.977	1.00	9468
Ramp	1360	0.92	Grade	2	2	0.986	1.00	1499
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3079 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7575	9400	No
V_{12}	3079	4400:All	No
$V_{FO} = V_F - V_R$	6076	9400	No
V_R	1499	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -0.8 (pc/mi/ln) V_R = 0.0109 x V_F / N

LOS = A (Exhibit 25-4) = 0.0109 x 7575 / 5

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.563 (Exhibit 25-19) = 16.51

S_R = 52.1 mph (Exhibit 25-19) LOS B

S_0 = 66.4 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 55.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9290	0.92	Grade	4	2	0.977	1.00	10340
Ramp	3220	0.92	Grade	2	2	0.986	1.00	3549
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 4777 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8272	9400	No
V_{12}	4777	4400:All	Yes
$V_{FO} = V_F - V_R$	4723	9400	No
V_R	3549	4400	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 18.3 (pc/mi/ln) DR = 0.0109 * 8272/5 = 18.03

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.487 (Exhibit 25-19)

S_R = 53.8 mph (Exhibit 25-19)

S_0 = 68.4 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 55.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7140	0.92	Grade	4	2	0.977	1.00	7947
Ramp	2200	0.92	Grade	2	2	0.986	1.00	2425
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3448 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6358	9400	No
V_{12}	3448	4400:All	No
$V_{FO} = V_F - V_R$	3933	9400	No
V_R	2425	4400	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 2.4 (pc/mi/ln) v_R : 0.0109 * 6358/5 : 13 86

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.386 (Exhibit 25-19) : LOS : B

S_R= 56.1 mph (Exhibit 25-19)

S_0= 69.5 mph (Exhibit 25-19)

S = 61.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

10/2-10 w/ 6 lanes (on)

850 & w/ 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8508	0.92	Level	4	2	0.977	1.00	9470
Ramp	920	0.92	Level	2	2	0.986	1.00	1014
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3875 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7576	9400	No
V_{12}	3875	4400:All	No
$V_{FO} = V_F - V_R$	6562	9400	No
V_R	1014	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 24.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.519 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= 68.0 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

8227 w/ 6 lanes on

6905 w/ 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6905	0.92	Level	4	2	0.977	1.00	7686
Ramp	1147	0.92	Level	2	2	0.986	1.00	1264
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3394 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6149	9400	No
V_{12}	3394	4400:All	No
$V_{FO} = V_F - V_R$	4885	9400	No
V_R	1264	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 19.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.542 (Exhibit 25-19)

S_R= 52.5 mph (Exhibit 25-19)

S_0= 69.8 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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Same for Run B + Run C.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5660	0.92	Level	4	2	0.977	1.00	6300
Ramp	1050	0.92	Level	2	2	0.986	1.00	1157
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2248 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5355	9400	No
V_{12}	2248	4400:All	No
$V_{FO} = V_F - V_R$	4198	9400	No
V_R	1157	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 10.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.532 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 69.1 mph (Exhibit 25-19)

S = 61.2 mph (Exhibit 25-15)

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Same for Run B, Run C.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7300	0.92	Level	4	2	0.977	1.00	8125
Ramp	1180	0.92	Level	2	2	0.986	1.00	1301
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2653 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6500	9400	No
V_{12}	2653	4400:All	No
$V_{FO} = V_F - V_R$	5199	9400	No
V_R	1301	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 13.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.545 (Exhibit 25-19)

S_R= 52.5 mph (Exhibit 25-19)

S_0= 67.7 mph (Exhibit 25-19)

S = 60.5 mph (Exhibit 25-15)

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Same for Run B, B2, C, C2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7070	0.92	Level	4	2	0.977	1.00	7869
Ramp	820	0.92	Level	2	2	0.986	1.00	904
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3941 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fl} = V_F$	7869	9400	No
V_{12}	3941	4400:All	No
$V_{FO} = V_F - V_R$	6965	9400	No
V_R	904	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 36.8 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.509 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 67.5 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-15)

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Same for Run B, B2, C, C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4000	0.92	Level	4	2	0.977	1.00	4452
Ramp	650	0.92	Level	2	2	0.986	1.00	716
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2345 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4452	9400	No
V_{12}	2345	4400:All	No
$V_{FO} = V_F - V_R$	3736	9400	No
V_R	716	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 23.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.1 mph (Exhibit 25-19)

S = 60.7 mph (Exhibit 25-15)

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Same for Run B, Run C.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3800	0.92	Level	4	2	0.977	1.00	4230
Ramp	730	0.92	Level	2	2	0.986	1.00	805
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2298 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4230	9400	No
V_{12}	2298	4400:All	No
$V_{FO} = V_F - V_R$	3425	9400	No
V_R	805	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 22.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.500 (Exhibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.4 mph (Exhibit 25-15)

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Same for Run B + Run C.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6570	0.92	Level	4	2	0.977	1.00	7313
Ramp	950	0.92	Level	2	2	0.986	1.00	1047
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3779 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7313	9400	No
V_{12}	3779	4400:All	No
$V_{FO} = V_F - V_R$	6266	9400	No
V_R	1047	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 35.4 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.522 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= 68.3 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-15)

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Same for Run B & Run C

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 2000 ft

V_D = 1203 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2000	0.92	Level	4	2	0.977	1.00	2226
Ramp	940	0.92	Level	2	2	0.986	1.00	1036
UpStream								
DownStream	1203	0.90	Level	0	0	1.000	1.00	1337

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2226 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	2226	4700	No
V_{12}	2226	4400:All	No
$V_{FO} = V_F - V_R$	1190	4700	No
V_R	1036	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 23.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.521 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.0 mph (Exhibit 25-15)

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Same for Run B & Run C.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 2000 ft

V_D = 2557 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3740	0.92	Level	4	2	0.977	1.00	4163
Ramp	1100	0.92	Level	2	2	0.986	1.00	1212
UpStream								
DownStream	2557	0.90	Level	0	0	1.000	1.00	2841

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 4163 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4163	4700	No
V_{12}	4163	4400:All	No
$V_{FO} = V_F - V_R$	2951	4700	No
V_R	1212	2000	No

Level of Service Determination (If not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 40.1 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.537 (Exhibit 25-19)

S_R= 52.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 750 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6066	0.92	Level	4	2	0.977	1.00	6752
Ramp	674	0.92	Level	2	2	0.986	1.00	743
UpStream								
DownStream	750	0.90	Level	0	0	1.000	1.00	833

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.557 using Equation (Exhibit 25-11)

V_{12} = 4090 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6752	7050	No
V_{12}	4090	4400:All	No
$V_{FO} = V_F - V_R$	6009	4700 ~~7050~~	Yes ~~No~~
V_R	743	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 25.9 (pc/mi/ln) LOS F

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.495 (Exhibit 25-19)

S_R= 53.6 mph (Exhibit 25-19)

S_0= 64.8 mph (Exhibit 25-19)

S = 57.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 890 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2300	0.92	Level	4	2	0.977	1.00	2560
Ramp	355	0.92	Level	2	2	0.986	1.00	391
UpStream								
DownStream	890	0.90	Level	0	0	1.000	1.00	989

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = 1070.90 (Equation 25-8 or 25-9)

P_{FD} = 0.686 using Equation (Exhibit 25-11)

V_{12} = 1878 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2560	7050	No
V_{12}	1878	4400:All	No
$V_{FO} = V_F - V_R$	2169	4700 ~~7050~~	No
V_R	391	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 6.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.463 (Exhibit 25-19)

S_R= 54.3 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 58.0 mph (Exhibit 25-15)

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Same for Run B

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2547	0.92	Level	4	2	0.977	1.00	2835
Ramp	480	0.92	Level	2	2	0.986	1.00	529
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 1567 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2835	7050	No
V_{12}	1567	4400:All	No
$V_{FO} = V_F - V_R$	2306	4700 ~~7050~~	No
V_R	529	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -13.8 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.476 (Exhibit 25-19)

S_R = 54.1 mph (Exhibit 25-19)

S_0 = 70.3 mph (Exhibit 25-19)

S = 60.3 mph (Exhibit 25-15)

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Same for Run B

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A))

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4789	0.92	Level	4	2	0.977	1.00	5330
Ramp	810	0.92	Level	2	2	0.986	1.00	893
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 2890 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5330	7050	No
V_{12}	2890	4400:All	No
$V_{FO} = V_F - V_R$	4437	4900 ~~7050~~	No
V_R	893	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -2.4 (pc/mi/ln) $V/c = \frac{4437}{4700} = 0.94 \Rightarrow$ LOS E

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.508 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 65.7 mph (Exhibit 25-19)

S = 58.3 mph (Exhibit 25-15)

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Same for Run B

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5075	0.92	Level	4	2	0.977	1.00	5649
Ramp	489	0.92	Level	2	2	0.986	1.00	539
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 5649 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5649	4700	Yes
V_{12}	5649	4400:All	Yes
$V_{FO} = V_F - V_R$	5110	4700	Yes
V_R	539	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 39.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.477 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.0 mph (Exhibit 25-15)

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Same for Run B

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1901	0.92	Level	4	2	0.977	1.00	2116
Ramp	341	0.92	Level	2	2	0.986	1.00	376
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2116 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2116	4700	No
V_{12}	2116	4400:All	No
$V_{FO} = V_F - V_R$	1740	4700	No
V_R	376	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 8.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.462 (Exhibit 25-19)

S_R= 54.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.4 mph (Exhibit 25-15)

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Same for Run 12

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4520	0.92	Level	4	2	0.977	1.00	5031
Ramp	259	0.92	Level	2	2	0.986	1.00	285
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 5031 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	5031	4700	Yes
V_{12}	5031	4400:All	Yes
$V_{FO} = V_F - V_R$	4746	4700	Yes
V_R	285	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 46.2 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.454 (Exhibit 25-19)

S_R= 54.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.6 mph (Exhibit 25-15)

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Same for Run B

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 No Build (Run A)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1940	0.92	Level	4	2	0.977	1.00	2159
Ramp	517	0.92	Level	2	2	0.986	1.00	570
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2159 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2159	4700	No
V_{12}	2159	4400:All	No
$V_{FO} = V_F - V_R$	1589	4700	No
V_R	570	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 21.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.479 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.0 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Aux Lane (Run B)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

9290 w/ 6 lanes (or)

7740 w/ 5 lanes

S_{FF} = 65.0 mph S_{FR} = 55.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7740	0.92	Grade	4	2	0.977	1.00	8615
Ramp	3220	0.92	Grade	2	2	0.986	1.00	3549
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 4418 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6892	9400	No
V_{12}	4418	4400:All	Yes
$V_{FO} = V_F - V_R$	3343	9400	No
V_R	3549	4400	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 10.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.487 (Exhibit 25-19)

S_R= 53.8 mph (Exhibit 25-19)

S_0= 70.4 mph (Exhibit 25-19)

S = 58.8 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Aux Lane (Run B)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

7140 w/ 6 lanes or

5950 w/ 5 lanes

S_{FF} = 65.0 mph S_{FR} = 55.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5950	0.92	Grade	4	2	0.977	1.00	6623
Ramp	2200	0.92	Grade	2	2	0.986	1.00	2425
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3258 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5630	9400	No
V_{12}	3258	4400:All	No
$V_{FO} = V_F - V_R$	3205	9400	No
V_R	2425	4400	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 0.8 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.386 (Exhibit 25-19)

S_R= 56.1 mph (Exhibit 25-19)

S_0= 70.6 mph (Exhibit 25-19)

S = 61.4 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Aux Lane (Run B)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

10210 mi 7 lanes (or)

7290 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7290	0.92	Level	4	2	0.977	1.00	8114
Ramp	920	0.92	Level	2	2	0.986	1.00	1014
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3402 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6492	9400	No
V_{12}	3402	4400:All	No
$V_{FO} = V_F - V_R$	5478	9400	No
V_R	1014	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 20.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.519 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= 69.2 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Aux Lane (Run B)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

8287 mi of lanes (or)

5920 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5920	0.92	Level	4	2	0.977	1.00	6589
Ramp	1147	0.92	Level	2	2	0.986	1.00	1264
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3155 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5601	9400	No
V_{12}	3155	4400:All	No
$V_{FO} = V_F - V_R$	4337	9400	No
V_R	1264	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 17.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.542 (Exhibit 25-19)

S_R= 52.5 mph (Exhibit 25-19)

S_0= 70.4 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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Same for Run C5 & Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No EB Slip)	Analysis Year	Year 2015 Aux Lane (Run B2) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6365	0.92	Level	4	2	0.977	1.00	7085
Ramp	1755	0.92	Level	2	2	0.986	1.00	1934
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2905 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5668	9400	No
V_{12}	2905	4400:All	No
$V_{FO} = V_F - V_R$	3734	9400	No
V_R	1934	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 15.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.602 (Exhibit 25-19)

S_R= 51.2 mph (Exhibit 25-19)

S_0= 69.8 mph (Exhibit 25-19)

S = 58.8 mph (Exhibit 25-15)

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Same for Run C5 + D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No EB Slip)	Analysis Year	Year 2015 Aux Lane (Run B2) PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8125	0.92	Level	4	2	0.977	1.00	9043
Ramp	2005	0.92	Level	2	2	0.986	1.00	2210
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3516 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7235	9400	No
V_{12}	3516	4400:All	No
$V_{FO} = V_F - V_R$	5025	9400	No
V_R	2210	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 21.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.627 (Exhibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 68.0 mph (Exhibit 25-19)

S = 58.2 mph (Exhibit 25-15)

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Same for C2, C5 + Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 Aux Lane (B2) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3095	0.92	Level	4	2	0.977	1.00	3445
Ramp	730	0.92	Level	2	2	0.986	1.00	805
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 1956 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3445	9400	No
V_{12}	1956	4400:All	No
$V_{FO} = V_F - V_R$	2640	9400	No
V_R	805	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 19.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.500 (Exhibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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Same for Run C2, C5 + Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Aux lane (B2) PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5745	0.92	Level	4	2	0.977	1.00	6394
Ramp	950	0.92	Level	2	2	0.986	1.00	1047
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3378 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6394	9400	No
V_{12}	3378	4400:All	No
$V_{FO} = V_F - V_R$	5347	9400	No
V_R	1047	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 32.0 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.522 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= 69.3 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Aux Lane (Run B)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6066	0.92	Level	4	2	0.977	1.00	6752
Ramp	674	0.92	Level	2	2	0.986	1.00	743
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2305 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6752	9400	No
V_{12}	2305	4400:All	No
$V_{FO} = V_F - V_R$	6009	9400	No
V_R	743	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -7.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.495 (Exhibit 25-19)

S_R= 53.6 mph (Exhibit 25-19)

S_0= 66.5 mph (Exhibit 25-19)

S = 61.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Aux Lane (Run B)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2300	0.92	Level	4	2	0.977	1.00	2560
Ramp	355	0.92	Level	2	2	0.986	1.00	391
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 955 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2560	9400	No
V_{12}	955	4400:All	No
$V_{FO} = V_F - V_R$	2169	9400	No
V_R	391	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -19.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.463 (Exhibit 25-19)

S_R= 54.3 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 63.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM - No slip	Analysis Year	Year 2015 Aux Lane (Run B2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6207	0.92	Level	4	2	0.977	1.00	6909
Ramp	815	0.92	Level	2	2	0.986	1.00	898
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2461 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6909	9400	No
V_{12}	2461	4400:All	No
$V_{FO} = V_F - V_R$	6011	9400	No
V_R	898	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -6.1 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.509 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 66.5 mph (Exhibit 25-19)

S = 61.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM - No slip	Analysis Year	Year 2015 Aux Lane (Run B2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2465	0.92	Level	4	2	0.977	1.00	2744
Ramp	520	0.92	Level	2	2	0.986	1.00	573
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1137 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2744	9400	No
V_{12}	1137	4400:All	No
$V_{FO} = V_F - V_R$	2171	9400	No
V_R	573	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -17.5 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.480 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 62.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

9440 mi 6 lanes (on)

7870 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7870	0.92	Rolling	4	2	0.926	1.00	9239
Ramp	940	0.92	Rolling	2	2	0.952	1.00	1073
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2716 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7392	9400	No
V_{12}	2716	4400:All	No
$V_{FO} = V_F - V_R$	6319	9400	No
V_R	1073	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -3.9 (pc/mi/ln) DR: 0.0109 * VF / N

LOS = A (Exhibit 25-4) = 0.0109 * 7392/5

Speed Estimation

D_s = 0.525 (Exhibit 25-19) = 16.11

S_R= 52.9 mph (Exhibit 25-19) => LOS B

S_0= 66.1 mph (Exhibit 25-19)

S = 60.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

8190 in 6 lanes (or)

6825 in 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6825	0.92	Level	4	2	0.977	1.00	7597
Ramp	940	0.92	Level	2	2	0.986	1.00	1036
UpStream								
DownStream								

Estimation of v_{12} (Merge Areas)

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} (Diverge Areas)

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2347 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6078	9400	No
V_{12}	2347	4400:All	No
$V_{FO} = V_F - V_R$	5042	9400	No
V_R	1036	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -7.1 (pc/mi/ln) $D_R = 0.0109 * V_{FIM}$

LOS = A (Exhibit 25-4) $= 0.0109 * 6078/5$

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.521 (Exhibit 25-19) $= 13.25$

S_R = 53.0 mph (Exhibit 25-19) LOS B

S_0 = 67.9 mph (Exhibit 25-19)

S = 61.3 mph (Exhibit 25-15)

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Same for Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

8150 in 6 lanes (or)
6790 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6790	0.92	Rolling	4	2	0.926	1.00	7971
Ramp	1360	0.92	Rolling	2	2	0.952	1.00	1552
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2806 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6377	9400	No
V_{12}	2806	4400:All	No
$V_{FO} = V_F - V_R$	4825	9400	No
V_R	1552	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -3.1 (pc/mi/ln) D_R : 0.0109 x V_F/N

LOS = A (Exhibit 25-4) : 0.0109 x 6379/5

Speed Estimation

D_s = 0.568 (Exhibit 25-19) = 13.90

S_R= 51.9 mph (Exhibit 25-19) LOS B

S_0= 68.2 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

10,580 mi 6 lanes (or)

8820 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8820	0.92	Level	4	2	0.977	1.00	9817
Ramp	1650	0.92	Level	2	2	0.986	1.00	1819
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3388 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7854	9400	No
V_{12}	3388	4400:All	No
$V_{FO} = V_F - V_R$	6035	9400	No
V_R	1819	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 1.9 (pc/mi/ln) $D_R = 0.0109 * V_F / N$

LOS = A (Exhibit 25-4) $= 0.0109 * 7854/5$

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.592 (Exhibit 25-19) = 17.12

S_R= 51.4 mph (Exhibit 25-19) LOS B

S_0= 66.5 mph (Exhibit 25-19)

S = 59.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

10,200 in 3 lanes (OK)

6375 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6375	0.92	Rolling	4	2	0.926	1.00	7484
Ramp	1260	0.92	Rolling	2	2	0.952	1.00	1438
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2621 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5988	9400	No
V_{12}	2621	4400:All	No
$V_{FO} = V_F - V_R$	4550	9400	No
V_R	1438	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -4.7 (pc/mi/ln) D_R = 0.0109 * 5988/5 = 13.05

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.557 (Exhibit 25-19) LOS B

S_R = 52.2 mph (Exhibit 25-19)

S_0 = 68.6 mph (Exhibit 25-19)

S = 60.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

875 in 8 lanes (or)

5469 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5469	0.92	Level	4	2	0.977	1.00	6087
Ramp	1180	0.92	Level	2	2	0.986	1.00	1301
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2308 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5174	9400	No
V_{12}	2308	4400:All	No
$V_{FO} = V_F - V_R$	3873	9400	No
V_R	1301	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -7.4 (pc/mi/ln) D_R : 0.0169 * V_F / N

LOS = A (Exhibit 25-4) = 11.27

Speed Estimation

D_s = 0.545 (Exhibit 25-19) LOS B

S_R= 52.5 mph (Exhibit 25-19)

S_0= 69.6 mph (Exhibit 25-19)

S = 60.8 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	Del Mar Hts Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3570	0.92	Grade	4	2	0.977	1.00	3974
Ramp	1480	0.92	Grade	2	2	0.986	1.00	1631
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2240 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3974	9400	No
V_{12}	2240	4400:All	No
$V_{FO} = V_F - V_R$	2343	9400	No
V_R	1631	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 10.0 (pc/mi/ln) DR = 0.0109 * VFI N

LOS = B (Exhibit 25-4) = 8.66

Speed Estimation

D_s = 0.575 (Exhibit 25-19) LOS A

S_R= 51.8 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 58.8 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4140	0.92	Grade	4	2	0.977	1.00	4608
Ramp	1360	0.92	Grade	2	2	0.986	1.00	1499
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.260 using Equation (Exhibit 25-11)
V_{12} = 2307 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4608	9400	No
V_{12}	2307	4400:All	No
$V_{FO} = V_F - V_R$	3109	9400	No
V_R	1499	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 10.6 (pc/mi/ln) DR : 0.0109 x 4608 / 5 : 10.04
LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.563 (Exhibit 25-19) LOS : B
S_R = 52.1 mph (Exhibit 25-19)
S_0 = 70.7 mph (Exhibit 25-19)
S = 60.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	EB SR 56 from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 65.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6920	0.92	Grade	4	2	0.977	1.00	7702
Ramp	850	0.92	Grade	2	2	0.986	1.00	937
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R) P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2295 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6162	9400	No
V_{12}	2295	4400:All	No
$V_{FO} = V_F - V_R$	5225	9400	No
V_R	937	4400	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 10.5 (pc/mi/ln) $D_R = 0.0009 + V_F/N$

LOS = B (Exhibit 25-4) $= 0.0109 + 6162/5$

Speed Estimation

D_s = 0.122 (Exhibit 25-19) 13.43

S_R = 62.2 mph (Exhibit 25-19) LOS B

S_0 = 67.7 mph (Exhibit 25-19)

S = 65.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	EB SR 56 from Mainline I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6200	0.92	Grade	4	2	0.977	1.00	6901
Ramp	1260	0.92	Grade	2	2	0.986	1.00	1389
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2553 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5866	9400	No
V_{12}	2553	4400:All	No
$V_{FO} = V_F - V_R$	4477	9400	No
V_R	1389	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 12.7 (pc/mi/ln) DR : 0.0109 * 5866/5

LOS = B (Exhibit 25-4) = 12.78

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.553 (Exhibit 25-19) LOS B

S_R = 52.3 mph (Exhibit 25-19)

S_0 = 68.7 mph (Exhibit 25-19)

S = 60.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3670	0.92	Level	4	2	0.977	1.00	4085
Ramp	450	0.92	Level	2	2	0.986	1.00	496
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.635 using Equation (Exhibit 25-11)

V_{12} = 2775 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4085	7050	No
V_{12}	2775	4400:All	No
$V_{FO} = V_F - V_R$	3589	7050	No
V_R	496	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 14.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.473 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= 70.1 mph (Exhibit 25-19)

S = 58.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2640	0.92	Level	4	2	0.977	1.00	2938
Ramp	440	0.92	Level	2	2	0.986	1.00	485
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.664 using Equation (Exhibit 25-11)

V_{12} = 2114 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2938	7050	No
V_{12}	2114	4400:All	No
$V_{FO} = V_F - V_R$	2453	7050	No
V_R	485	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 8.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.472 (Exhibit 25-19)

S_R= 54.2 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 58.1 mph (Exhibit 25-15)

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Same for Run C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7070	0.92	Level	4	2	0.977	1.00	7869
Ramp	820	0.92	Level	2	2	0.986	1.00	904
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3941 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7869	9400	No
V_{12}	3941	4400:All	No
$V_{FO} = V_F - V_R$	6965	9400	No
V_R	904	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 36.8 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.509 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 67.5 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-15)

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Same for Run C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4000	0.92	Level	4	2	0.977	1.00	4452
Ramp	650	0.92	Level	2	2	0.986	1.00	716
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2345 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4452	9400	No
V_{12}	2345	4400:All	No
$V_{FO} = V_F - V_R$	3736	9400	No
V_R	716	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 23.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.1 mph (Exhibit 25-19)

S = 60.7 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM (WB C-D)	Analysis Year	Year 2015 Dir Conn (Run C5)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6770	0.92	Level	4	2	0.977	1.00	7535
Ramp	820	0.92	Level	2	2	0.986	1.00	904
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3795 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7535	9400	No
V_{12}	3795	4400:All	No
$V_{FO} = V_F - V_R$	6631	9400	No
V_R	904	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 35.5 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.509 (Exhibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 67.9 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM (WB C-D)	Analysis Year	Year 2015 Dir Conn (Run C5)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3695	0.92	Level	4	2	0.977	1.00	4113
Ramp	650	0.92	Level	2	2	0.986	1.00	716
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2197 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4113	9400	No
V_{12}	2197	4400:All	No
$V_{FO} = V_F - V_R$	3397	9400	No
V_R	716	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 21.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.7 mph (Exhibit 25-15)

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Same for Run C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D2
Agency or Company	LLG	Junction	I-5 NB connector from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Yeaar 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5350	0.92	Level	4	2	0.977	1.00	5955
Ramp	1500	0.92	Level	2	2	0.986	1.00	1653
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2772 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5955	9400	No
V_{12}	2772	4400:All	No
$V_{FO} = V_F - V_R$	4302	9400	No
V_R	1653	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 23.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.577 (Exhibit 25-19)

S_R = 51.7 mph (Exhibit 25-19)

S_0 = 69.0 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-15)

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Same for Run C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D2
Agency or Company	LLG	Junction	I-5 NB connector from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 Pm	Analysis Year	Year 2015 Dir Conn (Run C) PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2750	0.92	Level	4	2	0.977	1.00	3061
Ramp	950	0.92	Level	2	2	0.986	1.00	1047
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1571 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3061	9400	No
V_{12}	1571	4400:All	No
$V_{FO} = V_F - V_R$	2014	9400	No
V_R	1047	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 13.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.522 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 750 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6650	0.92	Level	4	2	0.977	1.00	7402
Ramp	650	0.92	Level	2	2	0.986	1.00	716
UpStream								
DownStream	750	0.90	Level	0	0	1.000	1.00	833

Estimation of v_{12} (Merge Areas)

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} (Diverge Areas)

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2070 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5922	9400	No
V_{12}	2070	4400:All	No
$V_{FO} = V_F - V_R$	5206	9400	No
V_R	716	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -9.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 67.7 mph (Exhibit 25-19)

S = 62.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 890 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2680	0.92	Level	4	2	0.977	1.00	2983
Ramp	340	0.92	Level	2	2	0.986	1.00	375
UpStream								
DownStream	890	0.90	Level	0	0	1.000	1.00	989

Estimation of v_{12} (Merge Areas)

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} (Diverge Areas)

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1053 pc/h

Capacity Checks (Merge Areas)

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks (Diverge Areas)

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2983	9400	No
V_{12}	1053	4400:All	No
$V_{FO} = V_F - V_R$	2608	9400	No
V_R	375	3800	No

Level of Service Determination (if not F) (Merge Areas)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F) (Diverge Areas)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -18.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation (Merge Areas)

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation (Diverge Areas)

D_s = 0.462 (Exhibit 25-19)

S_R = 54.4 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 64.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM - No slip	Analysis Year	Year 2015 Dir Conn (Run C2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 25.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 750 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6791	0.92	Level	4	2	0.977	1.00	7559
Ramp	791	0.92	Level	2	2	0.986	1.00	872
UpStream								
DownStream	750	0.90	Level	0	0	1.000	1.00	833

Merge Areas | Diverge Areas

Estimation of v_{12} (Merge Areas)

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} (Diverge Areas)

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2218 pc/h

Capacity Checks (Merge Areas)

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks (Diverge Areas)

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6048	9400	No
V_{12}	2218	4400:All	No
$V_{FO} = V_F - V_R$	5176	9400	No
V_R	872	3500	No

Level of Service Determination (if not F) (Merge Areas)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F) (Diverge Areas)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -8.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation (Merge Areas)

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation (Diverge Areas)

D_s = 0.636 (Exhibit 25-19)

S_R= 50.4 mph (Exhibit 25-19)

S_0= 67.7 mph (Exhibit 25-19)

S = 60.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM - No slip	Analysis Year	Year 2015 Dir Conn (Run C2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 890 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2845	0.92	Level	4	2	0.977	1.00	3167
Ramp	505	0.92	Level	2	2	0.986	1.00	557
UpStream								
DownStream	890	0.90	Level	0	0	1.000	1.00	989

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1236 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3167	9400	No
V_{12}	1236	4400:All	No
$V_{FO} = V_F - V_R$	2610	9400	No
V_R	557	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -16.6 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.478 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 63.4 mph (Exhibit 25-15)

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Same for Run D + D1

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Run C5 (No slip + WB C-D)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 750 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6871	0.92	Level	4	2	0.977	1.00	7648
Ramp	791	0.92	Level	2	2	0.986	1.00	872
UpStream								
DownStream	750	0.90	Level	0	0	1.000	1.00	833

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2236 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6119	9400	No
V_{12}	2236	4400:All	No
$V_{FO} = V_F - V_R$	5247	9400	No
V_R	872	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -8.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.506 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 67.6 mph (Exhibit 25-19)

S = 61.6 mph (Exhibit 25-15)

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Same for Run D + D1

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Run C5 (No slip + WB C-D)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 890 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2925	0.92	Level	4	2	0.977	1.00	3256
Ramp	505	0.92	Level	2	2	0.986	1.00	557
UpStream								
DownStream	890	0.90	Level	0	0	1.000	1.00	989

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1259 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3256	9400	No
V_{12}	1259	4400:All	No
$V_{FO} = V_F - V_R$	2699	9400	No
V_R	557	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -16.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.478 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 63.4 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2780	0.92	Level	4	2	0.977	1.00	3094
Ramp	500	0.92	Level	2	2	0.986	1.00	551
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 3094 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3094	4700	No
V_{12}	3094	4400:All	No
$V_{FO} = V_F - V_R$	2543	4700	No
V_R	551	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 17.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.478 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.0 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5120	0.92	Level	4	2	0.977	1.00	5699
Ramp	840	0.92	Level	2	2	0.986	1.00	926
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 5699 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5699	4700	Yes
V_{12}	5699	4400:All	Yes
$V_{FO} = V_F - V_R$	4773	4700	Yes
V_R	926	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 39.8 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.511 (Exhibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.2 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5480	0.92	Level	4	2	0.977	1.00	6099
Ramp	310	0.92	Level	2	2	0.986	1.00	342
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 6099 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	6099	4700	Yes
V_{12}	6099	4400:All	Yes
$V_{FO} = V_F - V_R$	5757	4700	Yes
V_R	342	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 55.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.459 (Exhibit 25-19)

S_R= 54.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.4 mph (Exhibit 25-15)

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Same for Run D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2170	0.92	Level	4	2	0.977	1.00	2415
Ramp	230	0.92	Level	2	2	0.986	1.00	253
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2415 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2415	4700	No
V_{12}	2415	4400:All	No
$V_{FO} = V_F - V_R$	2162	4700	No
V_R	253	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 23.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.451 (Exhibit 25-19)

S_R= 54.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.6 mph (Exhibit 25-15)

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Same for Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4830	0.92	Level	4	2	0.977	1.00	5376
Ramp	200	0.92	Level	2	2	0.986	1.00	220
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 5376 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5376	4700	Yes
V_{12}	5376	4400:All	Yes
$V_{FO} = V_F - V_R$	5156	4700	Yes
V_R	220	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 49.1 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.448 (Exhibit 25-19)

S_R= 54.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.7 mph (Exhibit 25-15)

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Same for Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 Dir Conn (Run C)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2150	0.92	Level	4	2	0.977	1.00	2393
Ramp	480	0.92	Level	2	2	0.986	1.00	529
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2393 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	2393	4700	No
V_{12}	2393	4400:All	No
$V_{FO} = V_F - V_R$	1864	4700	No
V_R	529	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 23.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.476 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On	10740 mi 6 lanes or	☐ Yes ☐ On
☒ No ☐ Off	8950 mi 5 lanes	☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	V_D = veh/h
	Sketch (show lanes, L_A, L_D, V_R, V_f)	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8950	0.92	Rolling	4	2	0.926	1.00	10507
Ramp	1125	0.92	Rolling	2	2	0.952	1.00	1284
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3136 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8406	9400	No
V_{12}	3136	4400:All	No
$V_{FO} = V_F - V_R$	7122	9400	No
V_R	1284	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -0.3 (pc/mi/ln) DR = 0.0109 * VF/N.

LOS = A (Exhibit 25-4) = 0.0109 * 8406/5

Speed Estimation

D_s = 0.544 (Exhibit 25-19) = 18.32 pc/mi/ln

S_R = 52.5 mph (Exhibit 25-19) LOS = B.

S_0 = 64.9 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	9720 mi 6 lanes (or)	☐ Yes ☐ On
☑ No ☐ Off	7725 mi 5 lanes	☑ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7725	0.92	Level	4	2	0.977	1.00	8598
Ramp	1135	0.92	Level	2	2	0.986	1.00	1251
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2714 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6879	9400	No
V_{12}	2714	4400:All	No
$V_{FO} = V_F - V_R$	5628	9400	No
V_R	1251	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -3.9 (pc/mi/ln) $D_R = 0.0109 * V_F / N$

LOS = A (Exhibit 25-4) $= 0.0109 \times 6879/5$

Speed Estimation

D_s = 0.541 (Exhibit 25-19) $= 14.99$ pc/mi/ln

S_R = 52.6 mph (Exhibit 25-19) $\Rightarrow$ LOS : B

S_0 = 67.1 mph (Exhibit 25-19)

S = 60.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On	9179 mi 6 lanes (on)	☐ Yes ☐ On
☑ No ☐ Off	7650 mi 5 lanes	☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7650	0.92	Rolling	4	2	0.926	1.00	8980
Ramp	1470	0.92	Rolling	2	2	0.952	1.00	1678
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3110 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7184	9400	No
V_{12}	3110	4400:All	No
$V_{FO} = V_F - V_R$	5506	9400	No
V_R	1678	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -0.5 (pc/mi/ln) $D_R = 0.0109 \times V_F/N$

LOS = A (Exhibit 25-4) $= 0.0109 \times 7184/5$

Speed Estimation

D_s = 0.579 (Exhibit 25-19) $= 15.66$ pc/mi/ln

S_R = 51.7 mph (Exhibit 25-19) LOS: B

S_0 = 67.3 mph (Exhibit 25-19)

S = 59.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

11,613 on 6 lanes

(67) 9678 on 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9678	0.92	Level	4	2	0.977	1.00	10772
Ramp	1790	0.92	Level	2	2	0.986	1.00	1973
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3701 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	8618	9400	No
V_{12}	3701	4400:All	No
$V_{FO} = V_F - V_R$	6645	9400	No
V_R	1973	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 4.6 (pc/mi/ln) DR: 0.0109 * Vf/N

LOS = A (Exhibit 25-4) : 0.0109 x 8618 / 5

Speed Estimation

D_s = 0.606 (Exhibit 25-19) : 18.78 pc/mi/ln

S_R= 51.1 mph (Exhibit 25-19)

S_0= 65.6 mph (Exhibit 25-19)

S = 58.5 mph (Exhibit 25-15)

LOS : B

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On	11395 mi 6 lanes (on)	☐ Yes ☐ On
☑ No ☐ Off	9495 mi 5 lanes	☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9495	0.92	Rolling	4	2	0.926	1.00	11146
Ramp	1597	0.92	Rolling	2	2	0.952	1.00	1823
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3667 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8917	9400	No
V_{12}	3667	4400:All	No
$V_{FO} = V_F - V_R$	7094	9400	No
V_R	1823	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 4.3 (pc/mi/ln) DR = 0.0109 x VF/N

LOS = A (Exhibit 25-4) = 0.0109 * 8917/5

Speed Estimation

D_s = 0.592 (Exhibit 25-19) = 19.43 pc/mi/ln

S_R= 51.4 mph (Exhibit 25-19)

S_0= 65.0 mph (Exhibit 25-19)

S = 58.6 mph (Exhibit 25-15)

LOS: B

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

9705 mi 6 lanes (or)

8088 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8088	0.92	Level	4	2	0.977	1.00	9002
Ramp	1597	0.92	Level	2	2	0.986	1.00	1760
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3175 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7202	9400	No
V_{12}	3175	4400:All	No
$V_{FO} = V_F - V_R$	5442	9400	No
V_R	1760	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 0.1 (pc/mi/ln) D = 0.0109 * V_F/N

LOS = A (Exhibit 25-4) = 0.0109 * 7202/5

Speed Estimation

D_s = 0.586 (Exhibit 25-19) = 15.70 pc/mi/ln

S_R = 51.5 mph (Exhibit 25-19)

S_0 = 67.4 mph (Exhibit 25-19)

S = 59.3 mph (Exhibit 25-15)

LOS: B.

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	Del Mar Hts Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 No Build RUN E

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
- [ ] Yes [ ] On
- [x] No [ ] Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

9108 in 7 lanes or
6505 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
- [ ] Yes [ ] On
- [x] No [ ] Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6505	0.92	Grade	4	2	0.977	1.00	7240
Ramp	1600	0.92	Grade	2	2	0.986	1.00	1763
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2811 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5792	9400	No
V_{12}	2811	4400:All	No
$V_{FO} = V_F - V_R$	4029	9400	No
V_R	1763	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -3.1 (pc/mi/ln) DR = 0.0109 * VF/N

LOS = A (Exhibit 25-4) = 0.0109 * 5792/5

Speed Estimation

D_s = 0.587 (Exhibit 25-19) = 12.82 pc/mi/ln

S_R= 51.5 mph (Exhibit 25-19) LOS: D

S_0= 69.4 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Grade	Downstream Adj Ramp
☐ Yes ☐ On	11,576 vehs 7 lanes (or)	☐ Yes ☐ On
☒ No ☐ Off	8269 vehs 5 lanes	☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	V_D = veh/h
	Sketch (show lanes, L_A, L_D, V_R, V_f)	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8269	0.92	Grade	4	2	0.977	1.00	9204
Ramp	1600	0.92	Grade	2	2	0.986	1.00	1763
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3219 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7364	9400	No
V_{12}	3219	4400:All	No
$V_{FO} = V_F - V_R$	5601	9400	No
V_R	1763	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 0.4 (pc/mi/ln) $D_R = 0.0109 \times V_F/N$

LOS = A (Exhibit 25-4) $= 0.0109 \times 7364/5$

Speed Estimation

D_s = 0.587 (Exhibit 25-19) $= 16.05$ pc/mi/ln

S_R= 51.5 mph (Exhibit 25-19) LOS: B

S_0= 67.1 mph (Exhibit 25-19)

S = 59.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 55.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	10720	0.92	Grade	4	2	0.977	1.00	11932
Ramp	3390	0.92	Grade	2	2	0.986	1.00	3736
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 5247 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	9546	9400	Yes
V_{12}	5247	4400:All	Yes
$V_{FO} = V_F - V_R$	5810	9400	No
V_R	3736	4400	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 35.9 (pc/mi/ln) $D_R = 0.0109 \times V_F / N$

LOS = F (Exhibit 25-4) $= 0.0109 \times 9546 / 5$

$= 20.8$ pc/mi/ln

LOS. B.

Speed Estimation

D_s = 0.504 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 66.8 mph (Exhibit 25-19)

S = 58.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Grade	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 55.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8160	0.92	Grade	4	2	0.977	1.00	9082
Ramp	2311	0.92	Grade	2	2	0.986	1.00	2547
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3774 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7266	9400	No
V_{12}	3774	4400:All	No
$V_{FO} = V_F - V_R$	4719	9400	No
V_R	2547	4400	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 23.2 (pc/mi/ln) $D_R = 0.0109 \times V_F / N$

LOS = C (Exhibit 25-4) $= 0.0109 \times 7266 / 5$

Speed Estimation

D_s = 0.397 (Exhibit 25-19) $= 15.83$ pc/mi/ln

S_R= 55.9 mph (Exhibit 25-19)

S_0= 68.4 mph (Exhibit 25-19) LOS: B

S = 61.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	11,838 on 6 lanes or	☐ Yes ☐ On
☑ No ☐ Off	9865 on 5 lanes.	☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9865	0.92	Level	4	2	0.977	1.00	10980
Ramp	1118	0.92	Level	2	2	0.986	1.00	1232
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.436 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 4525 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8784	9400	No
V_{12}	4525	4400:All	Yes
$V_{FO} = V_F - V_R$	7552	9400	No
V_R	1232	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 29.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.539 (Exhibit 25-19)

S_R= 52.6 mph (Exhibit 25-19)

S_0= 66.9 mph (Exhibit 25-19)

S = 58.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	9508 in 6 lanes or	☐ Yes ☐ On
☑ No ☐ Off	7923 in 5 lanes.	☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7923	0.92	Level	4	2	0.977	1.00	8819
Ramp	1348	0.92	Level	2	2	0.986	1.00	1486
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3915 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7056	9400	No
V_{12}	3915	4400:All	No
$V_{FO} = V_F - V_R$	5570	9400	No
V_R	1486	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 24.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.562 (Exhibit 25-19)

S_R = 52.1 mph (Exhibit 25-19)

S_0 = 69.1 mph (Exhibit 25-19)

S = 58.5 mph (Exhibit 25-15)

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Same for Aux. lane (Run F), Run F(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6400	0.92	Level	4	2	0.977	1.00	7123
Ramp	1150	0.92	Level	2	2	0.986	1.00	1267
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2419 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5699	9400	No
V_{12}	2419	4400:All	No
$V_{FO} = V_F - V_R$	4432	9400	No
V_R	1267	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 11.6 (pc/mi/ln) $D_R = 0.0109 \times V_F/N$

LOS = B (Exhibit 25-4) $= 0.0109 \times 5699/5$

$= 12.42$ pc/mi/ln

LOS: B

Speed Estimation

D_s = 0.542 (Exhibit 25-19)

S_R= 52.5 mph (Exhibit 25-19)

S_0= 68.8 mph (Exhibit 25-19)

S = 60.8 mph (Exhibit 25-15)

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Same for Aux. Lane (Run F), Run F(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☒ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☒ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8330	0.92	Level	4	2	0.977	1.00	9272
Ramp	1300	0.92	Level	2	2	0.986	1.00	1433
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (Ramp)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2989 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7418	9400	No
V_{12}	2989	4400:All	No
$V_{FO} = V_F - V_R$	5985	9400	No
V_R	1433	3800	No

Level of Service Determination (Ramp)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 16.5 (pc/mi/ln) $D_R = 0.0109 \times V_F / N$

LOS = B (Exhibit 25-4) $= 0.0109 \times 7418 / 5$

Speed Estimation

D_s = 0.557 (Exhibit 25-19) $= 16.17$ pc/mi/ln

S_R = 52.2 mph (Exhibit 25-19) LOS: B

S_0 = 66.6 mph (Exhibit 25-19)

S = 59.9 mph (Exhibit 25-15)

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Same for Run F, F(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_D = 150'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7388	0.92	Level	4	2	0.977	1.00	8223
Ramp	960	0.92	Level	2	2	0.986	1.00	1058
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 4182 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8223	9400	No
V_{12}	4182	4400:All	No
$V_{FO} = V_F - V_R$	7165	9400	No
V_R	1058	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 38.9 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.523 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= 67.3 mph (Exhibit 25-19)

S = 59.2 mph (Exhibit 25-15)

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Same for Run F, F(2).

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_D = 150	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4311	0.92	Level	4	2	0.977	1.00	4798
Ramp	760	0.92	Level	2	2	0.986	1.00	838
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2356 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	4319	9400	No
V_{12}	2356	4400:All	No
$V_{FO} = V_F - V_R$	3481	9400	No
V_R	838	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 23.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.503 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.3 mph (Exhibit 25-15)

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Same for Run F, F(3), G, G(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4800	0.92	Level	4	2	0.977	1.00	5343
Ramp	850	0.92	Level	2	2	0.986	1.00	937
UpStream								
DownStream								

Merge Areas | Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2858 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5343	9400	No
V_{12}	2858	4400:All	No
$V_{FO} = V_F - V_R$	4406	9400	No
V_R	937	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 27.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.512 (Exhibit 25-19)

S_R = 53.2 mph (Exhibit 25-19)

S_0 = 70.4 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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Same for Run F, F(3), G, G(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7080	0.92	Level	4	2	0.977	1.00	7880
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 4132 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7880	9400	No
V_{12}	4132	4400:All	No
$V_{FO} = V_F - V_R$	6646	9400	No
V_R	1234	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 38.4 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.539 (Exhibit 25-19)

S_R= 52.6 mph (Exhibit 25-19)

S_0= 67.9 mph (Exhibit 25-19)

S = 58.9 mph (Exhibit 25-15)

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Same for Run F, F(3), G, G(3).

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (RUN E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☒ Yes ☒ On

☐ No ☐ Off

L_{down} = 2000 ft

V_D = 940 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2520	0.92	Level	4	2	0.977	1.00	2805
Ramp	1273	0.92	Level	2	2	0.986	1.00	1403
UpStream								
DownStream	940	0.90	Level	0	0	1.000	1.00	1044

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2805 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2805	4700	No
V_{12}	2805	4400:All	No
$V_{FO} = V_F - V_R$	1402	4700	No
V_R	1403	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.554 (Exhibit 25-19)

S_R= 52.3 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (RUN E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 2000 ft

V_D = 2407 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3940	0.92	Level	4	2	0.977	1.00	4385
Ramp	1527	0.92	Level	2	2	0.986	1.00	1683
UpStream								
DownStream	2407	0.90	Level	0	0	1.000	1.00	2674

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 4385 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4385	4700	No
V_{12}	4385	4400:All	No
$V_{FO} = V_F - V_R$	2702	4700	No
V_R	1683	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 40.6 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.579 (Exhibit 25-19)

S_R= 51.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 51.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	C-D diverge from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 56 Build G(5)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 65.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2742	0.92	Level	4	2	0.977	1.00	3052
Ramp	2093	0.92	Level	2	2	0.986	1.00	2307
UpStream								
DownStream								

Merge Areas | Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2501 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3052	9400	No
V_{12}	2501	4400:All	No
$V_{FO} = V_F - V_R$	745	~~9400~~ 4700	No
V_R	2307	~~4400~~ 4700	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 12.3 (pc/mi/ln) DR: 0.0109 * VF/N

LOS = B (Exhibit 25-4) = 0.0109 * 3052/4

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.246 (Exhibit 25-19) = 8.31

S_R = 59.4 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 61.2 mph (Exhibit 25-15)

LOS: A

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	C-D diverge from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 56 Build G(5)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 65.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6621	0.92	Level	4	2	0.977	1.00	7369
Ramp	3819	0.92	Level	2	2	0.986	1.00	4209
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 5031 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7369	9400	No
V_{12}	5031	4400:All	Yes
$V_{FO} = V_F - V_R$	3160	~~9400~~ 4700	No
V_R	4209	~~4400~~ 4700	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 34.0 (pc/mi/ln) $D_R = 0.0109 \times V_F / N$

LOS = F (Exhibit 25-4) $= 0.0109 \times 7369 / 4$

Speed Estimation

D_s = 0.417 (Exhibit 25-19) $= 20.08$

S_R= 55.4 mph (Exhibit 25-19) LOS: C

S_0= 70.6 mph (Exhibit 25-19)

S = 59.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☒ Yes ☒ On
☒ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 1000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 961 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6722	0.92	Level	4	2	0.977	1.00	7482
Ramp	898	0.92	Level	2	2	0.986	1.00	990
UpStream								
DownStream	961	0.90	Level	0	0	1.000	1.00	1068

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.527 using Equation (Exhibit 25-11)

V_{12} = 4414 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7482	7050	Yes
V_{12}	4414	4400:All	Yes
$V_{FO} = V_F - V_R$	6492	~~7050~~ 4700	~~No~~ Yes
V_R	990	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 28.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.517 (Exhibit 25-19)

S_R = 53.1 mph (Exhibit 25-19)

S_0 = 63.2 mph (Exhibit 25-19)

S = 56.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☐ On
☑ No ☐ Off		☐ No ☑ Off
L_{up} = ft		L_{down} = 1000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 1107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2634	0.92	Level	4	2	0.977	1.00	2932
Ramp	459	0.92	Level	2	2	0.986	1.00	506
UpStream								
DownStream	1107	0.90	Level	0	0	1.000	1.00	1230

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = 1415.19 (Equation 25-8 or 25-9)

P_{FD} = 0.708 using Equation (Exhibit 25-11)

V_{12} = 2223 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2932	7050	No
V_{12}	2223	4400:All	No
$V_{FO} = V_F - V_R$	2426	~~7050~~ 4700	No
V_R	506	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 9.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.474 (Exhibit 25-19)

S_R = 54.1 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 57.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2895	0.92	Level	4	2	0.977	1.00	3222
Ramp	525	0.92	Level	2	2	0.986	1.00	579
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 1768 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3222	7050	No
V_{12}	1768	4400:All	No
$V_{FO} = V_F - V_R$	2643	7050 4700	No
V_R	579	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -12.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.480 (Exhibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= 69.5 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4567	0.92	Level	4	2	0.977	1.00	5083
Ramp	1015	0.92	Level	2	2	0.986	1.00	1119
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 2903 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5083	7050	No
V_{12}	2903	4400:All	No
$V_{FO} = V_F - V_R$	3964	~~7050~~ 4700	No
V_R	1119	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -2.3 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.529 (Exhibit 25-19)

S_R = 52.8 mph (Exhibit 25-19)

S_0 = 66.7 mph (Exhibit 25-19)

S = 58.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4978	0.92	Level	4	2	0.977	1.00	5541
Ramp	606	0.92	Level	2	2	0.986	1.00	668
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 2861 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5541	7050	No
V_{12}	2861	4400:All	No
$V_{FO} = V_F - V_R$	4873	~~7050~~ 4700	~~No~~ Yes
V_R	668	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -2.6 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.488 (Exhibit 25-19)

S_R= 53.8 mph (Exhibit 25-19)

S_0= 64.8 mph (Exhibit 25-19)

S = 58.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1771	0.92	Level	4	2	0.977	1.00	1971
Ramp	437	0.92	Level	2	2	0.986	1.00	482
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-11)

V_{12} = 1152 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	1971	7050	No
V_{12}	1152	4400:All	No
$V_{FO} = V_F - V_R$	1489	7050 4700	No
V_R	482	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -17.3 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.471 (Exhibit 25-19)

S_R= 54.2 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4448	0.92	Level	4	2	0.977	1.00	4951
Ramp	309	0.92	Level	2	2	0.986	1.00	341
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 4951 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4951	4700	Yes
V_{12}	4951	4400:All	Yes
$V_{FO} = V_F - V_R$	4610	4700	No
V_R	341	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 45.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.459 (Exhibit 25-19)

S_R= 54.5 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 54.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	Gr: 150'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1824	0.92	Level	4	2	0.977	1.00	2030
Ramp	646	0.92	Level	2	2	0.986	1.00	712
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of V_{12}	**Estimation of V_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 1.000 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 2030 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2030	4700	No
V_{12}	2030	4400:All	No
$V_{FO} = V_F - V_R$	1318	4700	No
V_R	712	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 20.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2889	0.92	Level	4	2	0.977	1.00	3216
Ramp	710	0.92	Level	2	2	0.986	1.00	783
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.644 using Equation (Exhibit 25-11)

V_{12} = 2349 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3216	7050	No
V_{12}	2349	4400:All	No
$V_{FO} = V_F - V_R$	2433	7050	No
V_R	783	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 11.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.498 (Exhibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 57.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 No Build (Run E)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5736	0.92	Level	4	2	0.977	1.00	6384
Ramp	1755	0.92	Level	2	2	0.986	1.00	1934
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.511 using Equation (Exhibit 25-11)

V_{12} = 4210 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6384	7050	No
V_{12}	4210	4400:All	No
$V_{FO} = V_F - V_R$	4450	7050	No
V_R	1934	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.602 (Exhibit 25-19)

S_R= 51.2 mph (Exhibit 25-19)

S_0= 66.7 mph (Exhibit 25-19)

S = 55.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Grade	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 55.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8933	0.92	Grade	4	2	0.977	1.00	9943
Ramp	3390	0.92	Grade	2	2	0.986	1.00	3736
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 4833 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7955	9400	No
V_{12}	4833	4400:All	Yes
$V_{FO} = V_F - V_R$	4219	9400	No
V_R	3736	4400	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 14.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.504 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 69.1 mph (Exhibit 25-19)

S = 58.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	SB Bypass from Mainline I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Aux Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 55.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6800	0.92	Grade	4	2	0.977	1.00	7569
Ramp	2311	0.92	Grade	2	2	0.986	1.00	2547
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3459 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6056	9400	No
V_{12}	3459	4400:All	No
$V_{FO} = V_F - V_R$	3509	9400	No
V_R	2547	4400	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 2.5 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.397 (Exhibit 25-19)

S_R= 55.9 mph (Exhibit 25-19)

S_0= 70.1 mph (Exhibit 25-19)

S = 61.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux. Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8455	0.92	Level	4	2	0.977	1.00	9411
Ramp	1118	0.92	Level	2	2	0.986	1.00	1232
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of V_{12}	**Estimation of V_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.436 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 3977 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7529	9400	No
V_{12}	3977	4400:All	No
$V_{FO} = V_F - V_R$	6297	9400	No
V_R	1232	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 25.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.539 (Exhibit 25-19)

S_R= 52.6 mph (Exhibit 25-19)

S_0= 68.3 mph (Exhibit 25-19)

S = 59.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Aux. Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6791	0.92	Level	4	2	0.977	1.00	7559
Ramp	1348	0.92	Level	2	2	0.986	1.00	1486
UpStream								
DownStream								

Merge Areas | Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3475 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6048	9400	No
V_{12}	3475	4400:All	No
$V_{FO} = V_F - V_R$	4562	9400	No
V_R	1486	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 20.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.562 (Exhibit 25-19)

S_R= 52.1 mph (Exhibit 25-19)

S_0= 70.2 mph (Exhibit 25-19)

S = 58.5 mph (Exhibit 25-15)

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Same for Run F(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (No EB Slip)	Analysis Year	Year 2030 Aux Lane (Run F) No slip.

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7340	0.92	Level	4	2	0.977	1.00	8170
Ramp	2090	0.92	Level	2	2	0.986	1.00	2304
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3404 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6536	9400	No
V_{12}	3404	4400:All	No
$V_{FO} = V_F - V_R$	4232	9400	No
V_R	2304	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 20.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.635 (Exhibit 25-19)

S_R= 50.4 mph (Exhibit 25-19)

S_0= 69.1 mph (Exhibit 25-19)

S = 57.9 mph (Exhibit 25-15)

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Same for Run F(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (No EB Slip)	Analysis Year	Year 2030 Aux Lane (Run F) PM (No slip)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9393	0.92	Level	4	2	0.977	1.00	10455
Ramp	2363	0.92	Level	2	2	0.986	1.00	2604
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 4102 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8364	9400	No
V_{12}	4102	4400:All	No
$V_{FO} = V_F - V_R$	5760	9400	No
V_R	2604	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 26.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.662 (Exhibit 25-19)

S_R= 49.8 mph (Exhibit 25-19)

S_0= 66.9 mph (Exhibit 25-19)

S = 57.2 mph (Exhibit 25-15)

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Same for F(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (With WB barrier)	Analysis Year	Year 2030 Aux Lane (Run F) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

$L_D = 150'$

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7011	0.92	Level	4	2	0.977	1.00	7804
Ramp	960	0.92	Level	2	2	0.986	1.00	1058
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 3999 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7804	9400	No
V_{12}	3999	4400:All	No
$V_{FO} = V_F - V_R$	6746	9400	No
V_R	1058	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 37.3 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.523 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= 67.8 mph (Exhibit 25-19)

S = 59.3 mph (Exhibit 25-15)

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Same for F(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (With WB barrier)	Analysis Year	Year 2030 Aux Lane (Run F) PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3912	0.92	Level	4	2	0.977	1.00	4354
Ramp	760	0.92	Level	2	2	0.986	1.00	838
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2181 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3919	9400	No
V_{12}	2181	4400:All	No
$V_{FO} = V_F - V_R$	3081	9400	No
V_R	838	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 21.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.503 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.1 mph (Exhibit 25-15)

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same for F(U)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans F(2)
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (No Slip)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3860	0.92	Level	4	2	0.977	1.00	4296
Ramp	850	0.92	Level	2	2	0.986	1.00	937
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2402 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4296	9400	No
V_{12}	2402	4400:All	No
$V_{FO} = V_F - V_R$	3359	9400	No
V_R	937	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 23.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.512 (Exhibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 59.9 mph (Exhibit 25-15)

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Same for F(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D9
Agency or Company	LLG	Junction	Carmel Mtn Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans F(2)
Analysis Time Period	PM	Analysis Year	Year 2030 Aux lane (No slip)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_p = 150'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6017	0.92	Level	4	2	0.977	1.00	6697
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.436 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 3616 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6697	9400	No
V_{12}	3616	4400:All	No
$V_{FO} = V_F - V_R$	5463	9400	No
V_R	1234	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 34.0 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.539 (Exhibit 25-19)

S_R = 52.6 mph (Exhibit 25-19)

S_0 = 69.2 mph (Exhibit 25-19)

S = 59.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6722	0.92	Level	4	2	0.977	1.00	7482
Ramp	898	0.92	Level	2	2	0.986	1.00	990
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2678 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7482	9400	No
V_{12}	2678	4400:All	No
$V_{FO} = V_F - V_R$	6492	9400	No
V_R	990	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -4.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.517 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= 65.8 mph (Exhibit 25-19)

S = 60.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Aux Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2634	0.92	Level	4	2	0.977	1.00	2932
Ramp	459	0.92	Level	2	2	0.986	1.00	506
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1137 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2932	9400	No
V_{12}	1137	4400:All	No
$V_{FO} = V_F - V_R$	2426	9400	No
V_R	506	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -17.5 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.474 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 63.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	2030 Aux Lane (Run F) -No slip F(2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6910	0.92	Level	4	2	0.977	1.00	7691
Ramp	1086	0.92	Level	2	2	0.986	1.00	1197
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2885 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7691	9400	No
V_{12}	2885	4400:All	No
$V_{FO} = V_F - V_R$	6494	9400	No
V_R	1197	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -2.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.536 (Exhibit 25-19)

S_R= 52.7 mph (Exhibit 25-19)

S_0= 65.8 mph (Exhibit 25-19)

S = 60.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	2030 Aux Lane Run F - No slip F(2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2847	0.92	Level	4	2	0.977	1.00	3169
Ramp	672	0.92	Level	2	2	0.986	1.00	741
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1372 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3169	9400	No
V_{12}	1372	4400:All	No
$V_{FO} = V_F - V_R$	2428	9400	No
V_R	741	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -15.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.495 (Exhibit 25-19)

S_R= 53.6 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 62.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	2030 Aux Lane Run F - barrier F(3)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6816	0.92	Level	4	2	0.977	1.00	7587
Ramp	898	0.92	Level	2	2	0.986	1.00	990
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2705 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7587	9400	No
V_{12}	2705	4400:All	No
$V_{FO} = V_F - V_R$	6597	9400	No
V_R	990	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -4.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.517 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= 65.7 mph (Exhibit 25-19)

S = 60.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans F(3)
Analysis Time Period	PM	Analysis Year	2030 Aux Lane Run F - barrier

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2734	0.92	Level	4	2	0.977	1.00	3043
Ramp	459	0.92	Level	2	2	0.986	1.00	506
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1166 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3043	9400	No
V_{12}	1166	4400:All	No
$V_{FO} = V_F - V_R$	2537	9400	No
V_R	506	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -17.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.474 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 63.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 Aux Lane	Analysis Year	Run F- No slip + barrier F(4)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7004	0.92	Level	4	2	0.977	1.00	7796
Ramp	1086	0.92	Level	2	2	0.986	1.00	1197
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2913 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7796	9400	No
V_{12}	2913	4400:All	No
$V_{FO} = V_F - V_R$	6599	9400	No
V_R	1197	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -2.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.536 (Exhibit 25-19)

S_R= 52.7 mph (Exhibit 25-19)

S_0= 65.7 mph (Exhibit 25-19)

S = 60.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 Aux Lane PM	Analysis Year	Run F - No slip + barrier F(4)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2947	0.92	Level	4	2	0.977	1.00	3280
Ramp	672	0.92	Level	2	2	0.986	1.00	741
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1401 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3280	9400	No
V_{12}	1401	4400:All	No
$V_{FO} = V_F - V_R$	2539	9400	No
V_R	741	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -15.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.495 (Exhibit 25-19)

S_R= 53.6 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 62.5 mph (Exhibit 25-15)

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Same for Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (Run F) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2895	0.92	Level	4	2	0.977	1.00	3222
Ramp	525	0.92	Level	2	2	0.986	1.00	579
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.653 using Equation (Exhibit 25-11)

V_{12} = 2304 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3222	7050	No
V_{12}	2304	4400:All	No
$V_{FO} = V_F - V_R$	2643	7050	No
V_R	579	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 10.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.480 (Exhibit 25-19)

S_R = 54.0 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 58.0 mph (Exhibit 25-15)

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Same for Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Aux Lane (Run F) PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4567	0.92	Level	4	2	0.977	1.00	5083
Ramp	1015	0.92	Level	2	2	0.986	1.00	1119
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.581 using Equation (Exhibit 25-11)

V_{12} = 3424 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5083	7050	No
V_{12}	3424	4400:All	No
$V_{FO} = V_F - V_R$	3964	7050	No
V_R	1119	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 20.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.529 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 68.7 mph (Exhibit 25-19)

S = 57.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (Run F) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4978	0.92	Level	4	2	0.977	1.00	5541
Ramp	606	0.92	Level	2	2	0.986	1.00	668
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.591 using Equation (Exhibit 25-11)

V_{12} = 3547 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5541	7050	No
V_{12}	3547	4400:All	No
$V_{FO} = V_F - V_R$	4873	7050	No
V_R	668	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 21.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.488 (Exhibit 25-19)

S_R= 53.8 mph (Exhibit 25-19)

S_0= 67.4 mph (Exhibit 25-19)

S = 58.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1771	0.92	Level	4	2	0.977	1.00	1971
Ramp	437	0.92	Level	2	2	0.986	1.00	482
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.689 using Equation (Exhibit 25-11)

V_{12} = 1507 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	1971	7050	No
V_{12}	1507	4400:All	No
$V_{FO} = V_F - V_R$	1489	7050	No
V_R	482	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 3.7 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.471 (Exhibit 25-19)

S_R= 54.2 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 57.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (Run F) AM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4448	0.92	Level	4	2	0.977	1.00	4951
Ramp	309	0.92	Level	2	2	0.986	1.00	341
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.621 using Equation (Exhibit 25-11)

V_{12} = 3202 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4951	7050	No
V_{12}	3202	4400:All	No
$V_{FO} = V_F - V_R$	4610	7050	No
V_R	341	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 30.4 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

D_s = 0.459 (Exhibit 25-19)

S_R= 54.5 mph (Exhibit 25-19)

S_0= 68.4 mph (Exhibit 25-19)

S = 58.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Aux Lane (Run F) PM

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1824	0.92	Level	4	2	0.977	1.00	2030
Ramp	646	0.92	Level	2	2	0.986	1.00	712
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.676 using Equation (Exhibit 25-11)

V_{12} = 1604 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2030	7050	No
V_{12}	1604	4400:All	No
$V_{FO} = V_F - V_R$	1318	7050	No
V_R	712	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 16.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.492 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 56.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Aux Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2889	0.92	Level	4	2	0.977	1.00	3216
Ramp	710	0.92	Level	2	2	0.986	1.00	783
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.644 using Equation (Exhibit 25-11)

V_{12} = 2349 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3216	7050	No
V_{12}	2349	4400:All	No
$V_{FO} = V_F - V_R$	2433	7050	No
V_R	783	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 11.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.498 (Exhibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 57.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Aux Lane (Run F)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5736	0.92	Level	4	2	0.977	1.00	6384
Ramp	1755	0.92	Level	2	2	0.986	1.00	1934
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.511 using Equation (Exhibit 25-11)

V_{12} = 4210 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6384	7050	No
V_{12}	4210	4400:All	No
$V_{FO} = V_F - V_R$	4450	7050	No
V_R	1934	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.602 (Exhibit 25-19)

S_R= 51.2 mph (Exhibit 25-19)

S_0= 66.7 mph (Exhibit 25-19)

S = 55.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Aux Lane (Run F(2) - No slip

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3202	0.92	Level	4	2	0.977	1.00	3564
Ramp	1023	0.92	Level	2	2	0.986	1.00	1128
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.619 using Equation (Exhibit 25-11)

V_{12} = 2636 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3564	7050	No
V_{12}	2636	4400:All	No
$V_{FO} = V_F - V_R$	2436	7050	No
V_R	1128	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 13.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.530 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 56.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Aux Lane (Run F(2) - No slip

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6090	0.92	Level	4	2	0.977	1.00	6778
Ramp	2109	0.92	Level	2	2	0.986	1.00	2324
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.484 using Equation (Exhibit 25-11)

V_{12} = 4478 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6778	7050	No
V_{12}	4478	4400:All	Yes
$V_{FO} = V_F - V_R$	4454	7050	No
V_R	2324	2000	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 29.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.637 (Exhibit 25-19)

S_R= 50.3 mph (Exhibit 25-19)

S_0= 66.2 mph (Exhibit 25-19)

S = 54.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Run F(3) - With barrier

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2912	0.92	Level	4	2	0.977	1.00	3241
Ramp	733	0.92	Level	2	2	0.986	1.00	808
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.642 using Equation (Exhibit 25-11)

V_{12} = 2370 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3241	7050	No
V_{12}	2370	4400:All	No
$V_{FO} = V_F - V_R$	2433	7050	No
V_R	808	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 11.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.501 (Exhibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 57.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Run F(3) - With barrier

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5761	0.92	Level	4	2	0.977	1.00	6412
Ramp	1780	0.92	Level	2	2	0.986	1.00	1962
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.509 using Equation (Exhibit 25-11)

V_{12} = 4229 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6412	7050	No
V_{12}	4229	4400:All	No
$V_{FO} = V_F - V_R$	4450	7050	No
V_R	1962	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 27.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.605 (Exhibit 25-19)

S_R= 51.1 mph (Exhibit 25-19)

S_0= 66.7 mph (Exhibit 25-19)

S = 55.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Run F(4) - NS With barrier

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3225	0.92	Level	4	2	0.977	1.00	3590
Ramp	1046	0.92	Level	2	2	0.986	1.00	1153
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.617 using Equation (Exhibit 25-11)

V_{12} = 2657 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3590	7050	No
V_{12}	2657	4400:All	No
$V_{FO} = V_F - V_R$	2437	7050	No
V_R	1153	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 13.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.532 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 56.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D8
Agency or Company	LLG	Junction	CCtry Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	(Run F(2) - NS with barrier

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6115	0.92	Level	4	2	0.977	1.00	6806
Ramp	2134	0.92	Level	2	2	0.986	1.00	2352
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.482 using Equation (Exhibit 25-11)

V_{12} = 4497 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6806	7050	No
V_{12}	4497	4400:All	Yes
$V_{FO} = V_F - V_R$	4454	7050	No
V_R	2352	2000	Yes

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 29.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

D_s = 0.640 (Exhibit 25-19)

S_R= 50.3 mph (Exhibit 25-19)

S_0= 66.2 mph (Exhibit 25-19)

S = 54.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN: G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On	1095 mi 6 lanes	☐ Yes ☐ On
☑ No ☐ Off	(or) 9125 mi 5 lanes.	☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9125	0.92	Rolling	4	2	0.926	1.00	10712
Ramp	1100	0.92	Rolling	2	2	0.952	1.00	1255
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R) P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3157 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8570	9400	No
V_{12}	3157	4400:All	No
$V_{FO} = V_F - V_R$	7315	9400	No
V_R	1255	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -0.1 (pc/mi/ln) D = 0.0109 * VF/N

LOS = A (Exhibit 25-4) = 0.0109 * 8570/5

Speed Estimation

D_s = 0.541 (Exhibit 25-19) = 18.68 pc/mi/ln

S_R = 52.6 mph (Exhibit 25-19) LOS = B.

S_0 = 64.7 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D1
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN 6)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

9570 mi 6 lanes

(or) 7975 mi 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7975	0.92	Level	4	2	0.977	1.00	8877
Ramp	1100	0.92	Level	2	2	0.986	1.00	1212
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2743 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7102	9400	No
V_{12}	2743	4400:All	No
$V_{FO} = V_F - V_R$	5890	9400	No
V_R	1212	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -3.7 (pc/mi/ln) D = 0.0109 * VF/N

LOS = A (Exhibit 25-4) = 0.0109 * 7102/5

Speed Estimation

D_s = 0.537 (Exhibit 25-19) = 15.48 pc/mi/ln

S_R = 52.6 mph (Exhibit 25-19) LOS = B.

S_0 = 66.7 mph (Exhibit 25-19)

S = 60.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On	9580 on 6 lanes	☐ Yes ☐ On
☒ No ☐ Off	(or) 7982 on 5 lanes	☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7982	0.92	Rolling	4	2	0.926	1.00	9370
Ramp	1470	0.92	Rolling	2	2	0.952	1.00	1678
UpStream								
DownStream								

Merge Areas | Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3191 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	7496	9400	No
V_{12}	3191	4400:All	No
$V_{FO} = V_F - V_R$	5818	9400	No
V_R	1678	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 0.2 (pc/mi/ln) D = 0.0109 * VF / N

LOS = A (Exhibit 25-4) = 0.0109 * 7496 / 5

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.579 (Exhibit 25-19) = 16.34 pc/mi/ln

S_R = 51.7 mph (Exhibit 25-19)

S_0 = 66.8 mph (Exhibit 25-19) LOS = B

S = 59.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D2
Agency or Company	LLG	Junction	VDV Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	11,880 ui 6 lanes (or)	☐ Yes ☐ On
☑ No ☐ Off	9900 ui 5 lanes.	☑ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_I)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9900	0.92	Level	4	2	0.977	1.00	11019
Ramp	1790	0.92	Level	2	2	0.986	1.00	1973
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3752 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8816	9400	No
V_{12}	3752	4400:All	No
$V_{FO} = V_F - V_R$	6843	9400	No
V_R	1973	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 5.0 (pc/mi/ln) D: 0.0109 * V_F / N

LOS = A (Exhibit 25-4) : 0.0109 * 8816 / 5

Speed Estimation

D_s = 0.606 (Exhibit 25-19) : 19.2 pc/mi/ln

S_R= 51.1 mph (Exhibit 25-19) : LOS B

S_0= 65.3 mph (Exhibit 25-19)

S = 58.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

11,630 in 8 lanes

(or) 7269 in 5 lanes.

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7269	0.92	Rolling	4	2	0.926	1.00	8533
Ramp	1370	0.92	Rolling	2	2	0.952	1.00	1564
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2932 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6827	9400	No
V_{12}	2932	4400:All	No
$V_{FO} = V_F - V_R$	5263	9400	No
V_R	1564	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -2.0 (pc/mi/ln) D = 0.0109 * V_F / 1N

LOS = A (Exhibit 25-4) = 0.0109 * 6827 / 5

D_R = 14.88 pc/mi/ln

LOS = B.

Speed Estimation

D_s = 0.569 (Exhibit 25-19)

S_R= 51.9 mph (Exhibit 25-19)

S_0= 67.6 mph (Exhibit 25-19)

S = 59.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D3
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

10,040 in 8 lanes

6275 in 5 lanes

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6275	0.92	Level	4	2	0.977	1.00	6984
Ramp	1280	0.92	Level	2	2	0.986	1.00	1411
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2588 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5937	9400	No
V_{12}	2588	4400:All	No
$V_{FO} = V_F - V_R$	4526	9400	No
V_R	1411	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = ~~-5.0 (pc/mi/ln)~~ $D_R = 0.0109\, V_F / N$

LOS = ~~A (Exhibit 25-4)~~ $= 0.0109 * 5937 / 5$

$= 12.94$ pc/mi/ln

LOS = B

Speed Estimation

D_s = 0.555 (Exhibit 25-19)

S_R = 52.2 mph (Exhibit 25-19)

S_0 = 68.7 mph (Exhibit 25-19)

S = 60.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	Del Mar Hts Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Grade	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4270	0.92	Grade	4	2	0.977	1.00	4753
Ramp	1600	0.92	Grade	2	2	0.986	1.00	1763
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2540 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4753	9400	No
V_{12}	2540	4400:All	No
$V_{FO} = V_F - V_R$	2990	~~9400~~ 7050	No
V_R	1763	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 12.6 (pc/mi/ln) $D_R = 0.0109 * V_F / N$

LOS = B (Exhibit 25-4) $= 0.0109 * 4753 / 4$

$= 12.95$ pc/mi/ln

LOS = B.

Speed Estimation

D_s = 0.587 (Exhibit 25-19)

S_R = 51.5 mph (Exhibit 25-19)

S_0 = 70.9 mph (Exhibit 25-19)

S = 59.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D4
Agency or Company	LLG	Junction	DMH Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4650	0.92	Grade	4	2	0.977	1.00	5176
Ramp	1600	0.92	Grade	2	2	0.986	1.00	1763
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2650 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5176	9400	No
V_{12}	2650	4400:All	No
$V_{FO} = V_F - V_R$	3413	~~9400~~ 7050	No
V_R	1763	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 13.5 (pc/mi/ln) DR = 0.0109 * VF / N

LOS = B (Exhibit 25-4) = 0.0109 * 5176 / 5

Speed Estimation

D_s = 0.587 (Exhibit 25-19) DR = 11.28 pc/mi/ln

S_R = 51.5 mph (Exhibit 25-19) LOS = B.

S_0 = 70.3 mph (Exhibit 25-19)

S = 59.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	EB SR 56 from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Grade	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 65.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7980	0.92	Grade	4	2	0.977	1.00	8882
Ramp	1050	0.92	Grade	2	2	0.986	1.00	1157
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2704 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7106	9400	No
V_{12}	2704	4400:All	No
$V_{FO} = V_F - V_R$	5949	9400	No
V_R	1157	4400	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 14.0 (pc/mi/ln) $D_R = 0.0109 * V_{FI} / N$

LOS = B (Exhibit 25-4) $= 0.0109 * 7106 / 5$

Speed Estimation

D_s = 0.142 (Exhibit 25-19) $= 15.49$ pc/mi/ln

S_R = 61.7 mph (Exhibit 25-19) LOS = B

S_0 = 66.6 mph (Exhibit 25-19)

S = 64.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	EB SR 56 from Mainline I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7320	0.92	Grade	4	2	0.977	1.00	8147
Ramp	1471	0.92	Grade	2	2	0.986	1.00	1621
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2894 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6518	9400	No
V_{12}	2894	4400:All	No
$V_{FO} = V_F - V_R$	4897	9400	No
V_R	1621	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 15.6 (pc/mi/ln) $D_R = 0.0109 * VF/N$

LOS = B (Exhibit 25-4) $= 0.0109 * 6518/5$

Speed Estimation

D_s = 0.574 (Exhibit 25-19) $= 14.2$ pc/mi/ln

S_R= 51.8 mph (Exhibit 25-19) LOS = B

S_0= 68.1 mph (Exhibit 25-19)

S = 59.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	Bypass exit from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Grade

S_{FF} = 65.0 mph S_{FR} = 65.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7330	0.92	Grade	4	2	0.977	1.00	8159
Ramp	2280	0.92	Grade	2	2	0.986	1.00	2513
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3557 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6528	9400	No
V_{12}	3557	4400:All	No
$V_{FO} = V_F - V_R$	4015	9400	No
V_R	2513	4400	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 21.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.264 (Exhibit 25-19)

S_R= 58.9 mph (Exhibit 25-19)

S_0= 69.4 mph (Exhibit 25-19)

S = 63.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D5
Agency or Company	LLG	Junction	Bypass exit from Mainline 5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Grade	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 65.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6260	0.92	Grade	4	2	0.977	1.00	6968
Ramp	1530	0.92	Grade	2	2	0.986	1.00	1686
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2788 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5923	9400	No
V_{12}	2788	4400:All	No
$V_{FO} = V_F - V_R$	4237	9400	No
V_R	1686	4400	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 14.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.190 (Exhibit 25-19)

S_R= 60.6 mph (Exhibit 25-19)

S_0= 69.1 mph (Exhibit 25-19)

S = 64.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4320	0.92	Level	4	2	0.977	1.00	4808
Ramp	530	0.92	Level	2	2	0.986	1.00	584
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.613 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 3173 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4808	7050	No
V_{12}	3173	4400:All	No
$V_{FO} = V_F - V_R$	4224	~~7050~~ 4400	No
V_R	584	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$
D_R = (pc/mi/ln)	D_R = 18.0 (pc/mi/ln)
LOS = (Exhibit 25-4)	LOS = B (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)	D_s = 0.481 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 53.9 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= 68.8 mph (Exhibit 25-19)
S = mph (Exhibit 25-14)	S = 58.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D6
Agency or Company	LLG	Junction	CVR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN 6)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2840	0.92	Level	4	2	0.977	1.00	3161
Ramp	529	0.92	Level	2	2	0.986	1.00	583
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.654 using Equation (Exhibit 25-11)

V_{12} = 2269 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3161	7050	No
V_{12}	2269	4400:All	No
$V_{FO} = V_F - V_R$	2578	~~7050~~ 4700	No
V_R	583	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 10.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.480 (Exhibit 25-19)

S_R= 53.9 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 57.9 mph (Exhibit 25-15)

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Same for b7(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6400	0.92	Level	4	2	0.977	1.00	7123
Ramp	1150	0.92	Level	2	2	0.986	1.00	1267
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2419 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	5699	9400	No
V_{12}	2419	4400:All	No
$V_{FO} = V_F - V_R$	4432	9400	No
V_R	1267	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 11.6 (pc/mi/ln) $D_R = 0.0109 * V_F/N$

LOS = B (Exhibit 25-4) $= 0.0109 * 5699/5$

Speed Estimation

D_s = 0.542 (Exhibit 25-19) = 12.42 pc/mi/ln

S_R = 52.5 mph (Exhibit 25-19) LOS = B.

S_0 = 68.8 mph (Exhibit 25-19)

S = 60.8 mph (Exhibit 25-15)

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Same for G(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8330	0.92	Level	4	2	0.977	1.00	9272
Ramp	1300	0.92	Level	2	2	0.986	1.00	1433
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2989 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7418	9400	No
V_{12}	2989	4400:All	No
$V_{FO} = V_F - V_R$	5985	9400	No
V_R	1433	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 16.5 (pc/mi/ln) $D_R = 0.0109 * V_F/N$

LOS = B (Exhibit 25-4) $= 0.0109 * 7418/5$

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.557 (Exhibit 25-19) = 16.17 pc/mi/ln

S_R = 52.2 mph (Exhibit 25-19) LOS = B

S_0 = 66.6 mph (Exhibit 25-19)

S = 59.9 mph (Exhibit 25-15)

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Same for G(4), G(5) and Run H

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7 (No EB Slip Ramp)
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build G(2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7340	0.92	Level	4	2	0.977	1.00	8170
Ramp	2090	0.92	Level	2	2	0.986	1.00	2304
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3404 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6536	9400	No
V_{12}	3404	4400:All	No
$V_{FO} = V_F - V_R$	4232	9400	No
V_R	2304	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 20.0 (pc/mi/ln) D_R = 0.0109 * V_F / N

LOS = C (Exhibit 25-4) = 0.0109 * 6536/5

Speed Estimation

D_s = 0.635 (Exhibit 25-19) = 14.24 pc/mi/ln

S_R= 50.4 mph (Exhibit 25-19) LOS = B

S_0= 69.1 mph (Exhibit 25-19)

S = 57.9 mph (Exhibit 25-15)

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Same for G(4), G(5) and Run H.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5D7 (No EB Slip ramp)
Agency or Company	LLG	Junction	CVR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build G(2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9393	0.92	Level	4	2	0.977	1.00	10455
Ramp	2363	0.92	Level	2	2	0.986	1.00	2604
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 4102 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8364	9400	No
V_{12}	4102	4400:All	No
$V_{FO} = V_F - V_R$	5760	9400	No
V_R	2604	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 26.0 (pc/mi/ln) DR = 0.0109 * VF/N

LOS = C (Exhibit 25-4) = 0.0109 * 8364/5

Speed Estimation

D_s = 0.662 (Exhibit 25-19) = 18.23 pc/mi/ln

S_R = 49.8 mph (Exhibit 25-19) LOS = B.

S_0 = 66.9 mph (Exhibit 25-19)

S = 57.2 mph (Exhibit 25-15)

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Same for G(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7788	0.92	Level	4	2	0.977	1.00	8668
Ramp	960	0.92	Level	2	2	0.986	1.00	1058
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 4376 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8668	9400	No
V_{12}	4376	4400:All	No
$V_{FO} = V_F - V_R$	7610	9400	No
V_R	1058	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 40.5 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.523 (Exhibit 25-19)

S_R = 53.0 mph (Exhibit 25-19)

S_0 = 66.8 mph (Exhibit 25-19)

S = 59.0 mph (Exhibit 25-15)

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Same for G(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4311	0.92	Level	4	2	0.977	1.00	4798
Ramp	760	0.92	Level	2	2	0.986	1.00	838
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2356 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4319	9400	No
V_{12}	2356	4400:All	No
$V_{FO} = V_F - V_R$	3481	9400	No
V_R	838	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 23.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.503 (Exhibit 25-19)

S_R = 53.4 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 60.3 mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8 (With WB barrier)
Agency or Company	LLG	Junction	CMR Off ramp from Bypass I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build G(3)

Project Description I-5 / SR 56 PSR

Input

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_D = 150'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7411	0.92	Level	4	2	0.977	1.00	8249
Ramp	960	0.92	Level	2	2	0.986	1.00	1058
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 4193 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	8249	9400	No
V_{12}	4193	4400:All	No
$V_{FO} = V_F - V_R$	7191	9400	No
V_R	1058	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 39.0 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

D_s = 0.523 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= 67.3 mph (Exhibit 25-19)

S = 59.2 mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5D8 (With WB Barrier)
Agency or Company	LLG	Junction	CMR Off Ramp with I-5
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build G(3)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3912	0.92	Level	4	2	0.977	1.00	4354
Ramp	760	0.92	Level	2	2	0.986	1.00	838
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-11)

V_{12} = 2181 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3919	9400	No
V_{12}	2181	4400:All	No
$V_{FO} = V_F - V_R$	3081	9400	No
V_R	838	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 21.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.503 (Exhibit 25-19)

S_R= 53.4 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build RUN 6

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☒ Yes ☒ On
☒ No ☒ Off		☐ No ☒ Off
L_{up} = ft		L_{down} = 2000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 940 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2520	0.92	Level	4	2	0.977	1.00	2805
Ramp	1273	0.92	Level	2	2	0.986	1.00	1403
UpStream								
DownStream	940	0.90	Level	0	0	1.000	1.00	1044

Estimation of V_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of V_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 2805 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2805	4700	No
V_{12}	2805	4400:All	No
$V_{FO} = V_F - V_R$	1402	4700	No
V_R	1403	2000	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 14.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.554 (Exhibit 25-19)

S_R= 52.3 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D1
Agency or Company	LLG	Junction	CCR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build Run G

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☐ On
☑ No ☐ Off		☐ No ☑ Off
L_{up} = ft		L_{down} = 2000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 2407 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3940	0.92	Level	4	2	0.977	1.00	4385
Ramp	1527	0.92	Level	2	2	0.986	1.00	1683
UpStream								
DownStream	2407	0.90	Level	0	0	1.000	1.00	2674

Merge Areas

Estimation of V_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-11)

V_{12} = 4385 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	4385	4700	No
V_{12}	4385	4400:All	No
$V_{FO} = V_F - V_R$	2702	4700	No
V_R	1683	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 28.5 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

D_s = 0.579 (Exhibit 25-19)

S_R = 51.7 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 51.7 mph (Exhibit 25-15)

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Same for G2(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D2
Agency or Company	LLG	Junction	I-5 NB connector from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build Run G

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☒ Yes ☒ On

☒ No ☒ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☒ Yes ☒ On

☒ No ☒ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5728	0.92	Level	4	2	0.977	1.00	6376
Ramp	1730	0.92	Level	2	2	0.986	1.00	1907
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of V_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 3069 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	6376	9400	No
V_{12}	3069	4400:All	No
$V_{FO} = V_F - V_R$	4469	~~9400~~ 4200	No
V_R	1907	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 26.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.600 (Exhibit 25-19)

S_R= 51.2 mph (Exhibit 25-19)

S_0= 68.8 mph (Exhibit 25-19)

S = 59.0 mph (Exhibit 25-15)

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Same for G(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D2
Agency or Company	LLG	Junction	I-5 NB connector from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G7)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3150	0.92	Level	4	2	0.977	1.00	3506
Ramp	1150	0.92	Level	2	2	0.986	1.00	1267
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1849 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3506	9400	No
V_{12}	1849	4400:All	No
$V_{FO} = V_F - V_R$	2239	~~9400~~ 4700	No
V_R	1267	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 15.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.542 (Exhibit 25-19)

S_R= 52.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D2 (With WB barrier
Agency or Company	LLG	Junction	I-5 NB connector from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build G(3)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4959	0.92	Level	4	2	0.977	1.00	5520
Ramp	1338	0.92	Level	2	2	0.986	1.00	1475
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of V_{12}	**Estimation of V_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.260 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 2527 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5520	9400	No
V_{12}	2527	4400:All	No
$V_{FO} = V_F - V_R$	4045	~~9400~~ 4700	No
V_R	1475	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -5.5 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.561 (Exhibit 25-19)

S_R= 52.1 mph (Exhibit 25-19)

S_0= 69.4 mph (Exhibit 25-19)

S = 60.2 mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D2
Agency or Company	LLG	Junction	I-5 NB connector from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build G(3)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2264	0.92	Level	4	2	0.977	1.00	2520
Ramp	663	0.92	Level	2	2	0.986	1.00	731
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1196 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2520	9400	No
V_{12}	1196	4400:All	No
$V_{FO} = V_F - V_R$	1789	~~9400~~ 4700	No
V_R	731	3800	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -17.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.494 (Exhibit 25-19)

S_R = 53.6 mph (Exhibit 25-19)

S_0 = 71.3 mph (Exhibit 25-19)

S = 61.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (Rev 6)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 961 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6648	0.92	Level	4	2	0.977	1.00	7400
Ramp	871	0.92	Level	2	2	0.986	1.00	960
UpStream								
DownStream	961	0.90	Level	0	0	1.000	1.00	1068

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2634 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7400	9400	No
V_{12}	2634	4400:All	No
$V_{FO} = V_F - V_R$	6440	9400	No
V_R	960	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -4.6 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.514 (Exhibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= 65.9 mph (Exhibit 25-19)

S = 60.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (Rw G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 1107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2684	0.92	Level	4	2	0.977	1.00	2987
Ramp	441	0.92	Level	2	2	0.986	1.00	486
UpStream								
DownStream	1107	0.90	Level	0	0	1.000	1.00	1230

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1136 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2987	9400	No
V_{12}	1136	4400:All	No
$V_{FO} = V_F - V_R$	2501	9400	No
V_R	486	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -17.5 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.472 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 63.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 Run G (No slip ramp)

G (2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 961 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6836	0.92	Level	4	2	0.977	1.00	7609
Ramp	1059	0.92	Level	2	2	0.986	1.00	1167
UpStream								
DownStream	961	0.90	Level	0	0	1.000	1.00	1068

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2842 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7609	9400	No
V_{12}	2842	4400:All	No
$V_{FO} = V_F - V_R$	6442	9400	No
V_R	1167	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -2.8 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.533 (Exhibit 25-19)

S_R= 52.7 mph (Exhibit 25-19)

S_0= 65.9 mph (Exhibit 25-19)

S = 60.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Run G (No slip ramp) G(2)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 1107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2897	0.92	Level	4	2	0.977	1.00	3224
Ramp	654	0.92	Level	2	2	0.986	1.00	721
UpStream								
DownStream	1107	0.90	Level	0	0	1.000	1.00	1230

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1372 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3224	9400	No
V_{12}	1372	4400:All	No
$V_{FO} = V_F - V_R$	2503	9400	No
V_R	721	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -15.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.493 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 62.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans G(3)
Analysis Time Period	AM	Analysis Year	Year 2030 Run G (Barrier)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 961 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6840	0.92	Level	4	2	0.977	1.00	7613
Ramp	871	0.92	Level	2	2	0.986	1.00	960
UpStream								
DownStream	961	0.90	Level	0	0	1.000	1.00	1068

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2690 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7613	9400	No
V_{12}	2690	4400:All	No
$V_{FO} = V_F - V_R$	6653	9400	No
V_R	960	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -4.1 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.514 (Exhibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= 65.6 mph (Exhibit 25-19)

S = 60.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 Run G (barrier)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 1107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2905	0.92	Level	4	2	0.977	1.00	3233
Ramp	441	0.92	Level	2	2	0.986	1.00	486
UpStream								
DownStream	1107	0.90	Level	0	0	1.000	1.00	1230

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1200 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$	3233	9400	No
V_{12}	1200	4400:All	No
$V_{FO} = V_F - V_R$	2747	9400	No
V_R	486	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -16.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.472 (Exhibit 25-19)

S_R= 54.1 mph (Exhibit 25-19)

S_0= 71.2 mph (Exhibit 25-19)

S = 63.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans G7(4)
Analysis Time Period	AM	Analysis Year	Run G (No slip + Barrier)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1000 ft

V_D = 961 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7028	0.92	Level	4	2	0.977	1.00	7822
Ramp	1059	0.92	Level	2	2	0.986	1.00	1167
UpStream								
DownStream	961	0.90	Level	0	0	1.000	1.00	1068

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2897 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7822	9400	No
V_{12}	2897	4400:All	No
$V_{FO} = V_F - V_R$	6655	9400	No
V_R	1167	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -2.3 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.533 (Exhibit 25-19)

S_R= 52.7 mph (Exhibit 25-19)

S_0= 65.6 mph (Exhibit 25-19)

S = 60.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans G(4)
Analysis Time Period	PM	Analysis Year	Run G (No slip + barrier)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1000 ft

V_D = 1107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3118	0.92	Level	4	2	0.977	1.00	3470
Ramp	654	0.92	Level	2	2	0.986	1.00	721
UpStream								
DownStream	1107	0.90	Level	0	0	1.000	1.00	1230

Merge Areas | Diverge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1436 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3470	9400	No
V_{12}	1436	4400:All	No
$V_{FO} = V_F - V_R$	2749	9400	No
V_R	721	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -14.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.493 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.2 mph (Exhibit 25-19)

S = 62.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans G(5)
Analysis Time Period	AM	Analysis Year	Run G (No slip + WB C-D)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 1000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 961 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6930	0.92	Level	4	2	0.977	1.00	7713
Ramp	1059	0.92	Level	2	2	0.986	1.00	1167
UpStream								
DownStream	961	0.90	Level	0	0	1.000	1.00	1068

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 2869 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7713	9400	No
V_{12}	2869	4400:All	No
$V_{FO} = V_F - V_R$	6546	9400	No
V_R	1167	3800	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = -2.6 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.533 (Exhibit 25-19)

S_R= 52.7 mph (Exhibit 25-19)

S_0= 65.8 mph (Exhibit 25-19)

S = 60.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D3
Agency or Company	LLG	Junction	CCR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans G15
Analysis Time Period	PM	Analysis Year	Run G (No slip + WB C-D)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☐ On
☑ No ☐ Off		☐ No ☑ Off
L_{up} = ft		L_{down} = 1000 ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 1107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2996	0.92	Level	4	2	0.977	1.00	3335
Ramp	654	0.92	Level	2	2	0.986	1.00	721
UpStream								
DownStream	1107	0.90	Level	0	0	1.000	1.00	1230

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.260 using Equation (Exhibit 25-11)

V_{12} = 1401 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3335	9400	No
V_{12}	1401	4400:All	No
$V_{FO} = V_F - V_R$	2614	9400	No
V_R	721	3800	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -15.2 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.493 (Exhibit 25-19)

S_R= 53.7 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 62.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off ramp from EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3122	0.92	Level	4	2	0.977	1.00	3475
Ramp	550	0.92	Level	2	2	0.986	1.00	606
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.645 using Equation (Exhibit 25-11)

V_{12} = 2457 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3475	7050	No
V_{12}	2457	4400:All	No
$V_{FO} = V_F - V_R$	2869	7050	No
V_R	606	2000	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 11.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.483 (Exhibit 25-19)

S_R= 53.9 mph (Exhibit 25-19)

S_0= 71.2 mph (Exhibit 25-19)

S = 58.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	EB SR 56-56D4
Agency or Company	LLG	Junction	CVR Off Ramp with EB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4861	0.92	Level	4	2	0.977	1.00	5411
Ramp	1050	0.92	Level	2	2	0.986	1.00	1157
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Estimation of v_{12} — Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.572 using Equation (Exhibit 25-11)

V_{12} = 3588 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5411	7050	No
V_{12}	3588	4400:All	No
$V_{FO} = V_F - V_R$	4254	7050	No
V_R	1157	2000	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 21.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.532 (Exhibit 25-19)

S_R= 52.8 mph (Exhibit 25-19)

S_0= 68.1 mph (Exhibit 25-19)

S = 57.1 mph (Exhibit 25-15)

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Same for Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_D = 150'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5348	0.92	Level	4	2	0.977	1.00	5953
Ramp	400	0.92	Level	2	2	0.986	1.00	441
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.591 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 3698 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5953	7050	No
V_{12}	3698	4400:All	No
$V_{FO} = V_F - V_R$	5512	7050	No
V_R	441	2000	No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$
D_R = (pc/mi/ln)	D_R = 34.7 (pc/mi/ln)
LOS = (Exhibit 25-4)	LOS = D (Exhibit 25-4)

Speed Estimation	Speed Estimation
M_S = (Exibit 25-19)	D_s = 0.468 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.2 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= 66.4 mph (Exhibit 25-19)
S = mph (Exhibit 25-14)	S = 58.3 mph (Exhibit 25-15)

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Same for Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D5
Agency or Company	LLG	Junction	CCtry Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

$L_D = 150'$

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2034	0.92	Level	4	2	0.977	1.00	2264
Ramp	300	0.92	Level	2	2	0.986	1.00	331
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.688 using Equation (Exhibit 25-11)

V_{12} = 1661 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2264	7050	No
V_{12}	1661	4400:All	No
$V_{FO} = V_F - V_R$	1933	7050	No
V_R	331	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 17.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.458 (Exhibit 25-19)

S_R= 54.5 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 58.1 mph (Exhibit 25-15)

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Same for Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off ramp from WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build (Run G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

L_D = 150'

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4708	0.92	Level	4	2	0.977	1.00	5240
Ramp	240	0.92	Level	2	2	0.986	1.00	265
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.617 using Equation (Exhibit 25-11)

V_{12} = 3334 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	5240	7050	No
V_{12}	3334	4400:All	No
$V_{FO} = V_F - V_R$	4975	7050	No
V_R	265	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = 31.6 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

D_s = 0.452 (Exhibit 25-19)

S_R= 54.6 mph (Exhibit 25-19)

S_0= 67.8 mph (Exhibit 25-19)

S = 58.8 mph (Exhibit 25-15)

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Same for Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D6
Agency or Company	LLG	Junction	CVR Off Ramp with WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build (RUN G)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_D = 150'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2014	0.92	Level	4	2	0.977	1.00	2242
Ramp	600	0.92	Level	2	2	0.986	1.00	661
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.674 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 1726 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2242	7050	No
V_{12}	1726	4400:All	No
$V_{FO} = V_F - V_R$	1581	7050	No
V_R	661	2000	No

Level of Service Determination (if more)	Level of Service Determination (if not)
$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$
D_R = (pc/mi/ln)	D_R = 17.7 (pc/mi/ln)
LOS = (Exhibit 25-4)	LOS = B (Exhibit 25-4)

Speed Estimation	Speed Estimation
M_S = (Exibit 25-19)	D_s = 0.487 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 53.8 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= 71.3 mph (Exhibit 25-19)
S = mph (Exhibit 25-14)	S = 57.0 mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D7 With WB Barrier
Agency or Company	LLG	Junction	ECR Off ramp WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	AM	Analysis Year	Year 2030 SR 56 Build G(3)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Converts to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6719	0.92	Level	4	2	0.977	1.00	7479
Ramp	1760	0.92	Level	2	2	0.986	1.00	1940
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.260 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 3380 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	7479	9400	No
V_{12}	3380	4400:All	No
$V_{FO} = V_F - V_R$	5539	9400	No
V_R	1940	3800	No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$
D_R = (pc/mi/ln)	D_R = 1.8 (pc/mi/ln)
LOS = (Exhibit 25-4)	LOS = A (Exhibit 25-4)

Speed Estimation	Speed Estimation
M_S = (Exibit 25-19)	D_s = 0.603 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 51.1 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= 67.2 mph (Exhibit 25-19)
S = mph (Exhibit 25-14)	S = 58.9 mph (Exhibit 25-15)

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Same for G(4).

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	WB SR 56-56D7 With WB Barrier
Agency or Company	LLG	Junction	ECR Off ramp WB SR 56
Date Performed	7/20/2007	Jurisdiction	Caltrans
Analysis Time Period	PM	Analysis Year	Year 2030 SR 56 Build G(3)

Project Description I-5 / SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2864	0.92	Level	4	2	0.977	1.00	3188
Ramp	600	0.92	Level	2	2	0.986	1.00	661
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of V_{12}	**Estimation of V_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM} = using Equation (Exhibit 25-5)	P_{FD} = 0.260 using Equation (Exhibit 25-11)
V_{12} = pc/h	V_{12} = 1318 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	3188	9400	No
V_{12}	1318	4400:All	No
$V_{FO} = V_F - V_R$	2527	9400	No
V_R	661	3800	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = -15.9 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Estimation

D_s = 0.487 (Exhibit 25-19)

S_R= 53.8 mph (Exhibit 25-19)

S_0= 71.3 mph (Exhibit 25-19)

S = 62.8 mph (Exhibit 25-15)

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