APPENDIX C

FREEWAY MERGE CALCULATION SHEETS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	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

Vu = 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	6733	0.92	Grade	4	2	0.977	1.00	7494
Ramp	550	0.92	Grade	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} = 0.333 using Equation (Exhibit 25-5)

V_{12} = 1823 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6077	See Exhibit 25-7	No
V_{R12}	2429	4600:All	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 = 20.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.323 (Exibit 25-19)

S_R= 57.6 mph (Exhibit 25-19)

S_0= 60.2 mph (Exhibit 25-19)

S = 59.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	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

Vu = 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	6710	0.92	Grade	4	2	0.977	1.00	7469
Ramp	550	0.92	Grade	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} = 0.333 using Equation (Exhibit 25-5)

V_{12} = 1817 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6059	See Exhibit 25-7	No
V_{R12}	2423	4600:All	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 = 20.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.323 (Exibit 25-19)

S_R= 57.6 mph (Exhibit 25-19)

S_0= 60.3 mph (Exhibit 25-19)

S = 59.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 -5M5
Agency or Company	Caltrans	Junction	CVR on ramp to NB I-5
Date Performed	7/5/2007	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

Vu = 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	5540	0.92	Grade	4	2	0.977	1.00	6166
Ramp	880	0.92	Grade	2	2	0.986	1.00	970
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.288 using Equation (Exhibit 25-5)

V_{12} = 1348 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5657	See Exhibit 25-7	No
V_{R12}	2318	4600:All	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 = 19.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.319 (Exibit 25-19)

S_R= 57.7 mph (Exhibit 25-19)

S_0= 60.8 mph (Exhibit 25-19)

S = 59.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 -5M5
Agency or Company	Caltrans	Junction	CVR on ramp to NB I-5
Date Performed	7/5/2007	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

Vu = 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	6060	0.92	Grade	4	2	0.977	1.00	6745
Ramp	680	0.92	Grade	2	2	0.986	1.00	749
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} = 0.315 using Equation (Exhibit 25-5)

V_{12} = 1553 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5673	See Exhibit 25-7	No
V_{R12}	2302	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 19.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.318 (Exibit 25-19)

S_R= 57.7 mph (Exhibit 25-19)

S_0= 60.7 mph (Exhibit 25-19)

S = 59.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	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

Vu = 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	5630	0.92	Level	4	2	0.977	1.00	6266
Ramp	840	0.92	Level	2	2	0.986	1.00	926
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.580 using Equation (Exhibit 25-5)

V_{12} = 3634 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7192	See Exhibit 25-7	No
V_{R12}	4560	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 31.2 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.589 (Exibit 25-19)

S_R= 51.5 mph (Exhibit 25-19)

S_0= 62.1 mph (Exhibit 25-19)

S = 54.9 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Existing	Analysis Year	ExistingPM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5590	0.92	Level	4	2	0.977	1.00	6222
Ramp	800	0.92	Level	2	2	0.986	1.00	882
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.585 using Equation (Exhibit 25-5)

V_{12} = 3642 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7104	See Exhibit 25-7	No
V_{R12}	4524	4600:All	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 = 31.0 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.576 (Exibit 25-19)

S_R= 51.8 mph (Exhibit 25-19)

S_0= 62.2 mph (Exhibit 25-19)

S = 55.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	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

Vu = 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	2500	0.92	Level	4	2	0.977	1.00	2783
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} = 0.340 using Equation (Exhibit 25-5)

V_{12} = 946 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3334	See Exhibit 25-7	No
V_{R12}	1497	4600:All	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 = 13.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.296 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 63.5 mph (Exhibit 25-19)

S = 61.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	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

Vu = 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	5400	0.92	Level	4	2	0.977	1.00	6010
Ramp	600	0.92	Level	2	2	0.986	1.00	661
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.326 using Equation (Exhibit 25-5)

V_{12} = 1961 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6671	See Exhibit 25-7	No
V_{R12}	2622	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 21.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.333 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 59.5 mph (Exhibit 25-19)

S = 58.6 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	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

Vu = 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	5150	0.92	Level	4	2	0.977	1.00	5732
Ramp	750	0.92	Level	2	2	0.986	1.00	827
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} = 0.306 using Equation (Exhibit 25-5)

V_{12} = 1752 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6559	See Exhibit 25-7	No
V_{R12}	2579	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 21.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.330 (Exibit 25-19)

S_R= 57.4 mph (Exhibit 25-19)

S_0= 59.6 mph (Exhibit 25-19)

S = 58.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	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

Vu = 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	3400	0.92	Level	4	2	0.977	1.00	3784
Ramp	700	0.92	Level	2	2	0.986	1.00	772
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.312 using Equation (Exhibit 25-5)

V_{12} = 1182 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4556	See Exhibit 25-7	No
V_{R12}	1954	4600:All	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 = 16.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.307 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.1 mph (Exhibit 25-19)

S = 60.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	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

Vu = 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	6330	0.92	Level	4	2	0.977	1.00	7046
Ramp	1040	0.92	Level	2	2	0.986	1.00	1146
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.266 using Equation (Exhibit 25-5)

V_{12} = 1367 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6290	See Exhibit 25-7	No
V_{R12}	2513	4600:All	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 = 20.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.327 (Exibit 25-19)

S_R= 57.5 mph (Exhibit 25-19)

S_0= 60.0 mph (Exhibit 25-19)

S = 59.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	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

Vu = 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	6800	0.92	Level	4	2	0.977	1.00	7569
Ramp	1250	0.92	Level	2	2	0.986	1.00	1378
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.237 using Equation (Exhibit 25-5)

V_{12} = 1281 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6790	See Exhibit 25-7	No
V_{R12}	2659	4600:All	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 = 21.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.335 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 59.4 mph (Exhibit 25-19)

S = 58.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	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

Vu = 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} = 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	4108	0.92	Level	4	2	0.977	1.00	4572
Ramp	1126	0.92	Level	2	2	0.986	1.00	1241
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4572 pc/h If add a lane.

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5813	See Exhibit 25-7	~~Yes~~ No
V_{R12}	5813	~~4600:All~~ 7000	~~Yes~~ 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 = 40.8 (pc/mi/ln) Not applicable.

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.551 (Exibit 25-19)

S_R= 29.3 mph (Exhibit 25-19)

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

S = 29.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1398	0.92	Level	4	2	0.977	1.00	1556
Ramp	632	0.92	Level	2	2	0.986	1.00	697
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1556 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2253	See Exhibit 25-7	No
V_{R12}	2253	4600:All	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 = 13.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.223 (Exibit 25-19)

S_R= 59.9 mph (Exhibit 25-19)

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

S = 59.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1624	0.92	Level	4	2	0.977	1.00	1808
Ramp	393	0.92	Level	2	2	0.986	1.00	433
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1808 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2241	See Exhibit 25-7	No
V_{R12}	2241	4600:All	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 = 19.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.304 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

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

S = 58.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3400	0.92	Level	4	2	0.977	1.00	3784
Ramp	273	0.92	Level	2	2	0.986	1.00	301
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 3784 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4085	See Exhibit 25-7	No
V_{R12}	4085	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 33.4 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.499 (Exibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

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

S = 53.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3553	0.92	Level	4	2	0.977	1.00	3955
Ramp	816	0.92	Level	2	2	0.986	1.00	899
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 3955 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4854	See Exhibit 25-7	Yes
V_{R12}	4854	4600:All	Yes

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 = 39.2 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.767 (Exibit 25-19)

S_R= 47.4 mph (Exhibit 25-19)

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

S = 47.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	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

Vu = 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	1274	0.92	Level	4	2	0.977	1.00	1418
Ramp	319	0.92	Level	2	2	0.986	1.00	352
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1418 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1770	See Exhibit 25-7	No
V_{R12}	1770	4600:All	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 = 15.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.302 (Exibit 25-19)

S_R= 58.1 mph (Exhibit 25-19)

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

S = 58.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1552	0.92	Level	4	2	0.977	1.00	1727
Ramp	54	0.92	Level	2	2	0.986	1.00	60
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} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1727 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1787	See Exhibit 25-7	No
V_{R12}	1787	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 15.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.290 (Exibit 25-19)

S_R= 58.3 mph (Exhibit 25-19)

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

S = 58.3 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3137	0.92	Level	4	2	0.977	1.00	3492
Ramp	41	0.92	Level	2	2	0.986	1.00	45
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} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 3492 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3537	See Exhibit 25-7	No
V_{R12}	3537	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 29.3 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.401 (Exibit 25-19)

S_R= 55.8 mph (Exhibit 25-19)

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

S = 55.8 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run 13

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

0834 mi 6 lanes (or)

5695 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	5695	0.92	Level	4	2	0.977	1.00	6339
Ramp	406	0.92	Level	2	2	0.986	1.00	447
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.353 using Equation (Exhibit 25-5)

V_{12} = 1701 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5265	See Exhibit 25-7	No
V_{R12}	2148	4600:All	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 = 18.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.312 (Exibit 25-19)

S_R= 57.8 mph (Exhibit 25-19)

S_0= 61.2 mph (Exhibit 25-19)

S = 59.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

9348 mi 6 lanes (or)

7790 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	7790	0.92	Level	4	2	0.977	1.00	8671
Ramp	522	0.92	Level	2	2	0.986	1.00	575
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.337 using Equation (Exhibit 25-5)

V_{12} = 2080 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6746	See Exhibit 25-7	No
V_{R12}	2655	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 22.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.334 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 59.4 mph (Exhibit 25-19)

S = 58.6 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

9040 on 6 lanes (or)

7533 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	7533	0.92	Level	4	2	0.977	1.00	8385
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} = 0.277 using Equation (Exhibit 25-5)

V_{12} = 1659 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7054	See Exhibit 25-7	No
V_{R12}	2717	4600:All	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 = 22.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.338 (Exibit 25-19)

S_R= 57.2 mph (Exhibit 25-19)

S_0= 59.0 mph (Exhibit 25-19)

S = 58.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

7660 ui 6 lanes (or)

6388 ui 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	6383	0.92	Level	4	2	0.977	1.00	7105
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} = 0.297 using Equation (Exhibit 25-5)

V_{12} = 1542 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6080	See Exhibit 25-7	No
V_{R12}	2435	4600:All	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 = 20.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.324 (Exibit 25-19)

S_R= 57.6 mph (Exhibit 25-19)

S_0= 60.2 mph (Exhibit 25-19)

S = 59.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Grade

9610 vii 6 lanes (or)

8010 vii 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	8010	0.92	Grade	4	2	0.977	1.00	8915
Ramp	600	0.92	Grade	2	2	0.986	1.00	661
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.326 using Equation (Exhibit 25-5)

V_{12} = 2093 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7076	See Exhibit 25-7	No
V_{R12}	2754	4600;All	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 = 22.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.340 (Exibit 25-19)

S_R= 57.2 mph (Exhibit 25-19)

S_0= 59.0 mph (Exhibit 25-19)

S = 58.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Grade

7717 in 6 lanes (or)
6430 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	6430	0.92	Grade	4	2	0.977	1.00	7157
Ramp	570	0.92	Grade	2	2	0.986	1.00	628
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.330 using Equation (Exhibit 25-5)

V_{12} = 1727 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5853	See Exhibit 25-7	No
V_{R12}	2355	4600:All	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 = 19.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.320 (Exibit 25-19)

S_R= 57.6 mph (Exhibit 25-19)

S_0= 60.5 mph (Exhibit 25-19)

S = 59.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B1 B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5710	0.92	Level	4	2	0.977	1.00	6355
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} = 0.565 using Equation (Exhibit 25-5)

V_{12} = 3589 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7402	See Exhibit 25-7	No
V_{R12}	4636	4600:All	Yes

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 = 31.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.618 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 61.8 mph (Exhibit 25-19)

S = 54.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B, B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	4580	0.92	Level	4	2	0.977	1.00	5098
Ramp	940	0.92	Level	2	2	0.986	1.00	1036
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.566 using Equation (Exhibit 25-5)

V_{12} = 2886 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6134	See Exhibit 25-7	No
V_{R12}	3922	4600:All	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 = 26.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.413 (Exibit 25-19)

S_R= 55.5 mph (Exhibit 25-19)

S_0= 62.8 mph (Exhibit 25-19)

S = 57.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B, B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	3070	0.92	Level	4	2	0.977	1.00	3417
Ramp	630	0.92	Level	2	2	0.986	1.00	694
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.322 using Equation (Exhibit 25-5)

V_{12} = 1101 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4111	See Exhibit 25-7	No
V_{R12}	1795	4600:All	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 = 15.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.302 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.6 mph (Exhibit 25-19)

S = 60.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B, B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5620	0.92	Level	4	2	0.977	1.00	6255
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} = 0.296 using Equation (Exhibit 25-5)

V_{12} = 1851 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7159	See Exhibit 25-7	No
V_{R12}	2755	4600:All	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 = 22.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.340 (Exibit 25-19)

S_R= 57.2 mph (Exhibit 25-19)

S_0= 58.9 mph (Exhibit 25-19)

S = 58.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B, B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	6350	0.92	Level	4	2	0.977	1.00	7068
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} = 0.278 using Equation (Exhibit 25-5)

V_{12} = 1965 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8115	See Exhibit 25-7	No
V_{R12}	3012	4600:All	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 = 24.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.358 (Exibit 25-19)

S_R= 56.8 mph (Exhibit 25-19)

S_0= 57.0 mph (Exhibit 25-19)

S = 56.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B, B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	3350	0.92	Level	4	2	0.977	1.00	3729
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} = 0.292 using Equation (Exhibit 25-5)

V_{12} = 1088 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4666	See Exhibit 25-7	No
V_{R12}	2025	4600:All	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 = 17.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.309 (Exibit 25-19)

S_R= 57.9 mph (Exhibit 25-19)

S_0= 62.0 mph (Exhibit 25-19)

S = 60.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B1 / B2.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5302	0.92	Level	4	2	0.977	1.00	5901
Ramp	1441	0.92	Level	2	2	0.986	1.00	1588
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.497 using Equation (Exhibit 25-5)

V_{12} = 2230 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6073	See Exhibit 25-7	No
V_{R12}	3818	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 25.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.394 (Exibit 25-19)

S_R= 55.9 mph (Exhibit 25-19)

S_0= 62.7 mph (Exhibit 25-19)

S = 58.3 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run B, B2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	7373	0.92	Level	4	2	0.977	1.00	8206
Ramp	1500	0.92	Level	2	2	0.986	1.00	1653
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.489 using Equation (Exhibit 25-5)

V_{12} = 2870 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7521	See Exhibit 25-7	No
V_{R12}	4523	4600:All	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 = 30.6 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.575 (Exibit 25-19)

S_R= 51.8 mph (Exhibit 25-19)

S_0= 61.4 mph (Exhibit 25-19)

S = 55.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4586	0.92	Level	4	2	0.977	1.00	5104
Ramp	1480	0.92	Level	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} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5104 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6735	7050 ~~See Exhibit 25-7~~	~~Yes~~ No.
V_{R12}	6735	4600:All	Yes

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 = 47.9 (pc/mi/ln) 3 lanes downstream.

LOS = F (Exhibit 25-4) V/c: 6735/7050 = 0.95 ⇒ E.

Speed Estimation

M_S = 3.527 (Exibit 25-19)

S_R = -16.1 mph (Exhibit 25-19)

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

S = -16.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1560	0.92	Level	4	2	0.977	1.00	1736
Ramp	740	0.92	Level	2	2	0.986	1.00	816
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1736 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2552	2050 ~~See Exhibit 25-7~~	No
V_{R12}	2552	4600:All	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 = 15.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.236 (Exibit 25-19)

S_R= 59.6 mph (Exhibit 25-19)

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

S = 59.6 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1946	0.92	Level	4	2	0.977	1.00	2166
Ramp	601	0.92	Level	2	2	0.986	1.00	662
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 2166 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2828	See Exhibit 25-7	No
V_{R12}	2828	4600:All	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 = 23.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.333 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

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

S = 57.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4297	0.92	Level	4	2	0.977	1.00	4783
Ramp	492	0.92	Level	2	2	0.986	1.00	542
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4783 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5325	See Exhibit 25-7	Yes
V_{R12}	5325	4600:All	Yes

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 = 43.0 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.068 (Exibit 25-19)

S_R= 40.4 mph (Exhibit 25-19)

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

S = 40.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4261	0.92	Level	4	2	0.977	1.00	4743
Ramp	814	0.92	Level	2	2	0.986	1.00	897
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4743 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5640	See Exhibit 25-7	Yes
V_{R12}	5640	4600:All	Yes

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 = 45.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.365 (Exibit 25-19)

S_R= 33.6 mph (Exhibit 25-19)

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

S = 33.6 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1423	0.92	Level	4	2	0.977	1.00	1584
Ramp	478	0.92	Level	2	2	0.986	1.00	527
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1584 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2111	See Exhibit 25-7	No
V_{R12}	2111	4600:All	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 = 17.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.299 (Exibit 25-19)

S_R= 58.1 mph (Exhibit 25-19)

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

S = 58.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2067	0.92	Level	4	2	0.977	1.00	2301
Ramp	313	0.92	Level	2	2	0.986	1.00	345
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 2301 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2646	See Exhibit 25-7	No
V_{R12}	2646	4600:All	No

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 22.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Diverge Areas:

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

Merge Areas:

M_S = 0.322 (Exibit 25-19)

S_R = 57.6 mph (Exhibit 25-19)

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

S = 57.6 mph (Exhibit 25-14)

Diverge Areas:

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 No Build (Run A) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3979	0.92	Level	4	2	0.977	1.00	4429
Ramp	351	0.92	Level	2	2	0.986	1.00	387
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4429 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4816	See Exhibit 25-7	Yes
V_{R12}	4816	4600:All	Yes

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 = 39.1 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.749 (Exibit 25-19)

S_R= 47.8 mph (Exhibit 25-19)

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

S = 47.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 Aux Lane (Run B) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	6860	0.92	Grade	4	2	0.977	1.00	7635
Ramp	600	0.92	Grade	2	2	0.986	1.00	661
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.135 using Equation (Exhibit 25-5)

V_{12} = 738 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6121	See Exhibit 25-7	No
V_{R12}	1399	4600:All	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 = 16.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.337 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 58.1 mph (Exhibit 25-19)

S = 57.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Mainline
Date Performed	7/5/2007	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

Vu = 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	5510	0.92	Grade	4	2	0.977	1.00	6133
Ramp	570	0.92	Grade	2	2	0.986	1.00	628
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.139 using Equation (Exhibit 25-5)

V_{12} = 649 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5290	See Exhibit 25-7	No
V_{R12}	1277	4600:All	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 = 15.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.335 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 59.6 mph (Exhibit 25-19)

S = 59.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No slip) AM	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

Vu = 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	2365	0.92	Level	4	2	0.977	1.00	2632
Ramp	630	0.92	Level	2	2	0.986	1.00	694
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.322 using Equation (Exhibit 25-5)

V_{12} = 848 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3326	See Exhibit 25-7	No
V_{R12}	1542	4600:All	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 = 13.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.297 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 63.6 mph (Exhibit 25-19)

S = 61.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No slip) PM	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

Vu = 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	4795	0.92	Level	4	2	0.977	1.00	5337
Ramp	820	0.92	Level	2	2	0.986	1.00	904
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.296 using Equation (Exhibit 25-5)

V_{12} = 1579 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6241	See Exhibit 25-7	No
V_{R12}	2483	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 20.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.326 (Exibit 25-19)

S_R= 57.5 mph (Exhibit 25-19)

S_0= 60.0 mph (Exhibit 25-19)

S = 59.0 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 Aux Lane (Run B) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4586	0.92	Level	4	2	0.977	1.00	5104
Ramp	1480	0.92	Level	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} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3162 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6735	9400 ~~See Exhibit 25-7~~ 4 lanes.	No
V_{R12}	4793	7050 ~~4600 All~~ 3 lanes.	~~Yes~~ 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 = 32.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

V/c: 6735/9400 = 0.71 ⇒ C.

Speed Estimation

M_S = 0.717 (Exibit 25-19)

S_R= 48.5 mph (Exhibit 25-19)

S_0= 59.8 mph (Exhibit 25-19)

S = 51.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Year 2015 Aux Lane (Run B) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1560	0.92	Level	4	2	0.977	1.00	1736
Ramp	740	0.92	Level	2	2	0.986	1.00	816
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1075 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2552	9400 ~~See Exhibit 25-7~~	No
V_{R12}	1891	7050 ~~4600:All~~	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 = 10.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.212 (Exibit 25-19)

S_R= 60.1 mph (Exhibit 25-19)

S_0= 64.4 mph (Exhibit 25-19)

S = 61.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	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

Vu = 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} = 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	4586	0.92	Level	4	2	0.977	1.00	5104
Ramp	1621	0.92	Level	2	2	0.986	1.00	1787
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3162 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6891	9400 ~~See Exhibit 25-7~~	No
V_{R12}	4949	7050 ~~4600 All~~	~~Yes~~ 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 = 33.9 (pc/mi/ln) v/c: 6891 / 9400 = 0.73

LOS = ~~F~~ (Exhibit 25-4) => C

Speed Estimation

M_S = 0.796 (Exibit 25-19)

S_R= 46.7 mph (Exhibit 25-19)

S_0= 59.8 mph (Exhibit 25-19)

S = 49.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1560	0.92	Level	4	2	0.977	1.00	1736
Ramp	905	0.92	Level	2	2	0.986	1.00	997
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1075 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2733	9400 ~~See Exhibit 25-7~~	No
V_{R12}	2072	7050 ~~4600:All~~	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 = 11.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.217 (Exibit 25-19)

S_R= 60.0 mph (Exhibit 25-19)

S_0= 64.4 mph (Exhibit 25-19)

S = 61.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	I-5 NB - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

7130 ui 6 lanes (or)
5980 ui 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	5980	0.92	Level	4	2	0.977	1.00	6656
Ramp	370	0.92	Level	2	2	0.986	1.00	408
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.358 using Equation (Exhibit 25-5)

V_{12} = 1739 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5267	See Exhibit 25-7	No
V_{R12}	2147	4600:All	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 = 18.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.312 (Exibit 25-19)

S_R= 57.8 mph (Exhibit 25-19)

S_0= 61.2 mph (Exhibit 25-19)

S = 59.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

10,300 vi 6 lanes or

8580 vi 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	8580	0.92	Level	4	2	0.977	1.00	9550
Ramp	500	0.92	Level	2	2	0.986	1.00	551
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.340 using Equation (Exhibit 25-5)

V_{12} = 2397 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7601	See Exhibit 25-7	No
V_{R12}	2948	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 24.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.353 (Exibit 25-19)

S_R= 56.9 mph (Exhibit 25-19)

S_0= 58.3 mph (Exhibit 25-19)

S = 57.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

9240 in 6 lanes (or)

7700 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	7700	0.92	Level	4	2	0.977	1.00	8570
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} = 0.277 using Equation (Exhibit 25-5)

V_{12} = 1680 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7128	See Exhibit 25-7	No
V_{R12}	2738	4600:All	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 = 22.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.339 (Exibit 25-19)

S_R= 57.2 mph (Exhibit 25-19)

S_0= 58.9 mph (Exhibit 25-19)

S = 58.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

7940 in 6 lanes (on)

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	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} = 0.297 using Equation (Exhibit 25-5)

V_{12} = 1598 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6269	See Exhibit 25-7	No
V_{R12}	2491	4600:All	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 = 20.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.326 (Exibit 25-19)

S_R= 57.5 mph (Exhibit 25-19)

S_0= 60.0 mph (Exhibit 25-19)

S = 59.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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} = 4260 ft

V_D = 450 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	3070	0.92	Grade	4	2	0.977	1.00	3417
Ramp	600	0.92	Grade	2	2	0.986	1.00	661
UpStream								
DownStream	450	0.90	Level	0	0	1.000	1.00	500

Estimation of v_{12} (Merge Areas)

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

L_{EQ} = 2876.87 (Equation 25-2 or 25-3)

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2031 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4078	See Exhibit 25-7	No
V_{R12}	2692	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 22.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.337 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 61.8 mph (Exhibit 25-19)

S = 58.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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} = 4260 ft

V_D = 440 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	2070	0.92	Grade	4	2	0.977	1.00	2304
Ramp	570	0.92	Grade	2	2	0.986	1.00	628
UpStream								
DownStream	440	0.90	Level	0	0	1.000	1.00	489

Estimation of v_{12} — Merge Areas

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

L_{EQ} = 2813.58 (Equation 25-2 or 25-3)

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1369 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2932	See Exhibit 25-7	No
V_{R12}	1997	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 17.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.308 (Exibit 25-19)

S_R= 57.9 mph (Exhibit 25-19)

S_0= 63.4 mph (Exhibit 25-19)

S = 59.6 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run C2, C5 + D

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB -5M5
Agency or Company	Caltrans	Junction	WB connector into Bypass 5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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} = 2900 ft

V_D = 1480 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	2070	0.92	Grade	4	2	0.977	1.00	2304
Ramp	1500	0.92	Grade	2	2	0.986	1.00	1653
UpStream								
DownStream	1480	0.90	Level	0	0	1.000	1.00	1644

Estimation of v_{12} — Merge Areas

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

L_{EQ} = 6086.63 (Equation 25-2 or 25-3)

P_{FM} = 0.698 using Equation (Exhibit 25-5)

V_{12} = 1607 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3957	See Exhibit 25-7	No
V_{R12}	3260	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 20.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.318 (Exibit 25-19)

S_R= 57.7 mph (Exhibit 25-19)

S_0= 64.3 mph (Exhibit 25-19)

S = 58.8 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run C2, C5 + D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB -5M5
Agency or Company	Caltrans	Junction	WB connector to 5 NB Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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} = 2900 ft

V_D = 1360 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	3190	0.92	Grade	4	2	0.977	1.00	3551
Ramp	950	0.92	Grade	2	2	0.986	1.00	1047
UpStream								
DownStream	1360	0.90	Level	0	0	1.000	1.00	1511

Estimation of v_{12} — Merge Areas

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

L_{EQ} = 5594.22 (Equation 25-2 or 25-3)

P_{FM} = 0.686 using Equation (Exhibit 25-5)

V_{12} = 2435 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4598	See Exhibit 25-7	No
V_{R12}	3482	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 22.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.343 (Exibit 25-19)

S_R= 57.1 mph (Exhibit 25-19)

S_0= 62.8 mph (Exhibit 25-19)

S = 58.4 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Form for C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	5710	0.92	Level	4	2	0.977	1.00	6355
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} = 0.565 using Equation (Exhibit 25-5)

V_{12} = 3589 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7402	See Exhibit 25-7	No
V_{R12}	4636	4600:All	Yes

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 31.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.618 (Exibit 25-19)

S_R = 50.8 mph (Exhibit 25-19)

S_0 = 61.8 mph (Exhibit 25-19)

S = 54.4 mph (Exhibit 25-14)

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	4580	0.92	Level	4	2	0.977	1.00	5098
Ramp	940	0.92	Level	2	2	0.986	1.00	1036
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.566 using Equation (Exhibit 25-5)

V_{12} = 2886 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6134	See Exhibit 25-7	No
V_{R12}	3922	4600:All	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 = 26.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.413 (Exibit 25-19)

S_R= 55.5 mph (Exhibit 25-19)

S_0= 62.8 mph (Exhibit 25-19)

S = 57.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fl} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	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

Vu = 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	5710	0.92	Level	4	2	0.977	1.00	6355
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} = 0.562 using Equation (Exhibit 25-5)

V_{12} = 3572 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7424	See Exhibit 25-7	No
V_{R12}	4641	4600:All	Yes

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 = 31.8 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.620 (Exibit 25-19)

S_R= 50.7 mph (Exhibit 25-19)

S_0= 61.8 mph (Exhibit 25-19)

S = 54.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM (WB C-D)	Analysis Year	Year 2015 Dir Conn (Run C5) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	4580	0.92	Level	4	2	0.977	1.00	5098
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} = 0.563 using Equation (Exhibit 25-5)

V_{12} = 2872 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6156	See Exhibit 25-7	No
V_{R12}	3930	4600:All	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 = 26.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.415 (Exibit 25-19)

S_R= 55.5 mph (Exhibit 25-19)

S_0= 62.8 mph (Exhibit 25-19)

S = 57.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	3070	0.92	Level	4	2	0.977	1.00	3417
Ramp	630	0.92	Level	2	2	0.986	1.00	694
UpStream								
DownStream								

Estimation of v_{12} (Merge Areas)

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

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

P_{FM} = 0.322 using Equation (Exhibit 25-5)

V_{12} = 1101 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4111	See Exhibit 25-7	No
V_{R12}	1795	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 15.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.302 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.6 mph (Exhibit 25-19)

S = 60.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	5620	0.92	Level	4	2	0.977	1.00	6255
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} = 0.296 using Equation (Exhibit 25-5)

V_{12} = 1851 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7159	See Exhibit 25-7	No
V_{R12}	2755	4600:All	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 = 22.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.340 (Exibit 25-19)

S_R= 57.2 mph (Exhibit 25-19)

S_0= 58.9 mph (Exhibit 25-19)

S = 58.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run C5 and Run D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7 (No EB Slip ramp)
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No slip)	Analysis Year	Year 2015 Dir Conn (Run C2) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	2365	0.92	Level	4	2	0.977	1.00	2632
Ramp	630	0.92	Level	2	2	0.986	1.00	694
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.322 using Equation (Exhibit 25-5)

V_{12} = 848 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3326	See Exhibit 25-7	No
V_{R12}	1542	4600:All	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 = 13.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.297 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 63.6 mph (Exhibit 25-19)

S = 61.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run 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-5M7 (No EB Slip ramp)
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No slip)	Analysis Year	Year 2015 Dir Conn (Run C2) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	4795	0.92	Level	4	2	0.977	1.00	5337
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} = 0.296 using Equation (Exhibit 25-5)

V_{12} = 1579 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6241	See Exhibit 25-7	No
V_{R12}	2483	4600:All	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 = 20.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.326 (Exibit 25-19)

S_R= 57.5 mph (Exhibit 25-19)

S_0= 60.0 mph (Exhibit 25-19)

S = 59.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	6250	0.92	Level	4	2	0.977	1.00	6957
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} = 0.278 using Equation (Exhibit 25-5)

V_{12} = 1935 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8004	See Exhibit 25-7	No
V_{R12}	2982	4600:All	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 = 24.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.356 (Exibit 25-19)

S_R= 56.8 mph (Exhibit 25-19)

S_0= 57.2 mph (Exhibit 25-19)

S = 57.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run C2

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	3350	0.92	Level	4	2	0.977	1.00	3729
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} = 0.292 using Equation (Exhibit 25-5)

V_{12} = 1088 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4666	See Exhibit 25-7	No
V_{R12}	2025	4600:All	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 = 17.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.309 (Exibit 25-19)

S_R= 57.9 mph (Exhibit 25-19)

S_0= 62.0 mph (Exhibit 25-19)

S = 60.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM (WB C-D)	Analysis Year	Year 2015 Dir Conn (Run C5) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5950	0.92	Level	4	2	0.977	1.00	6623
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} = 0.278 using Equation (Exhibit 25-5)

V_{12} = 1842 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7670	See Exhibit 25-7	No
V_{R12}	2889	4600:All	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 = 23.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.349 (Exibit 25-19)

S_R= 57.0 mph (Exhibit 25-19)

S_0= 57.9 mph (Exhibit 25-19)

S = 57.6 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run 1D.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	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	3045	0.92	Level	4	2	0.977	1.00	3389
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} = 0.292 using Equation (Exhibit 25-5)

V_{12} = 989 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4326	See Exhibit 25-7	No
V_{R12}	1926	4600:All	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 = 16.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.306 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.5 mph (Exhibit 25-19)

S = 60.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	5020	0.92	Level	4	2	0.977	1.00	5587
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.541 using Equation (Exhibit 25-5)

V_{12} = 2299 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5481	See Exhibit 25-7	No
V_{R12}	3533	4600:All	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 = 23.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.349 (Exibit 25-19)

S_R= 57.0 mph (Exhibit 25-19)

S_0= 63.3 mph (Exhibit 25-19)

S = 59.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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	6630	0.92	Level	4	2	0.977	1.00	7379
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} = 0.517 using Equation (Exhibit 25-5)

V_{12} = 2783 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6820	See Exhibit 25-7	No
V_{R12}	4216	4600:All	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 = 28.3 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.480 (Exibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= 62.1 mph (Exhibit 25-19)

S = 56.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = 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} = 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	5170	0.92	Level	4	2	0.977	1.00	5754
Ramp	1650	0.92	Level	2	2	0.986	1.00	1819
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.659 using Equation (Exhibit 25-5)

V_{12} = 3794 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7573	11750 ~~See Exhibit 25-7~~	No
V_{R12}	5613	7050 ~~4600 All~~ 3 lanes	No ~~Yes~~

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 = 39.0 (pc/mi/ln) v/c: 7573/11750 = 0.64 => C

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.314 (Exibit 25-19)

S_R= 34.8 mph (Exhibit 25-19)

S_0= 63.3 mph (Exhibit 25-19)

S = 39.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	740	0.92	Level	2	2	0.986	1.00	816
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.487 using Equation (Exhibit 25-5)

V_{12} = 1052 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2975	11750 ~~See Exhibit 25-7~~	No
V_{R12}	1868	7050 ~~4600 All~~	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 = 10.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.211 (Exibit 25-19)

S_R= 60.1 mph (Exhibit 25-19)

S_0= 64.8 mph (Exhibit 25-19)

S = 61.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2 (No Slip)
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No Slip)	Analysis Year	Year 2015 Dir Conn (Run C2) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 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	5170	0.92	Level	4	2	0.977	1.00	5754
Ramp	1621	0.92	Level	2	2	0.986	1.00	1787
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3565 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7541	11750 ~~See Exhibit 25-7~~	No ~~Yes~~
V_{R12}	5352	7050 ~~4600~~:All	No ~~Yes~~

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 = 37.0 (pc/mi/ln) $V/c = \frac{7541}{11750} = 0.64 \Rightarrow$ LOS C.

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.069 (Exibit 25-19)

S_R= 40.4 mph (Exhibit 25-19)

S_0= 58.9 mph (Exhibit 25-19)

S = 44.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2 (No Slip)
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 (No Slip)	Analysis Year	Year 2015 Dir Conn (Run C2) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	905	0.92	Level	2	2	0.986	1.00	997
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3156	11750 ~~See Exhibit 25-7~~	No
V_{R12}	2335	~~4600 All~~ 7050	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 = 13.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.226 (Exibit 25-19)

S_R= 59.8 mph (Exhibit 25-19)

S_0= 63.8 mph (Exhibit 25-19)

S = 60.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 AM	Analysis Year	Year 2015 - No slip & WB C-D

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 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	5170	0.92	Level	4	2	0.977	1.00	5754
Ramp	1701	0.92	Level	2	2	0.986	1.00	1875
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3565 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7629	11750 ~~See Exhibit 25-7~~	~~Yes~~ NO
V_{R12}	5440	~~4600 All~~ 9057	~~Yes~~ 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 = 37.6 (pc/mi/ln) v/c: 7629 / 11750 = 0.64 => LOS C

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.145 (Exibit 25-19)

S_R= 38.7 mph (Exhibit 25-19)

S_0= 58.9 mph (Exhibit 25-19)

S = 42.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015 PM	Analysis Year	Year 2015 - No slip & WB C-D

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	985	0.92	Level	2	2	0.986	1.00	1086
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3245	11750 ~~See Exhibit 25-7~~	No
V_{R12}	2424	2050 ~~4600:All~~	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 = 14.5 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.230 (Exibit 25-19)

S_R= 59.7 mph (Exhibit 25-19)

S_0= 63.8 mph (Exhibit 25-19)

S = 60.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2280	0.92	Level	4	2	0.977	1.00	2538
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} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1508 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3089	2050 ~~See Exhibit 25-7~~	No
V_{R12}	2059	4600:All	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 = 17.5 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 63.1 mph (Exhibit 25-19)

S = 59.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4780	0.92	Level	4	2	0.977	1.00	5320
Ramp	340	0.92	Level	2	2	0.986	1.00	375
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 3162 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5695	7057 ~~See Exhibit 25-7~~	No
V_{R12}	3537	4600:All	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 = 29.1 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.401 (Exibit 25-19)

S_R= 55.8 mph (Exhibit 25-19)

S_0= 59.0 mph (Exhibit 25-19)

S = 57.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4630	0.92	Level	4	2	0.977	1.00	5153
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} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5153 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6090	See Exhibit 25-7	Yes
V_{R12}	6090	4600:All	Yes

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 = 48.8 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.989 (Exibit 25-19)

S_R= 19.3 mph (Exhibit 25-19)

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

S = 19.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1670	0.92	Level	4	2	0.977	1.00	1859
Ramp	500	0.92	Level	2	2	0.986	1.00	551
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} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 1859 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2410	See Exhibit 25-7	No
V_{R12}	2410	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 20.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.310 (Exibit 25-19)

S_R= 57.9 mph (Exhibit 25-19)

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

S = 57.9 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2280	0.92	Level	4	2	0.977	1.00	2538
Ramp	280	0.92	Level	2	2	0.986	1.00	309
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 2538 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2847	See Exhibit 25-7	No
V_{R12}	2847	4600:All	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 = 23.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.334 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

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

S = 57.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4280	0.92	Level	4	2	0.977	1.00	4764
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} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4764 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5095	See Exhibit 25-7	Yes
V_{R12}	5095	4600:All	Yes

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 = 41.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.903 (Exibit 25-19)

S_R= 44.2 mph (Exhibit 25-19)

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

S = 44.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Hyb flyover (Run D1) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1946	0.92	Level	4	2	0.977	1.00	2166
Ramp	601	0.92	Level	2	2	0.986	1.00	662
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1287 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2828	See Exhibit 25-7	No
V_{R12}	1949	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 16.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.294 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 63.6 mph (Exhibit 25-19)

S = 59.8 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2015	Analysis Year	Hyb flyover (Run D1) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4297	0.92	Level	4	2	0.977	1.00	4783
Ramp	492	0.92	Level	2	2	0.986	1.00	542
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2843 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5325	See Exhibit 25-7	No
V_{R12}	3385	4600:All	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 = 27.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.382 (Exibit 25-19)

S_R= 56.2 mph (Exhibit 25-19)

S_0= 59.8 mph (Exhibit 25-19)

S = 57.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	8139	0.92	Level	4	2	0.977	1.00	9059
Ramp	501	0.92	Level	2	2	0.986	1.00	552
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.340 using Equation (Exhibit 25-5)

V_{12} = 2230 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7111	See Exhibit 25-7	No
V_{R12}	2782	4600:All	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 = 23.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.342 (Exibit 25-19)

S_R= 57.1 mph (Exhibit 25-19)

S_0= 59.0 mph (Exhibit 25-19)

S = 58.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) 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_A = 600'

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	8785	0.92	Level	4	2	0.977	1.00	9778
Ramp	557	0.92	Level	2	2	0.986	1.00	614
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.332 using Equation (Exhibit 25-5)

V_{12} = 2418 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7892	See Exhibit 25-7	No
V_{R12}	3032	4600:All	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 = 25.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.360 (Exibit 25-19)

S_R = 56.7 mph (Exhibit 25-19)

S_0 = 57.7 mph (Exhibit 25-19)

S = 57.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F; Run H.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	8680	0.92	Level	4	2	0.977	1.00	9661
Ramp	980	0.92	Level	2	2	0.986	1.00	1080
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

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

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

P_{FM} = 0.274 using Equation (Exhibit 25-5)

V_{12} = 1962 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8241	See Exhibit 25-7	No
V_{R12}	3042	4600:All	No

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 24.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.361 (Exibit 25-19)

S_R= 56.7 mph (Exhibit 25-19)

S_0= 56.7 mph (Exhibit 25-19)

S = 56.7 mph (Exhibit 25-14)

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F, Run H.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	7405	0.92	Level	4	2	0.977	1.00	8242
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} = 0.296 using Equation (Exhibit 25-5)

V_{12} = 1744 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6798	See Exhibit 25-7	No
V_{R12}	2648	4600:All	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 = 22.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.334 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 59.3 mph (Exhibit 25-19)

S = 58.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Grade

L_A = 600'

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	9206	0.92	Grade	4	2	0.977	1.00	10247
Ramp	790	0.92	Grade	2	2	0.986	1.00	871
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.300 using Equation (Exhibit 25-5)

V_{12} = 2325 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8618	See Exhibit 25-7	No
V_{R12}	3196	4600:All	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 = 26.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.374 (Exibit 25-19)

S_R= 56.4 mph (Exhibit 25-19)

S_0= 56.0 mph (Exhibit 25-19)

S = 56.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Grade

L_A = 600'

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	7425	0.92	Grade	4	2	0.977	1.00	8264
Ramp	600	0.92	Grade	2	2	0.986	1.00	661
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.326 using Equation (Exhibit 25-5)

V_{12} = 1928 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6570	See Exhibit 25-7	No
V_{R12}	2589	4600:All	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 = 21.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.331 (Exibit 25-19)

S_R = 57.4 mph (Exhibit 25-19)

S_0 = 59.6 mph (Exhibit 25-19)

S = 58.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build AM (RUN E)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 1500'

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	6930	0.92	Level	4	2	0.977	1.00	7713
Ramp	1080	0.92	Level	2	2	0.986	1.00	1190
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.547 using Equation (Exhibit 25-5)

V_{12} = 4218 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8903	See Exhibit 25-7	No
V_{R12}	5408	4600:All	Yes

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 = 37.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.086 (Exibit 25-19)

S_R= 40.0 mph (Exhibit 25-19)

S_0= 60.5 mph (Exhibit 25-19)

S = 46.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build PM (RUN E)

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 1500'

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	5449	0.92	Level	4	2	0.977	1.00	6065
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} = 0.551 using Equation (Exhibit 25-5)

V_{12} = 3342 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7222	See Exhibit 25-7	No
V_{R12}	4499	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 30.6 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.567 (Exibit 25-19)

S_R= 52.0 mph (Exhibit 25-19)

S_0= 61.9 mph (Exhibit 25-19)

S = 55.3 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F, F(3), G1 and G1(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build AM (RUN E)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	L_a = 600'	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = 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	3950	0.92	Level	4	2	0.977	1.00	4397
Ramp	720	0.92	Level	2	2	0.986	1.00	794
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.310 using Equation (Exhibit 25-5)

V_{12} = 1362 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5191	See Exhibit 25-7	No
V_{R12}	2156	4600:All	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 = 18.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.313 (Exibit 25-19)

S_R = 57.8 mph (Exhibit 25-19)

S_0 = 61.3 mph (Exhibit 25-19)

S = 59.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build PM (RUN E)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	5960	0.92	Level	4	2	0.977	1.00	6634
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} = 0.277 using Equation (Exhibit 25-5)

V_{12} = 1836 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7692	See Exhibit 25-7	No
V_{R12}	2894	4600:All	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 = 23.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.349 (Exibit 25-19)

S_R= 57.0 mph (Exhibit 25-19)

S_0= 57.9 mph (Exhibit 25-19)

S = 57.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build AM(Run E)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	6428	0.92	Level	4	2	0.977	1.00	7155
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.255 using Equation (Exhibit 25-5)

V_{12} = 1822 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8389	See Exhibit 25-7	No
V_{R12}	3056	4600:All	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 = 25.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.362 (Exibit 25-19)

S_R = 56.7 mph (Exhibit 25-19)

S_0 = 56.3 mph (Exhibit 25-19)

S = 56.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F, F(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build PM (Run E)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	3551	0.92	Level	4	2	0.977	1.00	3952
Ramp	880	0.92	Level	2	2	0.986	1.00	970
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.288 using Equation (Exhibit 25-5)

V_{12} = 1137 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4922	See Exhibit 25-7	No
V_{R12}	2107	4600:All	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 = 17.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.311 (Exibit 25-19)

S_R = 57.8 mph (Exhibit 25-19)

S_0 = 61.7 mph (Exhibit 25-19)

S = 60.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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	6256	0.92	Level	4	2	0.977	1.00	6963
Ramp	1671	0.92	Level	2	2	0.986	1.00	1842
UpStream								
DownStream								

Estimation of V_{12} — Merge Areas

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

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

P_{FM} = 0.465 using Equation (Exhibit 25-5)

V_{12} = 2366 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6925	See Exhibit 25-7	No
V_{R12}	4208	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 28.0 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.478 (Exibit 25-19)

S_R= 54.0 mph (Exhibit 25-19)

S_0= 61.9 mph (Exhibit 25-19)

S = 56.9 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	8310	0.92	Level	4	2	0.977	1.00	9249
Ramp	1637	0.92	Level	2	2	0.986	1.00	1804
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.470 using Equation (Exhibit 25-5)

V_{12} = 3173 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8553	See Exhibit 25-7	No
V_{R12}	4977	4600:All	Yes

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 = 34.1 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.782 (Exibit 25-19)

S_R = 47.0 mph (Exhibit 25-19)

S_0 = 60.4 mph (Exhibit 25-19)

S = 51.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build Run(E)AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

Comes into its own lane.

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} = 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	4372	0.92	Level	4	2	0.977	1.00	4866
Ramp	1700	0.92	Level	2	2	0.986	1.00	1874
UpStream								
DownStream								

Estimation of V_{12} — Merge Areas

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3014 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6740	See Exhibit 25-7	No
V_{R12}	4888	~~4600~~:All 2050	~~Yes~~ No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 33.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Not applicable

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.763 (Exibit 25-19)

S_R = 47.4 mph (Exhibit 25-19)

S_0 = 60.1 mph (Exhibit 25-19)

S = 50.4 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run 0) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☒ Yes ☒ On

☒ No ☒ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

Comes into its own lane.

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1334	0.92	Level	4	2	0.977	1.00	1485
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} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 920 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2532	See Exhibit 25-7	No
V_{R12}	1967	~~4600:All~~ 2052	~~No~~ 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 = 10.9 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.214 (Exibit 25-19)

S_R = 60.1 mph (Exhibit 25-19)

S_0 = 64.8 mph (Exhibit 25-19)

S = 61.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build Run E 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} = 45.0 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	2179	0.92	Level	4	2	0.977	1.00	2425
Ramp	716	0.92	Level	2	2	0.986	1.00	789
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1441 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3214	See Exhibit 25-7	No
V_{R12}	2230	4600:All	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 = 18.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.303 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 63.3 mph (Exhibit 25-19)

S = 59.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3981	0.92	Level	4	2	0.977	1.00	4431
Ramp	586	0.92	Level	2	2	0.986	1.00	646
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2633 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5077	See Exhibit 25-7	No
V_{R12}	3279	4600:All	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 = 27.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.371 (Exibit 25-19)

S_R= 56.5 mph (Exhibit 25-19)

S_0= 60.3 mph (Exhibit 25-19)

S = 57.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4139	0.92	Level	4	2	0.977	1.00	4607
Ramp	839	0.92	Level	2	2	0.986	1.00	925
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2738 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5532	See Exhibit 25-7	No
V_{R12}	3663	4600:All	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 = 29.9 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.419 (Exibit 25-19)

S_R= 55.4 mph (Exhibit 25-19)

S_0= 60.1 mph (Exhibit 25-19)

S = 56.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1178	0.92	Level	4	2	0.977	1.00	1311
Ramp	593	0.92	Level	2	2	0.986	1.00	654
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 779 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1965	See Exhibit 25-7	No
V_{R12}	1433	4600:All	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 = 12.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.283 (Exibit 25-19)

S_R= 58.5 mph (Exhibit 25-19)

S_0= 64.9 mph (Exhibit 25-19)

S = 60.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2370	0.92	Level	4	2	0.977	1.00	2638
Ramp	367	0.92	Level	2	2	0.986	1.00	404
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1568 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3042	See Exhibit 25-7	No
V_{R12}	1972	4600:All	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 = 16.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.295 (Exibit 25-19)

S_R = 58.2 mph (Exhibit 25-19)

S_0 = 62.9 mph (Exhibit 25-19)

S = 59.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build Run E PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3552	0.92	Level	4	2	0.977	1.00	3954
Ramp	414	0.92	Level	2	2	0.986	1.00	456
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2350 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4410	See Exhibit 25-7	No
V_{R12}	2806	4600:All	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 = 23.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.332 (Exibit 25-19)

S_R= 57.4 mph (Exhibit 25-19)

S_0= 61.0 mph (Exhibit 25-19)

S = 58.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2517	0.92	Level	4	2	0.977	1.00	2802
Ramp	372	0.92	Level	2	2	0.986	1.00	410
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1665 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3212	See Exhibit 25-7	No
V_{R12}	2075	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 17.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R= 58.1 mph (Exhibit 25-19)

S_0= 62.7 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Year 2030 No Build (Run E) PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4998	0.92	Level	4	2	0.977	1.00	5563
Ramp	738	0.92	Level	2	2	0.986	1.00	813
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 3306 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6376	See Exhibit 25-7	No
V_{R12}	4119	4600:All	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 = 33.5 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.507 (Exibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 58.7 mph (Exhibit 25-19)

S = 55.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	I-5 SB-5M4
Agency or Company	Caltrans	Junction	EB DMH with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Grade

Comes in its own lane.

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	7890	0.92	Grade	4	2	0.977	1.00	8782
Ramp	790	0.92	Grade	2	2	0.986	1.00	871
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.587 using Equation (Exhibit 25-5)

V_{12} = 3686 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7153	See Exhibit 25-7	No
V_{R12}	4557	4600:All	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 = 31.2 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.588 (Exibit 25-19)

S_R = 51.5 mph (Exhibit 25-19)

S_0 = 62.1 mph (Exhibit 25-19)

S = 54.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Ff} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	I-5 SB-5M4
Agency or Company	Caltrans	Junction	EB DMH with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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: Grade

Comes in its own lane.

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	6362	0.92	Grade	4	2	0.977	1.00	7081
Ramp	600	0.92	Grade	2	2	0.986	1.00	661
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.613 using Equation (Exhibit 25-5)

V_{12} = 3169 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5831	See Exhibit 25-7	No
V_{R12}	3830	4600:All	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 = 25.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.396 (Exibit 25-19)

S_R= 55.9 mph (Exhibit 25-19)

S_0= 63.2 mph (Exhibit 25-19)

S = 58.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F(4), Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (With barrier)	Analysis Year	Year 2030 Aux Lane AM (RUN F)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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	6930	0.92	Level	4	2	0.977	1.00	7713
Ramp	1457	0.92	Level	2	2	0.986	1.00	1606
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.495 using Equation (Exhibit 25-5)

V_{12} = 3817 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	9319	See Exhibit 25-7	No
V_{R12}	5423	4600:All	Yes

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 = 37.6 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.100 (Exibit 25-19)

S_R= 39.7 mph (Exhibit 25-19)

S_0= 59.8 mph (Exhibit 25-19)

S = 46.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F(4); Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (With WB Barrier)	Analysis Year	Year 2030 (Aux Lane) PM Run F

Project Description I-5/SR 56

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	5449	0.92	Level	4	2	0.977	1.00	6065
Ramp	1449	0.92	Level	2	2	0.986	1.00	1597
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.496 using Equation (Exhibit 25-5)

V_{12} = 3008 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7662	See Exhibit 25-7	No
V_{R12}	4605	4600:All	Yes

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 31.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.606 (Exibit 25-19)

S_R= 51.1 mph (Exhibit 25-19)

S_0= 61.3 mph (Exhibit 25-19)

S = 54.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F(4), Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (No slip)	Analysis Year	Year 2030 Aux Lane AM Run F

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

LA = 600'

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	3010	0.92	Level	4	2	0.977	1.00	3350
Ramp	720	0.92	Level	2	2	0.986	1.00	794
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.310 using Equation (Exhibit 25-5)

V_{12} = 1037 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4144	See Exhibit 25-7	No
V_{R12}	1831	4600:All	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 = 15.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.303 (Exibit 25-19)

S_R = 58.0 mph (Exhibit 25-19)

S_0 = 62.6 mph (Exhibit 25-19)

S = 60.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Run F(4); Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (No slip)	Analysis Year	Year 2030 (Aux Lane) PM Run F

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	4897	0.92	Level	4	2	0.977	1.00	5451
Ramp	960	0.92	Level	2	2	0.986	1.00	1058
UpStream								
DownStream								

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} = 0.277 using Equation (Exhibit 25-5)

V_{12} = 1508 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6509	See Exhibit 25-7	No
V_{R12}	2566	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 21.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.330 (Exibit 25-19)

S_R= 57.4 mph (Exhibit 25-19)

S_0= 59.7 mph (Exhibit 25-19)

S = 58.8 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for FCV, Hybrid (Row H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (With WB barrier)	Analysis Year	Year 2030 Aux Lane AM Row F

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	6051	0.92	Level	4	2	0.977	1.00	6735
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.255 using Equation (Exhibit 25-5)

V_{12} = 1715 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7969	See Exhibit 25-7	No
V_{R12}	2949	4600:All	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 = 24.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.353 (Exibit 25-19)

S_R = 56.9 mph (Exhibit 25-19)

S_0 = 57.2 mph (Exhibit 25-19)

S = 57.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for F(4), Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (With WB barrier)	Analysis Year	Year 2030 Aux Lane PM Run F

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	3152	0.92	Level	4	2	0.977	1.00	3508
Ramp	880	0.92	Level	2	2	0.986	1.00	970
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.288 using Equation (Exhibit 25-5)

V_{12} = 1009 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4478	See Exhibit 25-7	No
V_{R12}	1979	4600:All	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 = 16.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.307 (Exibit 25-19)

S_R = 57.9 mph (Exhibit 25-19)

S_0 = 62.3 mph (Exhibit 25-19)

S = 60.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

Comes into its own lane.

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} = 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	4372	0.92	Level	4	2	0.977	1.00	4866
Ramp	1700	0.92	Level	2	2	0.986	1.00	1874
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3014 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6740	See Exhibit 25-7	No
V_{R12}	4888	~~4600~~ All 7050	~~Yes~~ 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 = 33.3 (pc/mi/ln) Not applicable

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.763 (Exibit 25-19)

S_R= 47.4 mph (Exhibit 25-19)

S_0= 60.1 mph (Exhibit 25-19)

S = 50.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

Comes into its own lane.

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1334	0.92	Level	4	2	0.977	1.00	1485
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} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 920 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2532	See Exhibit 25-7	No
V_{R12}	1967	~~4600:All~~ 2050	~~No~~ 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 = 10.9 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.214 (Exibit 25-19)

S_R = 60.1 mph (Exhibit 25-19)

S_0 = 64.8 mph (Exhibit 25-19)

S = 61.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 (No EB slip)	Analysis Year	Year 2030 Aux. Lane F(2) AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4372	0.92	Level	4	2	0.977	1.00	4866
Ramp	1888	0.92	Level	2	2	0.986	1.00	2081
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3014 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6947	See Exhibit 25-7	No
V_{R12}	5095	~~4600~~ 7057	~~Yes~~ No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = ~~34.9 (pc/mi/ln)~~ Not applicable

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

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.882 (Exibit 25-19)

S_R = 44.7 mph (Exhibit 25-19)

S_0 = 60.1 mph (Exhibit 25-19)

S = 48.0 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans FC2
Analysis Time Period	Year 2030 (No EB slip)	Analysis Year	Year 2030 Aux Lane PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1334	0.92	Level	4	2	0.977	1.00	1485
Ramp	1163	0.92	Level	2	2	0.986	1.00	1282
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 920 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2767	See Exhibit 25-7	No
V_{R12}	2202	~~4600:All~~ 7050	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 = ~~12.7 (pc/mi/ln)~~ Not applicable

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

Speed Estimation

M_S = 0.221 (Exibit 25-19)

S_R= 59.9 mph (Exhibit 25-19)

S_0= 64.8 mph (Exhibit 25-19)

S = 60.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans FC37
Analysis Time Period	Year 2030 (With Barrier)	Analysis Year	Year 2030 Aux. Lane AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4372	0.92	Level	4	2	0.977	1.00	4866
Ramp	1794	0.92	Level	2	2	0.986	1.00	1977
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3014 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6843	See Exhibit 25-7	No
V_{R12}	4991	~~4600~~ All 7050	~~Yes~~ 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 = ~~34.1~~ (pc/mi/ln) Not applicable.

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.820 (Exibit 25-19)

S_R= 46.1 mph (Exhibit 25-19)

S_0= 60.1 mph (Exhibit 25-19)

S = 49.2 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans F(3)
Analysis Time Period	Year 2030 With WB barrier)	Analysis Year	Year 2030 Aux Lane PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1334	0.92	Level	4	2	0.977	1.00	1485
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} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 920 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2642	See Exhibit 25-7	No
V_{R12}	2077	~~4600~~ All 7050	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 = 11.7 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.217 (Exibit 25-19)

S_R = 60.0 mph (Exhibit 25-19)

S_0 = 64.8 mph (Exhibit 25-19)

S = 61.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans F(4)
Analysis Time Period	2030 (No EB slip + barrier)	Analysis Year	Year 2030 Aux. Lane AM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4372	0.92	Level	4	2	0.977	1.00	4866
Ramp	1982	0.92	Level	2	2	0.986	1.00	2185
UpStream								
DownStream								

Estimation of V_{12} (Merge Areas)

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3014 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7051	See Exhibit 25-7	Yes
V_{R12}	5199	~~4600 All~~ 7050	~~Yes~~ No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 35.6 (pc/mi/ln) Not applicable

LOS = F (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.952 (Exibit 25-19)

S_R = 43.1 mph (Exhibit 25-19)

S_0 = 60.1 mph (Exhibit 25-19)

S = 46.6 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans F(4)
Analysis Time Period	2030 (No EB slip + barrier)	Analysis Year	Year 2030 Aux Lane 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} = 45.0 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	1334	0.92	Level	4	2	0.977	1.00	1485
Ramp	1263	0.92	Level	2	2	0.986	1.00	1392
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 920 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2877	See Exhibit 25-7	No
V_{R12}	2312	~~4600~~ All 7050	~~No~~ No.

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 13.5 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.225 (Exibit 25-19)

S_R = 59.8 mph (Exhibit 25-19)

S_0 = 64.8 mph (Exhibit 25-19)

S = 60.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2179	0.92	Level	4	2	0.977	1.00	2425
Ramp	716	0.92	Level	2	2	0.986	1.00	789
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1441 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3214	See Exhibit 25-7	No
V_{R12}	2230	4600:All	No

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 18.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.303 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 63.3 mph (Exhibit 25-19)

S = 59.5 mph (Exhibit 25-14)

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3981	0.92	Level	4	2	0.977	1.00	4431
Ramp	586	0.92	Level	2	2	0.986	1.00	646
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2633 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5077	See Exhibit 25-7	No
V_{R12}	3279	4600:All	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 = 27.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.371 (Exibit 25-19)

S_R= 56.5 mph (Exhibit 25-19)

S_0= 60.3 mph (Exhibit 25-19)

S = 57.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4139	0.92	Level	4	2	0.977	1.00	4607
Ramp	839	0.92	Level	2	2	0.986	1.00	925
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2738 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5532	See Exhibit 25-7	No
V_{R12}	3663	4600:All	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 = 29.9 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.419 (Exibit 25-19)

S_R= 55.4 mph (Exhibit 25-19)

S_0= 60.1 mph (Exhibit 25-19)

S = 56.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1178	0.92	Level	4	2	0.977	1.00	1311
Ramp	593	0.92	Level	2	2	0.986	1.00	654
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 779 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1965	See Exhibit 25-7	No
V_{R12}	1433	4600:All	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 = 12.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.283 (Exibit 25-19)

S_R= 58.5 mph (Exhibit 25-19)

S_0= 64.9 mph (Exhibit 25-19)

S = 60.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2370	0.92	Level	4	2	0.977	1.00	2638
Ramp	367	0.92	Level	2	2	0.986	1.00	404
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1568 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3042	See Exhibit 25-7	No
V_{R12}	1972	4600:All	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 = 16.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.295 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 62.9 mph (Exhibit 25-19)

S = 59.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3552	0.92	Level	4	2	0.977	1.00	3954
Ramp	414	0.92	Level	2	2	0.986	1.00	456
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2350 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4410	See Exhibit 25-7	No
V_{R12}	2806	4600:All	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 = 23.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.332 (Exibit 25-19)

S_R= 57.4 mph (Exhibit 25-19)

S_0= 61.0 mph (Exhibit 25-19)

S = 58.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2517	0.92	Level	4	2	0.977	1.00	2802
Ramp	372	0.92	Level	2	2	0.986	1.00	410
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1665 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3212	See Exhibit 25-7	No
V_{R12}	2075	4600:All	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 = 17.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R= 58.1 mph (Exhibit 25-19)

S_0= 62.7 mph (Exhibit 25-19)

S = 59.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	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

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4998	0.92	Level	4	2	0.977	1.00	5563
Ramp	738	0.92	Level	2	2	0.986	1.00	813
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 3306 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6376	See Exhibit 25-7	No
V_{R12}	4119	4600:All	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 = 33.5 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.507 (Exibit 25-19)

S_R= 53.3 mph (Exhibit 25-19)

S_0= 58.7 mph (Exhibit 25-19)

S = 55.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Run F(2) AM - 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} = 45.0 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	2830	0.92	Level	4	2	0.977	1.00	3150
Ramp	372	0.92	Level	2	2	0.986	1.00	410
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1872 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3560	See Exhibit 25-7	No
V_{R12}	2282	4600:All	No

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 19.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.305 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.2 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-14)

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Run F(2) PM - No slip

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	5352	0.92	Level	4	2	0.977	1.00	5957
Ramp	738	0.92	Level	2	2	0.986	1.00	813
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 3540 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6770	See Exhibit 25-7	No
V_{R12}	4353	4600:All	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 = 35.3 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

M_S = 0.570 (Exibit 25-19)

S_R= 51.9 mph (Exhibit 25-19)

S_0= 57.8 mph (Exhibit 25-19)

S = 53.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Run F(3) AM - With barrier

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2517	0.92	Level	4	2	0.977	1.00	2802
Ramp	395	0.92	Level	2	2	0.986	1.00	435
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1665 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3237	See Exhibit 25-7	No
V_{R12}	2100	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 17.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.299 (Exibit 25-19)

S_R= 58.1 mph (Exhibit 25-19)

S_0= 62.7 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Run F(3) PM - With barrier

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4998	0.92	Level	4	2	0.977	1.00	5563
Ramp	763	0.92	Level	2	2	0.986	1.00	841
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 3306 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6404	See Exhibit 25-7	No
V_{R12}	4147	4600:All	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 = 33.7 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.514 (Exibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= 58.7 mph (Exhibit 25-19)

S = 55.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Run F(4) AM - NS With barrier

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2830	0.92	Level	4	2	0.977	1.00	3150
Ramp	395	0.92	Level	2	2	0.986	1.00	435
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1872 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3585	See Exhibit 25-7	No
V_{R12}	2307	4600:All	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 = 19.5 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.306 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.2 mph (Exhibit 25-19)

S = 59.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M6
Agency or Company	Caltrans	Junction	Carmel Creek Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Run F(4) PM - NS With barrier

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	5352	0.92	Level	4	2	0.977	1.00	5957
Ramp	763	0.92	Level	2	2	0.986	1.00	841
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 3540 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6798	See Exhibit 25-7	No
V_{R12}	4381	4600:All	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 = 35.5 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Estimation

M_S = 0.579 (Exibit 25-19)

S_R= 51.7 mph (Exhibit 25-19)

S_0= 57.8 mph (Exhibit 25-19)

S = 53.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	I-5 NB - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 (Run G)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	7120	0.92	Level	4	2	0.977	1.00	7925
Ramp	460	0.92	Level	2	2	0.986	1.00	507
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.346 using Equation (Exhibit 25-5)

V_{12} = 1958 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6174	See Exhibit 25-7	No
V_{R12}	2465	4600:All	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 = 20.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.325 (Exibit 25-19)

S_R= 57.5 mph (Exhibit 25-19)

S_0= 60.1 mph (Exhibit 25-19)

S = 59.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	I-5 NB - 5M1
Agency or Company	Caltrans	Junction	WB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 (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_A = 600'

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	9010	0.92	Level	4	2	0.977	1.00	10029
Ramp	530	0.92	Level	2	2	0.986	1.00	584
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.336 using Equation (Exhibit 25-5)

V_{12} = 2529 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8113	See Exhibit 25-7	No
V_{R12}	3113	4600:All	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 = 25.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.367 (Exibit 25-19)

S_R= 56.6 mph (Exhibit 25-19)

S_0= 57.3 mph (Exhibit 25-19)

S = 57.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 (RUN G)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On	$L_A = 600'$	☐ Yes ☐ On
☑ No ☐ Off		☑ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = 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	8875	0.92	Level	4	2	0.977	1.00	9878
Ramp	980	0.92	Level	2	2	0.986	1.00	1080
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} = 0.274 using Equation (Exhibit 25-5)

V_{12} = 2021 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8458	See Exhibit 25-7	No
V_{R12}	3101	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 25.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.366 (Exibit 25-19)

S_R= 56.6 mph (Exhibit 25-19)

S_0= 56.2 mph (Exhibit 25-19)

S = 56.3 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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- 5M2
Agency or Company	Caltrans	Junction	EB Via de Valle with Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 (RUN G)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

LA=600'

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	7680	0.92	Level	4	2	0.977	1.00	8548
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} = 0.296 using Equation (Exhibit 25-5)

V_{12} = 1790 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6952	See Exhibit 25-7	No
V_{R12}	2694	4600:All	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 = 22.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.337 (Exibit 25-19)

S_R= 57.3 mph (Exhibit 25-19)

S_0= 59.1 mph (Exhibit 25-19)

S = 58.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 (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: Grade

L_A = 600'

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} = 4260 ft

V_D = 530 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	3530	0.92	Grade	4	2	0.977	1.00	3929
Ramp	790	0.92	Grade	2	2	0.986	1.00	871
UpStream								
DownStream	530	0.90	Level	0	0	1.000	1.00	589

Merge Areas

Estimation of V_{12}

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

L_{EQ} = 3388.95 (Equation 25-2 or 25-3)

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2335 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4800	See Exhibit 25-7	No
V_{R12}	3206	4600:All	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 = 26.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.375 (Exibit 25-19)

S_R = 56.4 mph (Exhibit 25-19)

S_0 = 61.1 mph (Exhibit 25-19)

S = 57.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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-5M4
Agency or Company	Caltrans	Junction	EB DMH with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 (RUN 6)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Grade

L_A = 600'

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} = 4260 ft

V_D = 529 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	2240	0.92	Grade	4	2	0.977	1.00	2493
Ramp	600	0.92	Grade	2	2	0.986	1.00	661
UpStream								
DownStream	529	0.90	Level	0	0	1.000	1.00	588

Estimation of v_{12} — Merge Areas

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

L_{EQ} = 3383.20 (Equation 25-2 or 25-3)

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1482 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3154	See Exhibit 25-7	No
V_{R12}	2143	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 18.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.312 (Exibit 25-19)

S_R= 57.8 mph (Exhibit 25-19)

S_0= 63.2 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for G1(2), Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB -5M5
Agency or Company	Caltrans	Junction	WB connector into Bypass 5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 (RUN G1)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 2900 ft

V_D = 1600 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	2540	0.92	Grade	4	2	0.977	1.00	2827
Ramp	1730	0.92	Grade	2	2	0.986	1.00	1907
UpStream								
DownStream	1600	0.90	Level	0	0	1.000	1.00	1778

Estimation of v_{12} (Merge Areas)

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

L_{EQ} = 6582.75 (Equation 25-2 or 25-3)

P_{FM} = 0.710 using Equation (Exhibit 25-5)

V_{12} = 2007 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4734	See Exhibit 25-7	No
V_{R12}	3914	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 25.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.411 (Exibit 25-19)

S_R= 55.5 mph (Exhibit 25-19)

S_0= 63.8 mph (Exhibit 25-19)

S = 56.8 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for 0(2), Hybrid (Run H)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 NB -5M5
Agency or Company	Caltrans	Junction	WB connector to 5 NB Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 (RUN G)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 2900 ft

V_D = 1600 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	3500	0.92	Grade	4	2	0.977	1.00	3896
Ramp	1150	0.92	Grade	2	2	0.986	1.00	1267
UpStream								
DownStream	1600	0.90	Level	0	0	1.000	1.00	1778

Estimation of v_{12} (Merge Areas)

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

L_{EQ} = 6582.75 (Equation 25-2 or 25-3)

P_{FM} = 0.710 using Equation (Exhibit 25-5)

V_{12} = 2765 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5163	See Exhibit 25-7	No
V_{R12}	4032	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 26.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.436 (Exibit 25-19)

S_R= 55.0 mph (Exhibit 25-19)

S_0= 62.7 mph (Exhibit 25-19)

S = 56.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 NB -5M5 (With WB Barrier)
Agency or Company	Caltrans	Junction	WB connector into Bypass 5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G(3)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 2900 ft

V_D = 1600 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	2932	0.92	Grade	4	2	0.977	1.00	3263
Ramp	1338	0.92	Grade	2	2	0.986	1.00	1475
UpStream								
DownStream	1600	0.90	Level	0	0	1.000	1.00	1778

Merge Areas | Diverge Areas

Estimation of v_{12}

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

L_{EQ} = 6582.75 (Equation 25-2 or 25-3)

P_{FM} = 0.710 using Equation (Exhibit 25-5)

V_{12} = 2316 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4738	See Exhibit 25-7	No
V_{R12}	3791	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Density Determination (Ramp)

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

D_R = 25.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Density Determination (Ramp)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.389 (Exibit 25-19)

S_R= 56.1 mph (Exhibit 25-19)

S_0= 63.4 mph (Exhibit 25-19)

S = 57.4 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 NB -5M5 (With WB barrier)
Agency or Company	Caltrans	Junction	WB connector to 5 NB Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G(3)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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} = 2900 ft

V_D = 1600 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	3987	0.92	Grade	4	2	0.977	1.00	4438
Ramp	663	0.92	Grade	2	2	0.986	1.00	731
UpStream								
DownStream	1600	0.90	Level	0	0	1.000	1.00	1778

Estimation of V_{12} — Merge Areas

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

L_{EQ} = 6582.75 (Equation 25-2 or 25-3)

P_{FM} = 0.710 using Equation (Exhibit 25-5)

V_{12} = 3150 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5169	See Exhibit 25-7	No
V_{R12}	3881	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 26.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.405 (Exibit 25-19)

S_R = 55.7 mph (Exhibit 25-19)

S_0 = 62.2 mph (Exhibit 25-19)

S = 57.2 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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	6530	0.92	Level	4	2	0.977	1.00	7268
Ramp	1080	0.92	Level	2	2	0.986	1.00	1190
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.547 using Equation (Exhibit 25-5)

V_{12} = 3975 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8458	See Exhibit 25-7	No
V_{R12}	5165	4600:All	Yes

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 = 35.8 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.899 (Exibit 25-19)

S_R= 44.3 mph (Exhibit 25-19)

S_0= 60.9 mph (Exhibit 25-19)

S = 49.6 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for Q(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	I-5 SB-5M6
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN 6

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5449	0.92	Level	4	2	0.977	1.00	6065
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} = 0.551 using Equation (Exhibit 25-5)

V_{12} = 3342 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7222	See Exhibit 25-7	No
V_{R12}	4499	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 30.6 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.567 (Exibit 25-19)

S_R= 52.0 mph (Exhibit 25-19)

S_0= 61.9 mph (Exhibit 25-19)

S = 55.3 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6 (With WB barrier)
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 Run 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
Vu = 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	6530	0.92	Level	4	2	0.977	1.00	7268
Ramp	1457	0.92	Level	2	2	0.986	1.00	1606
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.495 using Equation (Exhibit 25-5)

V_{12} = 3597 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8874	See Exhibit 25-7	No
V_{R12}	5203	4600:All	Yes

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 = 35.9 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 0.925 (Exibit 25-19)

S_R= 43.7 mph (Exhibit 25-19)

S_0= 60.2 mph (Exhibit 25-19)

S = 49.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M6 (With WB barrier)
Agency or Company	Caltrans	Junction	CVR On ramp to Mainline
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G(3)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5449	0.92	Level	4	2	0.977	1.00	6065
Ramp	1449	0.92	Level	2	2	0.986	1.00	1597
UpStream								
DownStream								

Estimation of V_{12}

Merge Areas

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

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

P_{FM} = 0.496 using Equation (Exhibit 25-5)

V_{12} = 3008 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7662	See Exhibit 25-7	No
V_{R12}	4605	4600:All	Yes

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 31.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.606 (Exibit 25-19)

S_R= 51.1 mph (Exhibit 25-19)

S_0= 61.3 mph (Exhibit 25-19)

S = 54.7 mph (Exhibit 25-14)

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for 07(3)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	3950	0.92	Level	4	2	0.977	1.00	4397
Ramp	720	0.92	Level	2	2	0.986	1.00	794
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.310 using Equation (Exhibit 25-5)

V_{12} = 1362 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5191	See Exhibit 25-7	No
V_{R12}	2156	4600:All	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 = 18.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.313 (Exibit 25-19)

S_R= 57.8 mph (Exhibit 25-19)

S_0= 61.3 mph (Exhibit 25-19)

S = 59.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M7
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 Run G7

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	5960	0.92	Level	4	2	0.977	1.00	6634
Ramp	960	0.92	Level	2	2	0.986	1.00	1058
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} = 0.277 using Equation (Exhibit 25-5)

V_{12} = 1836 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7692	See Exhibit 25-7	No
V_{R12}	2894	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fl} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 23.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.349 (Exibit 25-19)

S_R= 57.0 mph (Exhibit 25-19)

S_0= 57.9 mph (Exhibit 25-19)

S = 57.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 NB-5M7 (No EB Slip ramp)
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G(2)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	3010	0.92	Level	4	2	0.977	1.00	3350
Ramp	720	0.92	Level	2	2	0.986	1.00	794
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.310 using Equation (Exhibit 25-5)

V_{12} = 1037 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4144	See Exhibit 25-7	No
V_{R12}	1831	4600:All	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 = 15.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.303 (Exibit 25-19)

S_R= 58.0 mph (Exhibit 25-19)

S_0= 62.6 mph (Exhibit 25-19)

S = 60.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	I-5 NB-5M7 (No EB Slip ramp)
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN 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

C_A = 600'

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	4897	0.92	Level	4	2	0.977	1.00	5451
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} = 0.277 using Equation (Exhibit 25-5)

V_{12} = 1508 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6509	See Exhibit 25-7	No
V_{R12}	2566	4600:All	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 = 21.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.330 (Exibit 25-19)

S_R= 57.4 mph (Exhibit 25-19)

S_0= 59.7 mph (Exhibit 25-19)

S = 58.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	6828	0.92	Level	4	2	0.977	1.00	7600
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.255 using Equation (Exhibit 25-5)

V_{12} = 1936 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8834	See Exhibit 25-7	No
V_{R12}	3170	4600:All	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 = 25.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.372 (Exibit 25-19)

S_R= 56.4 mph (Exhibit 25-19)

S_0= 55.3 mph (Exhibit 25-19)

S = 55.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for 9(2)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	3551	0.92	Level	4	2	0.977	1.00	3952
Ramp	880	0.92	Level	2	2	0.986	1.00	970
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.288 using Equation (Exhibit 25-5)

V_{12} = 1137 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4922	See Exhibit 25-7	No
V_{R12}	2107	4600:All	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 = 17.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.311 (Exibit 25-19)

S_R= 57.8 mph (Exhibit 25-19)

S_0= 61.7 mph (Exhibit 25-19)

S = 60.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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-5M8 (With WB barrier)
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G(3)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

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	6451	0.92	Level	4	2	0.977	1.00	7180
Ramp	1120	0.92	Level	2	2	0.986	1.00	1234
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.255 using Equation (Exhibit 25-5)

V_{12} = 1829 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	8414	See Exhibit 25-7	No
V_{R12}	3063	4600:All	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 = 25.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.362 (Exibit 25-19)

S_R= 56.7 mph (Exhibit 25-19)

S_0= 56.2 mph (Exhibit 25-19)

S = 56.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Same for G(4)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	5M8	Freeway/Dir of Travel	I-5 SB-5M8 (With WB Barrier)
Agency or Company	Caltrans	Junction	Carmel Mtn Road with Bypass
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN 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_A = 600'

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	3152	0.92	Level	4	2	0.977	1.00	3508
Ramp	880	0.92	Level	2	2	0.986	1.00	970
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.288 using Equation (Exhibit 25-5)

V_{12} = 1009 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4478	See Exhibit 25-7	No
V_{R12}	1979	4600:All	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 = 16.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.307 (Exibit 25-19)

S_R = 57.9 mph (Exhibit 25-19)

S_0 = 62.3 mph (Exhibit 25-19)

S = 60.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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 - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN 67

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	5910	0.92	Level	4	2	0.977	1.00	6578
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} = 0.517 using Equation (Exhibit 25-5)

V_{12} = 2480 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	6235	See Exhibit 25-7	No
V_{R12}	3913	4600:All	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 = 25.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.411 (Exibit 25-19)

S_R= 55.5 mph (Exhibit 25-19)

S_0= 62.6 mph (Exhibit 25-19)

S = 58.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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 - 5M9
Agency or Company	Caltrans	Junction	WB DMH Road to I-5 NB
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = 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	7490	0.92	Level	4	2	0.977	1.00	8337
Ramp	1390	0.92	Level	2	2	0.986	1.00	1532
UpStream								
DownStream								

Estimation of V_{12} — Merge Areas

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

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

P_{FM} = 0.504 using Equation (Exhibit 25-5)

V_{12} = 3005 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7493	See Exhibit 25-7	No
V_{R12}	4537	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 30.8 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.580 (Exibit 25-19)

S_R= 51.7 mph (Exhibit 25-19)

S_0= 61.5 mph (Exhibit 25-19)

S = 55.1 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 Run G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

Comes in its own lane.

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} = 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	4948	0.92	Level	4	2	0.977	1.00	5507
Ramp	1700	0.92	Level	2	2	0.986	1.00	1874
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} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3412 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7381	See Exhibit 25-7	Yes
V_{R12}	5286	~~4600 All~~ 7050	~~Yes~~ No.

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = ~~36.4 (pc/mi/ln)~~ Not applicable

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

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 1.016 (Exibit 25-19)

S_R= 41.6 mph (Exhibit 25-19)

S_0= 59.3 mph (Exhibit 25-19)

S = 45.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN 6

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

Comes in its own lane.

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1734	0.92	Level	4	2	0.977	1.00	1930
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} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1196 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2977	See Exhibit 25-7	No
V_{R12}	2243	~~4600 All~~ 7050	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 = 13.1 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.223 (Exibit 25-19)

S_R = 59.9 mph (Exhibit 25-19)

S_0 = 64.2 mph (Exhibit 25-19)

S = 60.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 - No EB Slip ramp G (2)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4948	0.92	Level	4	2	0.977	1.00	5507
Ramp	1888	0.92	Level	2	2	0.986	1.00	2081
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3412 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7588	See Exhibit 25-7	Yes
V_{R12}	5493	~~4600:All~~ 7050	~~Yes~~ No

Leveled Service Determination (Merge)

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

D_R = 38.0 (pc/mi/ln) Not applicable

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.194 (Exibit 25-19)

S_R = 37.5 mph (Exhibit 25-19)

S_0 = 59.3 mph (Exhibit 25-19)

S = 41.8 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Leveled Service Determination (Diverge)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 - No EB slip ramp G(2)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1734	0.92	Level	4	2	0.977	1.00	1930
Ramp	1163	0.92	Level	2	2	0.986	1.00	1282
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1196 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3212	See Exhibit 25-7	No
V_{R12}	2478	~~4600 All~~ 7050	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 = 14.8 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.232 (Exibit 25-19)

S_R = 59.7 mph (Exhibit 25-19)

S_0 = 64.2 mph (Exhibit 25-19)

S = 60.6 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 - With WB barrier G(3)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4948	0.92	Level	4	2	0.977	1.00	5507
Ramp	1892	0.92	Level	2	2	0.986	1.00	2085
UpStream								
DownStream								

Merge Areas

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3412 pc/h

Diverge Areas

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

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

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

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7592	See Exhibit 25-7	Yes
V_{R12}	5497	~~4600~~ All 7050	~~Yes~~ No

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 38.0 (pc/mi/ln)

LOS = ~~F (Exhibit 25-4)~~ Not applicable

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 1.197 (Exibit 25-19)

S_R= 37.5 mph (Exhibit 25-19)

S_0= 59.3 mph (Exhibit 25-19)

S = 41.7 mph (Exhibit 25-14)

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans With WB barrier
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G7 (3)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1734	0.92	Level	4	2	0.977	1.00	1930
Ramp	1171	0.92	Level	2	2	0.986	1.00	1291
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1196 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3221	See Exhibit 25-7	No
V_{R12}	2487	~~4600~~:All 2050	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 = 14.9 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.233 (Exibit 25-19)

S_R= 59.6 mph (Exhibit 25-19)

S_0= 64.2 mph (Exhibit 25-19)

S = 60.6 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 - No slip & barrier G(4)

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
Vu = veh/h	S_{FF} = 65.0 mph S_{FR} = 25.0 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	4948	0.92	Level	4	2	0.977	1.00	5507
Ramp	2080	0.92	Level	2	2	0.986	1.00	2293
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3412 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7800	See Exhibit 25-7	Yes
V_{R12}	5705	~~4600 All~~ 2050	~~Yes~~ 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 = ~~39.5 (pc/mi/ln)~~ Not applicable

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

Speed Estimation

M_S = 1.417 (Exibit 25-19)

S_R = 32.4 mph (Exhibit 25-19)

S_0 = 59.3 mph (Exhibit 25-19)

S = 36.9 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 - No slip & barrier G (4)

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1734	0.92	Level	4	2	0.977	1.00	1930
Ramp	1384	0.92	Level	2	2	0.986	1.00	1525
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1196 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3455	See Exhibit 25-7	No
V_{R12}	2721	~~4600~~ All 7059	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 = 16.6 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.245 (Exibit 25-19)

S_R= 59.4 mph (Exhibit 25-19)

S_0= 64.2 mph (Exhibit 25-19)

S = 60.3 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 - No slip & WB C-D

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = 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} = 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	4948	0.92	Level	4	2	0.977	1.00	5507
Ramp	1982	0.92	Level	2	2	0.986	1.00	2185
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 3412 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	7692	See Exhibit 25-7	Yes
V_{R12}	5597	~~4600~~:All 2030	~~Yes~~ 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 = 38.7 (pc/mi/ln) Not applicable

LOS = F (Exhibit 25-4)

Speed Estimation

M_S = 1.298 (Exibit 25-19)

S_R= 35.2 mph (Exhibit 25-19)

S_0= 59.3 mph (Exhibit 25-19)

S = 39.5 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 WB-56M2
Agency or Company	Caltrans	Junction	Carmel Country Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 - No slip & WB C-D

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1734	0.92	Level	4	2	0.977	1.00	1930
Ramp	1262	0.92	Level	2	2	0.986	1.00	1391
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.619 using Equation (Exhibit 25-5)

V_{12} = 1196 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3321	See Exhibit 25-7	No
V_{R12}	2587	~~4600 All~~ 2050	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 15.6 (pc/mi/ln) Not applicable

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.238 (Exibit 25-19)

S_R = 59.5 mph (Exhibit 25-19)

S_0 = 64.2 mph (Exhibit 25-19)

S = 60.5 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 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_A = 600'

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2532	0.92	Level	4	2	0.977	1.00	2818
Ramp	590	0.92	Level	2	2	0.986	1.00	650
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.285 using Equation (Exhibit 25-5)

V_{12} = 804 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3468	See Exhibit 25-7	No
V_{R12}	1454	4600:All	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 = 12.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.284 (Exibit 25-19)

S_R = 58.5 mph (Exhibit 25-19)

S_0 = 63.2 mph (Exhibit 25-19)

S = 61.1 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4451	0.92	Level	4	2	0.977	1.00	4954
Ramp	410	0.92	Level	2	2	0.986	1.00	452
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} = 0.310 using Equation (Exhibit 25-5)

V_{12} = 1536 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5406	See Exhibit 25-7	No
V_{R12}	1988	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{Fi} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 17.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.295 (Exibit 25-19)

S_R= 58.2 mph (Exhibit 25-19)

S_0= 60.6 mph (Exhibit 25-19)

S = 59.7 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = 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	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

S_{FF} = 65.0 mph S_{FR} = 45.0 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	4468	0.92	Level	4	2	0.977	1.00	4973
Ramp	880	0.92	Level	2	2	0.986	1.00	970
UpStream								
DownStream								

Estimation of V_{12} — Merge Areas

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2955 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5943	See Exhibit 25-7	No
V_{R12}	3925	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 31.9 (pc/mi/ln)

LOS = D (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 = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation — Merge Areas

M_S = 0.465 (Exibit 25-19)

S_R = 54.3 mph (Exhibit 25-19)

S_0 = 59.5 mph (Exhibit 25-19)

S = 56.0 mph (Exhibit 25-14)

Speed Estimation — Diverge Areas

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	SR 56 WB-56M4
Agency or Company	Caltrans	Junction	Carmel Valley Rd to WB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

$L_A = 600'$

S_{FF} = 65.0 mph S_{FR} = 45.0 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	1414	0.92	Level	4	2	0.977	1.00	1574
Ramp	620	0.92	Level	2	2	0.986	1.00	683
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 935 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2257	See Exhibit 25-7	No
V_{R12}	1618	4600:All	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 = 14.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.287 (Exibit 25-19)

S_R = 58.4 mph (Exhibit 25-19)

S_0 = 64.5 mph (Exhibit 25-19)

S = 60.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build AM	Analysis Year	Year 2030 RUN G

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

C_A = 600'

S_{FF} = 65.0 mph S_{FR} = 45.0 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	2572	0.92	Level	4	2	0.977	1.00	2863
Ramp	325	0.92	Level	2	2	0.986	1.00	358
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 1701 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3221	See Exhibit 25-7	No
V_{R12}	2059	4600:All	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 = 17.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R = 58.2 mph (Exhibit 25-19)

S_0 = 62.6 mph (Exhibit 25-19)

S = 59.7 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M5
Agency or Company	Caltrans	Junction	Carmel Valley Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030 SR 56 Build PM	Analysis Year	Year 2030 RUN 6

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☒ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

L_A = 600'

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3811	0.92	Level	4	2	0.977	1.00	4242
Ramp	355	0.92	Level	2	2	0.986	1.00	391
UpStream								
DownStream								

Merge Areas

Estimation of V_{12}

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

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

P_{FM} = 0.594 using Equation (Exhibit 25-5)

V_{12} = 2521 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4633	See Exhibit 25-7	No
V_{R12}	2912	4600:All	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 = 24.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.339 (Exibit 25-19)

S_R = 57.2 mph (Exhibit 25-19)

S_0 = 60.6 mph (Exhibit 25-19)

S = 58.4 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = 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	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Hyb with flyover 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} = 45.0 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	2179	0.92	Level	4	2	0.977	1.00	2425
Ramp	716	0.92	Level	2	2	0.986	1.00	789
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

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

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

P_{FM} = 0.268 using Equation (Exhibit 25-5)

V_{12} = 650 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3214	See Exhibit 25-7	No
V_{R12}	1439	4600:All	No

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

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 = 12.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = 0.283 (Exibit 25-19)

S_R= 58.5 mph (Exhibit 25-19)

S_0= 63.6 mph (Exhibit 25-19)

S = 61.2 mph (Exhibit 25-14)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shankar	Freeway/Dir of Travel	SR 56 EB-56M3
Agency or Company	Caltrans	Junction	Carmel Country Rd to EB SR 56
Date Performed	7/5/2007	Jurisdiction	Caltrans
Analysis Time Period	Year 2030	Analysis Year	Hyb with flyover PM

Project Description I-5/SR 56 PSR

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 45.0 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	3981	0.92	Level	4	2	0.977	1.00	4431
Ramp	586	0.92	Level	2	2	0.986	1.00	646
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

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

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

P_{FM} = 0.286 using Equation (Exhibit 25-5)

V_{12} = 1266 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	5077	See Exhibit 25-7	No
V_{R12}	1912	4600:All	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 = 16.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.293 (Exibit 25-19)

S_R= 58.3 mph (Exhibit 25-19)

S_0= 61.1 mph (Exhibit 25-19)

S = 60.0 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} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

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

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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