



APPENDIX O

2020 & 2040 Build 2A Freeway HCS Operational Analysis

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 1-Bet Copans & Sample
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2380ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4305	0.95	3	0	1.5	1.2	0.985	1.00	4600
V_{RF}	355	0.92	2	0	1.5	1.2	0.990	1.00	390
V_{FR}	790	0.92	2	0	1.5	1.2	0.990	1.00	867
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	4600							V =	5857
V_W	1257								
VR	0.215								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1257 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1692 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1467 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3159 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	766

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5777 veh/h	Weaving intensity factor, W	0.283
Weaving segment capacity, c_w	8765 veh/h	Weaving segment speed, S	54.7 mph
Weaving segment v/c ratio	0.659	Average weaving speed, S_W	57.9 mph
Weaving segment density, D	26.8 pc/mi/ln	Average non-weaving speed, S_{NW}	53.9 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4686 ft

Notes

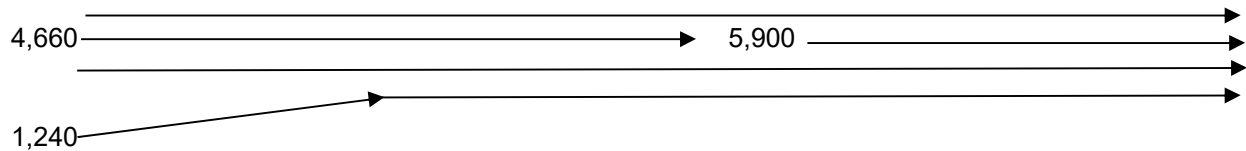
- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst		Highway/Direction of Travel	I-95 NB
Agency or Company	AECOM	From/To	Seg 2-Bet Off & On from Sample
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	4660	veh/h	Peak-Hour Factor, PHF
AADT		veh/day	%Trucks and Buses, P _T
Peak-Hr Prop. of AADT, K			%RVs, P _R
Peak-Hr Direction Prop, D			General Terrain:
DDHV = AADT x K x D		veh/h	Grade % Length
			Up/Down %
			0.95
			3
			0
			Level
			mi
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985
Speed Inputs		Calc Speed Adj and FFS	
Lane Width	ft	f _{LV}	mph
Rt-Side Lat. Clearance	ft	f _{LC}	mph
Number of Lanes, N	3	TRD Adjustment	mph
Total Ramp Density, TRD	ramps/mi	FFS	70.0
FFS (measured)	70.0	mph	mph
Base free-flow Speed, BFFS	mph		
LOS and Performance Measures		Design (N)	
Operational (LOS)		Design (N)	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	1660 pc/h/ln	Design LOS	
S	67.5 mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	pc/h/ln
D = v _p / S	24.6 pc/mi/ln	S	mph
LOS	C	D = v _p / S	pc/mi/ln
		Required Number of Lanes, N	
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LV} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 3: I-95 Northbound On-Ramp from WB Sample Road
Analysis Period: AM Peak Hour
Analysis Year: 2020 Build 2A



PHF =	0.95	
$V_{fr} =$	5,900	vph
$V_r =$	1,240	vph
$V_f =$	4,660	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.985</u>
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.9901</u>
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=V_r/(PHF)(f_{HV})(f_P) =$	6,304 pc/h
$V_r =$	$=V_r/(PHF)(f_{HV})(f_P) =$	1,318 pc/h
$V_f =$	$=V_f/(PHF)(f_{HV})(f_P) =$	4,979 pc/h
No. lanes upstream of ramp $N =$	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,304	0.66	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,979	0.69	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,318	0.63	No

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 4-On from Exp
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A

Project Description SW 10th Street SIMR

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off $L_{up} =$ ft $V_u =$ veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A 1500 Deceleration Lane Length L_D Freeway Volume, V_F 5900 Ramp Volume, V_R 710 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off $L_{down} =$ 2950 ft $V_D =$ 250 veh/h
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Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5900	0.95	Level	3	0	0.985	1.00	6304
Ramp	710	0.92	Level	2	0	0.990	1.00	779
UpStream								
DownStream	250	0.92	Level	2	0	0.990	1.00	274

Merge Areas

Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 $L_{EQ} =$
 $P_{FM} =$ 0.120 using Equation (Exhibit 13-6)
 $V_{12} =$ 759 pc/h
 V_3 or V_{av34} 2772 pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ 2521 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 $L_{EQ} =$
 $P_{FD} =$ using Equation (Exhibit 13-7)
 $V_{12} =$ pc/h
 V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V_{FO}	7083	Exhibit 13-8	No	V_F		Exhibit 13-8	
				$V_{FO} = V_F - V_R$		Exhibit 13-8	
				V_R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V_{R12}	3602	Exhibit 13-8 4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V_{12}		Exhibit 13-8	

Level 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 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 $D_R =$ (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

$M_S =$ 0.314 (Exhibit 13-11)
 $S_R =$ 61.2 mph (Exhibit 13-11)
 $S_0 =$ 65.9 mph (Exhibit 13-11)
 $S =$ 63.4 mph (Exhibit 13-13)

Speed Determination

$D_s =$ (Exhibit 13-12)
 $S_R =$ mph (Exhibit 13-12)
 $S_0 =$ mph (Exhibit 13-12)
 $S =$ mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 5-Off to Exp from GPL
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A

Project Description SW 10th Street SIMR

Inputs																		
Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 2950 ft V _u = 710 veh/h	<table style="width: 100%;"> <tr> <td>Freeway Number of Lanes, N</td> <td style="text-align: center;">4</td> </tr> <tr> <td>Ramp Number of Lanes, N</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Acceleration Lane Length, L_A</td> <td></td> </tr> <tr> <td>Deceleration Lane Length L_D</td> <td style="text-align: center;">200</td> </tr> <tr> <td>Freeway Volume, V_F</td> <td style="text-align: center;">6610</td> </tr> <tr> <td>Ramp Volume, V_R</td> <td style="text-align: center;">250</td> </tr> <tr> <td>Freeway Free-Flow Speed, S_{FF}</td> <td style="text-align: center;">70.0</td> </tr> <tr> <td>Ramp Free-Flow Speed, S_{FR}</td> <td style="text-align: center;">45.0</td> </tr> </table>	Freeway Number of Lanes, N	4	Ramp Number of Lanes, N	1	Acceleration Lane Length, L _A		Deceleration Lane Length L _D	200	Freeway Volume, V _F	6610	Ramp Volume, V _R	250	Freeway Free-Flow Speed, S _{FF}	70.0	Ramp Free-Flow Speed, S _{FR}	45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
Freeway Number of Lanes, N	4																	
Ramp Number of Lanes, N	1																	
Acceleration Lane Length, L _A																		
Deceleration Lane Length L _D	200																	
Freeway Volume, V _F	6610																	
Ramp Volume, V _R	250																	
Freeway Free-Flow Speed, S _{FF}	70.0																	
Ramp Free-Flow Speed, S _{FR}	45.0																	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	6610	0.95	Level	3	0	0.985	1.00	7062
Ramp	250	0.92	Level	2	0	0.990	1.00	274
UpStream	710	0.92	Level	2	0	0.990	1.00	779
DownStream								

Merge Areas	Diverge Areas
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Estimation of v ₁₂	Estimation of v ₁₂
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 0.436 using Equation (Exhibit 13-7) V ₁₂ = 3234 pc/h V ₃ or V _{av34} 1914 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS	F?		Actual	Capacity	LOS	F?
V _{FO}		Exhibit 13-8			V _F	7062	Exhibit 13-8	9600	No
					V _{FO} = V _F - V _R	6788	Exhibit 13-8	9600	No
					V _R	274	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area	Flow Entering Diverge Influence Area
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	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3234	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
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$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 30.3 (pc/mi/ln) LOS = D (Exhibit 13-2)
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Speed Determination	Speed Determination
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M _S = (Exhibit 13-11) S _R = mph (Exhibit 13-11) S ₀ = mph (Exhibit 13-11) S = mph (Exhibit 13-13)	D _s = 0.323 (Exhibit 13-12) S _R = 61.0 mph (Exhibit 13-12) S ₀ = 73.2 mph (Exhibit 13-12) S = 67.1 mph (Exhibit 13-13)
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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 6-South of Off to 10th*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>6360</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1699* pc/h/ln
 S *67.1* mph
 $D = v_p / S$ *25.3* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

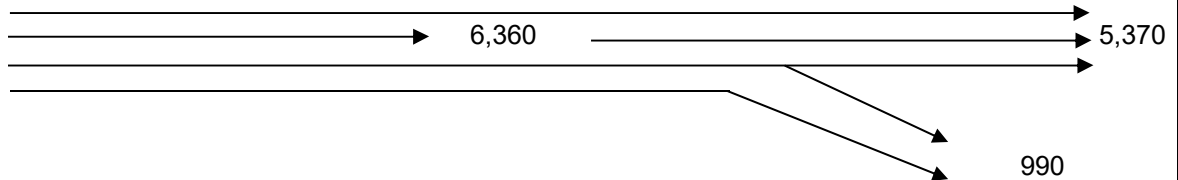
N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 7: I-95 NB Off-Ramp to SW 10th St EB & WB
Analysis Period: AM Peak Hour
Analysis Year: 2020 Build 2A



PHF =	0.95	
$v_{fr} =$	6,360	vph
$v_r =$	990	vph
$v_f =$	5,370	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,795 pc/h
$V_r =$	$=v_r/(PHF)(f_{HV})(f_P) =$	1,053 pc/h
$V_f =$	$=v_f/(PHF)(f_{HV})(f_P) =$	5,737 pc/h
No. lanes upstream of ramp $N =$	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

$D = 0.0175 (V_{fr}/N) = 29.7 \text{ pc/ln}$

LOS in the Diverge Area (from Density and Exhibit 13-2) =

D

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	6,795	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	5,737	No
2	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	4,200	1,053	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 8-Bet Off & Off Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5370</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1912* pc/h/ln
 S *64.1* mph
 $D = v_p / S$ *29.8* pc/mi/ln
 LOS *D*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 9-Off to Hillsboro EB&WB
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{up} = ft V _u = veh/h	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 5370 Ramp Volume, V_R 1250 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%; vertical-align: top;"> Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L_{down} = 2100 ft V_D = 1290 veh/h </td> </tr> </table>	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5370 Ramp Volume, V _R 1250 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1290 veh/h
Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5370 Ramp Volume, V _R 1250 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1290 veh/h		

Conversion to pc/h Under Base Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	5370	0.95	Level	3	0	0.985	1.00	5737
Ramp	1250	0.92	Level	2	0	0.990	1.00	1372
UpStream								
DownStream	1290	0.92	Level	2	0	0.990	1.00	1416

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.553 using Equation (Exhibit 13-7) V ₁₂ = 3788 pc/h V ₃ or V _{av34} 1949 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	5737	Exhibit 13-8	7200 No
				V _{FO} = V _F - V _R	4365	Exhibit 13-8	7200 No
				V _R	1372	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3788	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 35.0 (pc/mi/ln) LOS = E (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.421 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 58.2 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 73.1 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 62.5 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 10-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4120</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1467* pc/h/ln
 S *69.2* mph
 $D = v_p / S$ *21.2* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

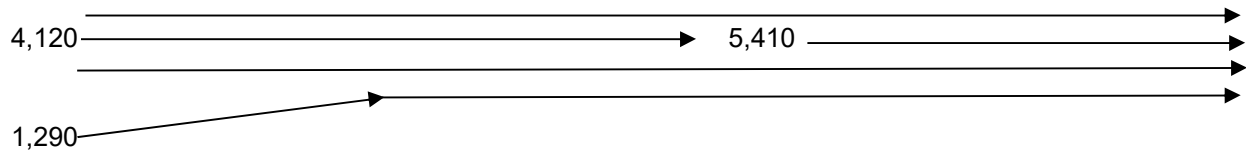
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 11: I-95 Northbound On-Ramp from EB & WB SW 10th St
Analysis Period: AM Peak Hour
Analysis Year: 2020 Build 2A



	PHF =	0.95	
	$V_{fr} =$	5,410 vph	
	$V_r =$	1,290 vph	
	$V_f =$	4,120	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	$f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985	
Ramp	$f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901	
flat terrain	$E_T =$	1.5	
	RV % =	0	
Driver Population adj.	$f_P =$	1.000	
	$V_{fr} = v_{fr}/(PHF)(f_{HV})(f_P) =$	5,780 pc/h	
	$V_r = v_r/(PHF)(f_{HV})(f_P) =$	1,371 pc/h	
	$V_f = v_f/(PHF)(f_{HV})(f_P) =$	4,402 pc/h	
No. lanes upstream of ramp	$N =$	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	5,780	0.60	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,402	0.61	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,371	0.65	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 12-Bet On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5410</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1445* pc/h/ln
 S *69.3* mph
 $D = v_p / S$ *20.9* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 13-Bet On & Off to Exp
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	4600ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4765	0.95	3	0	1.5	1.2	0.985	1.00	5091
V_{RF}	1125	0.92	2	0	1.5	1.2	0.990	1.00	1235
V_{FR}	645	0.92	2	0	1.5	1.2	0.990	1.00	708
V_{RR}	125	0.92	2	0	1.5	1.2	0.990	1.00	137
V_{NW}	7034							V =	7171
V_W	137								
VR	0.019								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	411 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1037 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3258 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4295 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2265

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	7076 veh/h	Weaving intensity factor, W	0.214
Weaving segment capacity, c_w	9064 veh/h	Weaving segment speed, S	58.5 mph
Weaving segment v/c ratio	0.781	Average weaving speed, S_W	60.3 mph
Weaving segment density, D	30.7 pc/mi/ln	Average non-weaving speed, S_{NW}	58.4 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	5904 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 14-North of Hillsboro*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5890</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1573* pc/h/ln
 S *68.4* mph
 $D = v_p / S$ *23.0* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 1-Bet Copans & Sample
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2380ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3985	0.95	3	0	1.5	1.2	0.985	1.00	4258
V_{RF}	415	0.92	2	0	1.5	1.2	0.990	1.00	456
V_{FR}	1560	0.92	2	0	1.5	1.2	0.990	1.00	1713
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	4258							V =	6427
V_W	2169								
VR	0.337								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2169 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	2604 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1397 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4001 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	709

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6342 veh/h	Weaving intensity factor, W	0.340
Weaving segment capacity, c_w	7006 veh/h	Weaving segment speed, S	49.5 mph
Weaving segment v/c ratio	0.905	Average weaving speed, S_W	56.0 mph
Weaving segment density, D	32.5 pc/mi/ln	Average non-weaving speed, S_{NW}	46.7 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	5989 ft

Notes

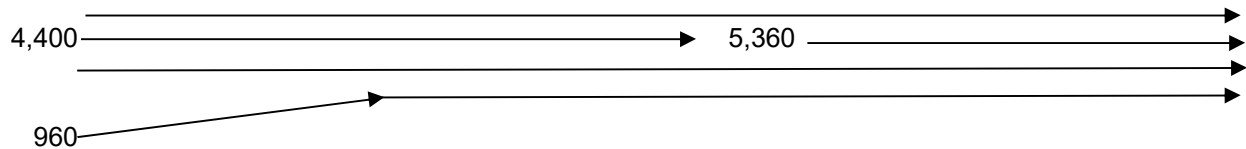
- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst		Highway/Direction of Travel	<i>I-95 NB</i>
Agency or Company	<i>AECOM</i>	From/To	<i>Seg 2-Bet Off & On from Sample</i>
Date Performed		Jurisdiction	
Analysis Time Period	<i>PM</i>	Analysis Year	<i>2020 Build 2A</i>
Project Description <i>SW 10th Street SIMR</i>			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	<i>4400</i>	veh/h	Peak-Hour Factor, PHF
AADT		veh/day	%Trucks and Buses, P _T
Peak-Hr Prop. of AADT, K			%RVs, P _R
Peak-Hr Direction Prop, D			General Terrain:
DDHV = AADT x K x D		veh/h	Grade % Length
			Up/Down %
			<i>0.95</i>
			<i>3</i>
			<i>0</i>
			<i>Level</i>
			<i>mi</i>
Calculate Flow Adjustments			
f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>
Speed Inputs		Calc Speed Adj and FFS	
Lane Width		ft	
Rt-Side Lat. Clearance		ft	f _{LV}
Number of Lanes, N	<i>3</i>		f _{LC}
Total Ramp Density, TRD		ramps/mi	TRD Adjustment
FFS (measured)	<i>70.0</i>	mph	FFS
Base free-flow Speed, BFFS		mph	<i>70.0</i>
			mph
LOS and Performance Measures		Design (N)	
Operational (LOS)		Design (N)	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	<i>1567</i>	pc/h/ln	Design LOS
S	<i>68.4</i>	mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)
D = v _p / S	<i>22.9</i>	pc/mi/ln	S
LOS	<i>C</i>		D = v _p / S
			Required Number of Lanes, N
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LV} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 3: I-95 Northbound On-Ramp from WB Sample Road
Analysis Period: PM Peak Hour
Analysis Year: 2020 Build 2A



	PHF =	0.95	
	v_{fr} =	5,360	vph
	v_r =	960	vph
	v_f =	4,400	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
	Freeway f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
	Ramp f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
	flat terrain E_T =	1.5	
	RV % =	0	
Driver Population adj.	f_P =	1.000	
	V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	5,727 pc/h
	V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,021 pc/h
	V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	4,701 pc/h
No. lanes upstream of ramp	N =	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	5,727	0.60	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,701	0.65	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,021	0.49	No

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 4-On from Exp
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp	Freeway Number of Lanes, N	4	Downstream Adj Ramp
<input type="checkbox"/> Yes <input type="checkbox"/> On	Ramp Number of Lanes, N	1	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> On
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off	Acceleration Lane Length, L_A	1500	<input type="checkbox"/> No <input checked="" type="checkbox"/> Off
$L_{up} =$ ft	Deceleration Lane Length L_D		$L_{down} =$ 2950 ft
$V_u =$ veh/h	Freeway Volume, V_F	5360	$V_D =$ 330 veh/h
	Ramp Volume, V_R	620	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5360	0.95	Level	3	0	0.985	1.00	5727
Ramp	620	0.92	Level	2	0	0.990	1.00	681
UpStream								
DownStream	330	0.92	Level	2	0	0.990	1.00	362

Merge Areas

Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 $L_{EQ} =$
 $P_{FM} =$ 0.133 using Equation (Exhibit 13-6)
 $V_{12} =$ 760 pc/h
 V_3 or V_{av34} 2483 pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ 2290 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 $L_{EQ} =$
 $P_{FD} =$ using Equation (Exhibit 13-7)
 $V_{12} =$ pc/h
 V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V_{FO}	6408	Exhibit 13-8	No	V_F		Exhibit 13-8	
				$V_{FO} = V_F - V_R$		Exhibit 13-8	
				V_R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V_{R12}	3245	Exhibit 13-8	4600:All
			No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V_{12}		Exhibit 13-8	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$
 $D_R =$ 22.5 (pc/mi/ln)
 $LOS =$ C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$
 $D_R =$ (pc/mi/ln)
 $LOS =$ (Exhibit 13-2)

Speed Determination

$M_S =$ 0.271 (Exhibit 13-11)
 $S_R =$ 62.4 mph (Exhibit 13-11)
 $S_0 =$ 66.4 mph (Exhibit 13-11)
 $S =$ 64.3 mph (Exhibit 13-13)

Speed Determination

$D_s =$ (Exhibit 13-12)
 $S_R =$ mph (Exhibit 13-12)
 $S_0 =$ mph (Exhibit 13-12)
 $S =$ mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 5-Off to Exp from GPL
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 2950 ft V _u = 620 veh/h	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 5980 Ramp Volume, V_R 330 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%;"> Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L_{down} = ft V_D = veh/h </td> </tr> </table>	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5980 Ramp Volume, V _R 330 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5980 Ramp Volume, V _R 330 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h		

Conversion to pc/h Under Base 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	0.95	Level	3	0	0.985	1.00	6389
Ramp	330	0.92	Level	2	0	0.990	1.00	362
UpStream	620	0.92	Level	2	0	0.990	1.00	681
DownStream								

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.436 using Equation (Exhibit 13-7) V ₁₂ = 2990 pc/h V ₃ or V _{av34} 1699 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	6389	Exhibit 13-8	9600 No
				V _{FO} = V _F - V _R	6027	Exhibit 13-8	9600 No
				V _R	362	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	2990	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 28.2 (pc/mi/ln) LOS = D (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11) S _R = mph (Exhibit 13-11) S ₀ = mph (Exhibit 13-11) S = mph (Exhibit 13-13)	D _s = 0.331 (Exhibit 13-12) S _R = 60.7 mph (Exhibit 13-12) S ₀ = 74.1 mph (Exhibit 13-12) S = 67.2 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 6-South of Off to 10th*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5650</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1509* pc/h/ln
 S *68.9* mph
 $D = v_p / S$ *21.9* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

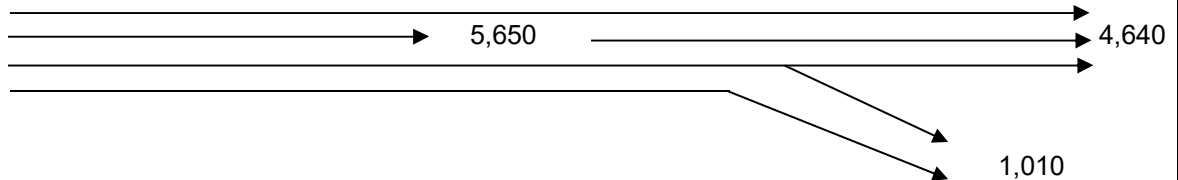
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 7: I-95 NB Off-Ramp to SW 10th St EB & WB
Analysis Period: PM Peak Hour
Analysis Year: 2020 Build 2A



PHF =	0.95	
v_{fr} =	5,650	vph
v_r =	1,010	vph
v_f =	4,640	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain E_T =	1.5	
RV % =	0	
Driver Population adj. f_P =	1.000	
V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,037 pc/h
V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,074 pc/h
V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	4,957 pc/h
No. lanes upstream of ramp N =	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

D = 0.0175 (V_{fr}/N) = 26.4 pc/ln

LOS in the Diverge Area (from Density and Exhibit 13-2) =

C

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	6,037	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	4,957	No
1	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	2,100	1,074	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 8-Bet Off & Off Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4640</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1652* pc/h/ln
 S *67.6* mph
 $D = v_p / S$ *24.4* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 9-Off to Hillsboro EB&WB
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{up} = ft V _u = veh/h	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 4640 Ramp Volume, V _R 1230 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1560 veh/h	

Conversion to pc/h Under Base Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	4640	0.95	Level	3	0	0.985	1.00	4957
Ramp	1230	0.92	Level	2	0	0.990	1.00	1350
UpStream								
DownStream	1560	0.92	Level	2	0	0.990	1.00	1713

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.574 using Equation (Exhibit 13-7) V ₁₂ = 3420 pc/h V ₃ or V _{av34} 1537 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	4957	Exhibit 13-8	7200 No
				V _{FO} = V _F - V _R	3607	Exhibit 13-8	7200 No
				V _R	1350	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3420	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 31.9 (pc/mi/ln) LOS = D (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.419 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 58.3 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 74.7 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 62.5 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 10-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>3410</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1214* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *17.3* pc/mi/ln
 LOS *B*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

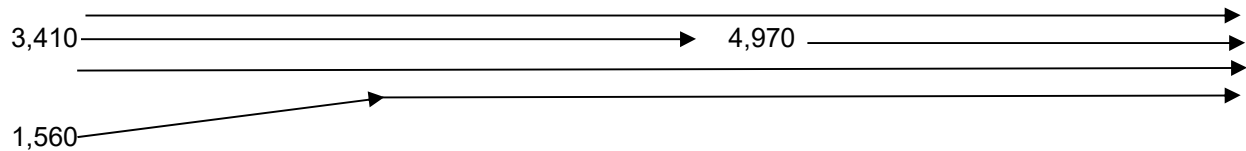
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 11: I-95 Northbound On-Ramp from EB & WB SW 10th St
Analysis Period: PM Peak Hour
Analysis Year: 2020 Build 2A



PHF =	0.95	
$V_{fr} =$	4,970	vph
$V_r =$	1,560	vph
$V_f =$	3,410	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.985</u>
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.9901</u>
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=V_r/(PHF)(f_{HV})(f_P) =$	5,310 pc/h
$V_r =$	$=V_r/(PHF)(f_{HV})(f_P) =$	1,659 pc/h
$V_f =$	$=V_f/(PHF)(f_{HV})(f_P) =$	3,643 pc/h
No. lanes upstream of ramp $N =$	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	5,310	0.55	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	3,643	0.51	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,659	0.79	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 12-Bet On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4970</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1328* pc/h/ln
 S *69.8* mph
 $D = v_p / S$ *19.0* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume

S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 13-Bet On & Off to Exp
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	4600ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4175	0.95	3	0	1.5	1.2	0.985	1.00	4461
V_{RF}	1105	0.92	2	0	1.5	1.2	0.990	1.00	1213
V_{FR}	795	0.92	2	0	1.5	1.2	0.990	1.00	873
V_{RR}	125	0.92	2	0	1.5	1.2	0.990	1.00	137
V_{NW}	6547							V =	6684
V_W	137								
VR	0.020								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	411 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1037 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3149 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4186 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2108

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6596 veh/h	Weaving intensity factor, W	0.210
Weaving segment capacity, c_w	9060 veh/h	Weaving segment speed, S	59.0 mph
Weaving segment v/c ratio	0.728	Average weaving speed, S_W	60.5 mph
Weaving segment density, D	28.3 pc/mi/ln	Average non-weaving speed, S_{NW}	59.0 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	5917 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 14-North of Hillsboro*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5280</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1410* pc/h/ln
 S *69.5* mph
 $D = v_p / S$ *20.3* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 1-Bet Hillsboro & Palmetto*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4560</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1218* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *17.4* pc/mi/ln
 LOS *B*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	195/SB
Agency/Company	AECOM	Weaving Segment Location	Seg 2-Bet On from Exp & Off
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	5200ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3470	0.95	3	0	1.5	1.2	0.985	1.00	3707
V_{RF}	970	0.92	2	0	1.5	1.2	0.990	1.00	1065
V_{FR}	1090	0.92	2	0	1.5	1.2	0.990	1.00	1197
V_{RR}	110	0.92	2	0	1.5	1.2	0.990	1.00	121
V_{NW}	5969							V =	6090
V_W	121								
VR	0.020								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	363 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1031 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3020 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4051 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2173

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6012 veh/h	Weaving intensity factor, W	0.186
Weaving segment capacity, c_w	9245 veh/h	Weaving segment speed, S	60.1 mph
Weaving segment v/c ratio	0.650	Average weaving speed, S_W	61.4 mph
Weaving segment density, D	25.3 pc/mi/ln	Average non-weaving speed, S_{NW}	60.1 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5911 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 3-Bet Off & On Ramp*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4440</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1581* pc/h/ln
 S *68.3* mph
 $D = v_p / S$ *23.1* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 5-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>3000</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1068* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *15.3* pc/mi/ln
 LOS *B*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume

S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 6-Merge from Hillsboro E&W
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 300 Deceleration Lane Length L _D Freeway Volume, V _F 3000 Ramp Volume, V _R 1310 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
L _{up} = 2400 ft V _u = 1440 veh/h		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	3000	0.95	Level	3	0	0.985	1.00	3205
Ramp	1310	0.92	Level	2	0	0.990	1.00	1438
UpStream	1440	0.92	Level	2	0	0.990	1.00	1581
DownStream								

Merge Areas	Diverge Areas
-------------	---------------

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$ L _{EQ} = 1339.80 (Equation 13-6 or 13-7) P _{FM} = 0.586 using Equation (Exhibit 13-6) V ₁₂ = 1878 pc/h V ₃ or V _{av34} = 1327 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = 1878 pc/h (Equation 13-16, 13-18, or 13-19)	$V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)
--	--

Estimation of v₁₂

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	4643	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	3316	Exhibit 13-8	4600:All No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 28.8 (pc/mi/ln) LOS = D (Exhibit 13-2)	$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)
---	--

Level of Service Determination (if not F)

Speed Determination

M _S = 0.398 (Exhibit 13-11)
S _R = 58.8 mph (Exhibit 13-11)
S ₀ = 67.0 mph (Exhibit 13-11)
S = 61.0 mph (Exhibit 13-13)

Speed Determination

D _s = (Exhibit 13-12)
S _R = mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 7-Bet On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4310</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1535* pc/h/ln
 S *68.7* mph
 $D = v_p / S$ *22.3* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

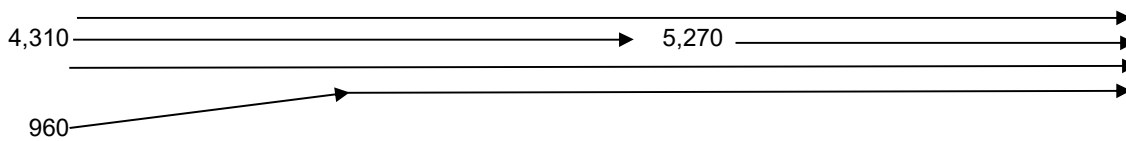
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 8: I-95 Southbound On-Ramp from SW 10th Street EB & WB
Analysis Period: AM Peak Hour
Analysis Year: 2020 Build 2A



	PHF =	0.95	
	v_{fr} =	5,270	vph
	v_r =	960	vph
	v_f =	4,310	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain	E_T =	1.5	
	RV % =	0	
Driver Population adj.	f_P =	1.000	
	V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	5,631 pc/h
	V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,021 pc/h
	V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	4,605 pc/h
No. lanes upstream of ramp	N =	3	

No. Ln	Capacity Check (see Exhibits 25-3 and 25-7):	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	5,631	0.59	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,605	0.64	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,021	0.49	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 9-Bet 10th & Exit to Exp*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	5270	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P _T	3
Peak-Hr Prop. of AADT, K			%RVs, P _R	0
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N 4
 Total Ramp Density, TRD ramps/mi
 FFS (measured) 70.0 mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS 70.0 mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ 1408 pc/h/ln
 S 69.5 mph
 $D = v_p / S$ 20.3 pc/mi/ln
 LOS C

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 10-Merge from Ex to GP
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 600 Deceleration Lane Length L _D Freeway Volume, V _F 5270 Ramp Volume, V _R 320 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off L _{down} = 1150 ft V _D = 620 veh/h
--	---	---

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	5270	0.95	Level	3	0	0.985	1.00	5631
Ramp	320	0.92	Level	2	0	0.990	1.00	351
UpStream								
DownStream	620	0.92	Level	2	0	0.990	1.00	681

Merge Areas

Diverge Areas

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 P_{FM} = 0.174 using Equation (Exhibit 13-6)
 V₁₂ = 979 pc/h
 V₃ or V_{av34} = 2326 pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = 2252 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 P_{FD} = using Equation (Exhibit 13-7)
 V₁₂ = pc/h
 V₃ or V_{av34} = pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	5982	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	2603	Exhibit 13-8	4600:All No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level 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 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 D_R = (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.314 (Exhibit 13-11)
 S_R = 61.2 mph (Exhibit 13-11)
 S₀ = 65.7 mph (Exhibit 13-11)
 S = 63.7 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)
 S_R = mph (Exhibit 13-12)
 S₀ = mph (Exhibit 13-12)
 S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 11- Diverge to Express
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 1150 ft V _u = 320 veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5590 Ramp Volume, V _R 620 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
--	---	--

Conversion to pc/h Under Base 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	0.95	Level	3	0	0.985	1.00	5972
Ramp	620	0.92	Level	2	0	0.990	1.00	681
UpStream	320	0.92	Level	2	0	0.990	1.00	351
DownStream								

Merge Areas

Diverge Areas

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 L_{EQ} =
 P_{FM} = using Equation (Exhibit 13-6)
 V₁₂ = pc/h
 V₃ or V_{av34} pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 L_{EQ} =
 P_{FD} = 0.436 using Equation (Exhibit 13-7)
 V₁₂ = 2988 pc/h
 V₃ or V_{av34} 1492 pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8	

Capacity Checks

	Actual	Capacity	LOS F?
V _F	5972	Exhibit 13-8	9600 No
V _{FO} = V _F - V _R	5291	Exhibit 13-8	9600 No
V _R	681	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂	2988	Exhibit 13-8	4400: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 = (pc/mi/ln)
 LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 D_R = 30.7 (pc/mi/ln)
 LOS = D (Exhibit 13-2)

Speed Determination

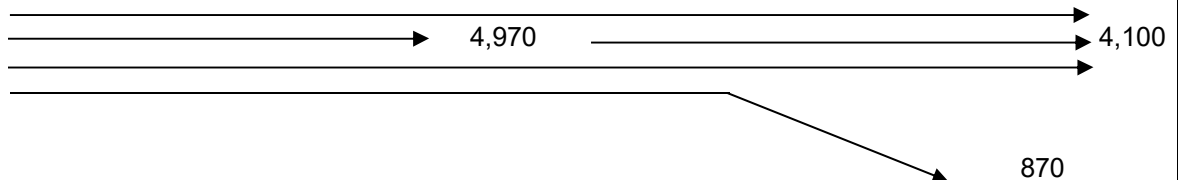
M_S = (Exhibit 13-11)
 S_R = mph (Exhibit 13-11)
 S₀ = mph (Exhibit 13-11)
 S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.359 (Exhibit 13-12)
 S_R = 59.9 mph (Exhibit 13-12)
 S₀ = 75.5 mph (Exhibit 13-12)
 S = 66.0 mph (Exhibit 13-13)

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 12: I-95 SB Off-Ramp to Sample Road EB & WB
Analysis Period: AM Peak Hour
Analysis Year: 2020 Build 2A



PHF =	0.95	
$v_{fr} =$	4,970	vph
$v_r =$	870	vph
$v_f =$	4,100	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	5,310 pc/h
$V_r =$	$=v_r/(PHF)(f_{HV})(f_P) =$	925 pc/h
$V_f =$	$=v_f/(PHF)(f_{HV})(f_P) =$	4,381 pc/h
No. lanes upstream of ramp $N =$	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

$D = 0.0175 (V_{fr}/N) = 23.2 \text{ pc/ln}$

LOS in the Diverge Area (from Density and Exhibit 13-2) =

C

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	5,310	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	4,381	No
1	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	2,100	925	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 13-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4100</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1460* pc/h/ln
 S *69.2* mph
 $D = v_p / S$ *21.1* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency/Company	AECOM	Weaving Segment Location	Seg 14- Bet Sample & Copans
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2520ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3485	0.95	3	0	1.5	1.2	0.985	1.00	3723
V_{RF}	1770	0.92	2	0	1.5	1.2	0.990	1.00	1943
V_{FR}	615	0.92	2	0	1.5	1.2	0.990	1.00	675
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	3723							V =	6341
V_W	2618								
VR	0.413								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6261 veh/h	Weaving intensity factor, W	
Weaving segment capacity, c_w	5727 veh/h	Weaving segment speed, S	mph
Weaving segment v/c ratio	1.093	Average weaving speed, S_W	mph
Weaving segment density, D	pc/mi/ln	Average non-weaving speed, S_{NW}	mph
Level of Service, LOS	F	Maximum weaving length, L_{MAX}	6826 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 1-Bet Hillsboro & Palmetto*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4530</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1210* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *17.3* pc/mi/ln
 LOS *B*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	195/SB
Agency/Company	AECOM	Weaving Segment Location	Seg 2-Bet On from Exp & Off
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	5200ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3600	0.95	3	0	1.5	1.2	0.985	1.00	3846
V_{RF}	970	0.92	2	0	1.5	1.2	0.990	1.00	1065
V_{FR}	930	0.92	2	0	1.5	1.2	0.990	1.00	1021
V_{RR}	110	0.92	2	0	1.5	1.2	0.990	1.00	121
V_{NW}	5932							V =	6053
V_W	121								
VR	0.020								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	363 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1031 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3012 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4043 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2159

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5975 veh/h	Weaving intensity factor, W	0.185
Weaving segment capacity, c_w	9245 veh/h	Weaving segment speed, S	60.1 mph
Weaving segment v/c ratio	0.646	Average weaving speed, S_W	61.4 mph
Weaving segment density, D	25.2 pc/mi/ln	Average non-weaving speed, S_{NW}	60.1 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5912 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 3-Bet Off & On Ramp*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4570</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1628* pc/h/ln
 S *67.9* mph
 $D = v_p / S$ *24.0* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 5-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	3360	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P _T	3
Peak-Hr Prop. of AADT, K			%RVs, P _R	0
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N 3
 Total Ramp Density, TRD ramps/mi
 FFS (measured) 70.0 mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS 70.0 mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ 1197 pc/h/ln
 S 70.0 mph
 $D = v_p / S$ 17.1 pc/mi/ln
 LOS B

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 6-Merge from Hillsboro E&W
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 300 Deceleration Lane Length L _D Freeway Volume, V _F 3360 Ramp Volume, V _R 1470 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
L _{up} = 2400 ft V _u = 1210 veh/h		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	3360	0.95	Level	3	0	0.985	1.00	3590
Ramp	1470	0.92	Level	2	0	0.990	1.00	1614
UpStream	1210	0.92	Level	2	0	0.990	1.00	1328
DownStream								

Merge Areas	Diverge Areas
-------------	---------------

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$ L _{EQ} = 1459.86 (Equation 13-6 or 13-7) P _{FM} = 0.586 using Equation (Exhibit 13-6) V ₁₂ = 2103 pc/h V ₃ or V _{av34} = 1487 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = 2103 pc/h (Equation 13-16, 13-18, or 13-19)
--

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)
--

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	5204	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	3717	Exhibit 13-8	4600:All No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level 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 = D (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)
--

Speed Determination

M _S = 0.451 (Exhibit 13-11)
S _R = 57.4 mph (Exhibit 13-11)
S ₀ = 66.4 mph (Exhibit 13-11)
S = 59.7 mph (Exhibit 13-13)

Speed Determination

D _s = (Exhibit 13-12)
S _R = mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 7-Bet On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4830</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1720* pc/h/ln
 S *66.9* mph
 $D = v_p / S$ *25.7* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

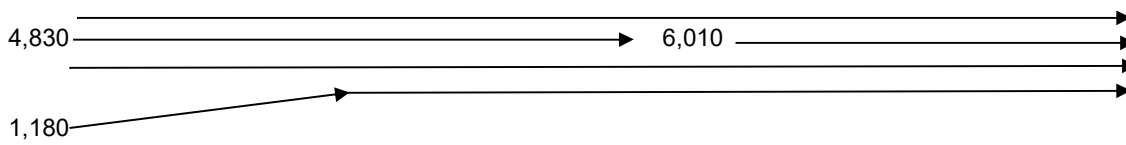
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 8: I-95 Southbound On-Ramp from SW 10th Street EB & WB
Analysis Period: PM Peak Hour
Analysis Year: 2020 Build 3



	PHF =	0.95	
	v_{fr} =	6,010	vph
	v_r =	1,180	vph
	v_f =	4,830	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain	E_T =	1.5	
	RV % =	0	
Driver Population adj.	f_P =	1.000	
	V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,421 pc/h
	V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,255 pc/h
	V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	5,160 pc/h
No. lanes upstream of ramp	N =	3	

No. Ln	Capacity Check (see Exhibits 25-3 and 25-7):	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,421	0.67	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	5,160	0.72	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,255	0.60	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 9-Bet 10th & Exit to Exp*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>6010</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1605* pc/h/ln
 S *68.1* mph
 $D = v_p / S$ *23.6* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume

S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 10-Merge from Ex to GP
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{up} = ft V _u = veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 600 Deceleration Lane Length L _D Freeway Volume, V _F 6010 Ramp Volume, V _R 300 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off L _{down} = 1150 ft V _D = 670 veh/h
--	---	---

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	6010	0.95	Level	3	0	0.985	1.00	6421
Ramp	300	0.92	Level	2	0	0.990	1.00	329
UpStream								
DownStream	670	0.92	Level	2	0	0.990	1.00	736

Merge Areas

Diverge Areas

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 P_{FM} = 0.177 using Equation (Exhibit 13-6)
 V₁₂ = 1134 pc/h
 V₃ or V_{av34} = 2643 pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = 2568 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 P_{FD} = using Equation (Exhibit 13-7)
 V₁₂ = pc/h
 V₃ or V_{av34} = pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}	6750	Exhibit 13-8	No	V _F		Exhibit 13-8	
				V _{FO} = V _F - V _R		Exhibit 13-8	
				V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	2897	Exhibit 13-8 4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level 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 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 D_R = (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.332 (Exhibit 13-11)
 S_R = 60.7 mph (Exhibit 13-11)
 S₀ = 64.9 mph (Exhibit 13-11)
 S = 63.0 mph (Exhibit 13-13)

Speed Determination

D_S = (Exhibit 13-12)
 S_R = mph (Exhibit 13-12)
 S₀ = mph (Exhibit 13-12)
 S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 11- Diverge to Express
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build 2A

Project Description SW 10th Street SIMR

Inputs		
Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 1150 ft V _u = 300 veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 6310 Ramp Volume, V _R 670 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h

Conversion to pc/h Under Base Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	6310	0.95	Level	3	0	0.985	1.00	6742
Ramp	670	0.92	Level	2	0	0.990	1.00	736
UpStream	300	0.92	Level	2	0	0.990	1.00	329
DownStream								

Merge Areas					Diverge Areas				
Estimation of v ₁₂					Estimation of v ₁₂				
V ₁₂ = V _F (P _{FM}) (Equation 13-6 or 13-7) L _{EQ} = P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					V ₁₂ = V _R + (V _F - V _R)P _{FD} (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 0.436 using Equation (Exhibit 13-7) V ₁₂ = 3355 pc/h V ₃ or V _{av34} 1693 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				

Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}		Exhibit 13-8			V _F	6742	Exhibit 13-8	9600	No
					V _{FO} = V _F - V _R	6006	Exhibit 13-8	9600	No
					V _R	736	Exhibit 13-10	2100	No

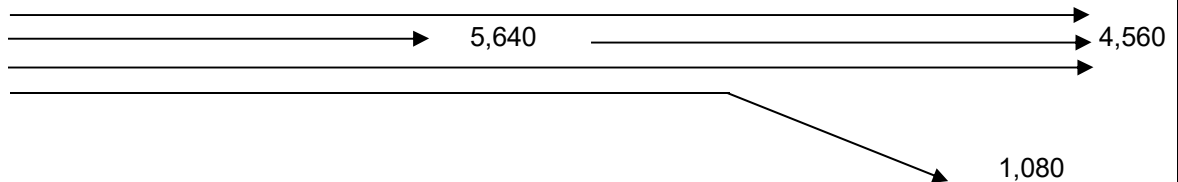
Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3355	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)				Level of Service Determination (if not F)			
D _R = 5.475 + 0.00734 v _R + 0.0078 V ₁₂ - 0.00627 L _A D _R = (pc/mi/ln) LOS = (Exhibit 13-2)				D _R = 4.252 + 0.0086 V ₁₂ - 0.009 L _D D _R = 34.2 (pc/mi/ln) LOS = D (Exhibit 13-2)			

Speed Determination		Speed Determination	
M _S = (Exhibit 13-11)		D _s = 0.364 (Exhibit 13-12)	
S _R = mph (Exhibit 13-11)		S _R = 59.8 mph (Exhibit 13-12)	
S ₀ = mph (Exhibit 13-11)		S ₀ = 74.7 mph (Exhibit 13-12)	
S = mph (Exhibit 13-13)		S = 65.7 mph (Exhibit 13-13)	

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 12: I-95 SB Off-Ramp to Sample Road EB & WB
Analysis Period: PM Peak Hour
Analysis Year: 2020 Build 2A



PHF =	0.95	
$v_{fr} =$	5,640	vph
$v_r =$	1,080	vph
$v_f =$	4,560	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,026 pc/h
$V_r =$	$=v_r/(PHF)(f_{HV})(f_P) =$	1,148 pc/h
$V_f =$	$=v_f/(PHF)(f_{HV})(f_P) =$	4,872 pc/h
No. lanes upstream of ramp $N =$	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

$D = 0.0175 (V_{fr}/N) = 26.4 \text{ pc/ln}$

LOS in the Diverge Area (from Density and Exhibit 13-2) =

C

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	6,026	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	4,872	No
1	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	2,100	1,148	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 13-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2020 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4560</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1624* pc/h/ln
 S *67.9* mph
 $D = v_p / S$ *23.9* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency/Company	AECOM	Weaving Segment Location	Seg 14- Bet Sample & Copans
Date Performed		Analysis Year	2020 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2520ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3915	0.95	3	0	1.5	1.2	0.985	1.00	4183
V_{RF}	1380	0.92	2	0	1.5	1.2	0.990	1.00	1515
V_{FR}	645	0.92	2	0	1.5	1.2	0.990	1.00	708
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	4183							V =	6406
V_W	2223								
VR	0.347								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2223 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	2672 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1457 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4129 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	738

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6323 veh/h	Weaving intensity factor, W	0.334
Weaving segment capacity, c_w	6814 veh/h	Weaving segment speed, S	49.3 mph
Weaving segment v/c ratio	0.928	Average weaving speed, S_W	56.2 mph
Weaving segment density, D	32.5 pc/mi/ln	Average non-weaving speed, S_{NW}	46.3 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	6094 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 1-Bet Copans & Sample
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2380ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4420	0.95	3	0	1.5	1.2	0.985	1.00	4722
V_{RF}	420	0.92	2	0	1.5	1.2	0.990	1.00	461
V_{FR}	980	0.92	2	0	1.5	1.2	0.990	1.00	1076
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	4722							V =	6259
V_W	1537								
VR	0.246								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1537 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1972 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1492 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3464 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	787

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6175 veh/h	Weaving intensity factor, W	0.304
Weaving segment capacity, c_w	8666 veh/h	Weaving segment speed, S	52.7 mph
Weaving segment v/c ratio	0.712	Average weaving speed, S_W	57.2 mph
Weaving segment density, D	29.7 pc/mi/ln	Average non-weaving speed, S_{NW}	51.4 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	5007 ft

Notes

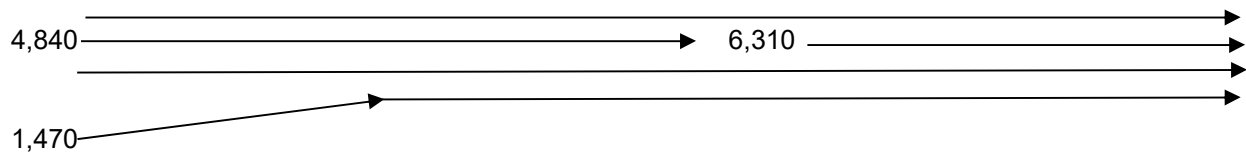
- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst		Highway/Direction of Travel	I-95 NB
Agency or Company	AECOM	From/To	Seg 2-Bet Off & On from Sample
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A
Project Description SW 10th Street SIMR			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	4840	veh/h	Peak-Hour Factor, PHF
AADT		veh/day	%Trucks and Buses, P _T
Peak-Hr Prop. of AADT, K			%RVs, P _R
Peak-Hr Direction Prop, D			General Terrain:
DDHV = AADT x K x D		veh/h	Grade % Length
			Up/Down %
			0.95
			3
			0
			Level
			mi
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985
Speed Inputs		Calc Speed Adj and FFS	
Lane Width			
Rt-Side Lat. Clearance		f _{LV}	mph
Number of Lanes, N	3	f _{LC}	mph
Total Ramp Density, TRD		TRD Adjustment	mph
FFS (measured)	70.0	FFS	70.0
Base free-flow Speed, BFFS			mph
LOS and Performance Measures		Design (N)	
Operational (LOS)		Design (N)	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	1724	Design LOS	
S	66.8	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	pc/h/ln
D = v _p / S	25.8	S	mph
LOS	C	D = v _p / S	pc/mi/ln
		Required Number of Lanes, N	
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LV} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 3: I-95 Northbound On-Ramp from WB Sample Road
Analysis Period: AM Peak Hour
Analysis Year: 2040 Build 2A



PHF =	0.95	
$V_{fr} =$	6,310	vph
$V_r =$	1,470	vph
$V_f =$	4,840	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.985</u>
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.9901</u>
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=V_r/(PHF)(f_{HV})(f_P) =$	6,742 pc/h
$V_r =$	$=V_r/(PHF)(f_{HV})(f_P) =$	1,563 pc/h
$V_f =$	$=V_f/(PHF)(f_{HV})(f_P) =$	5,171 pc/h
No. lanes upstream of ramp $N =$	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,742	0.70	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	5,171	0.72	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,563	0.74	No

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 4-On from Exp
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off $L_{up} =$ ft $V_u =$ veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A 1500 Deceleration Lane Length L_D Freeway Volume, V_F 6310 Ramp Volume, V_R 860 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off $L_{down} =$ 2950 ft $V_D =$ 310 veh/h
--	--	--

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6310	0.95	Level	3	0	0.985	1.00	6742
Ramp	860	0.92	Level	2	0	0.990	1.00	944
UpStream								
DownStream	310	0.92	Level	2	0	0.990	1.00	340

Merge Areas

Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 $L_{EQ} =$
 $P_{FM} =$ 0.100 using Equation (Exhibit 13-6)
 $V_{12} =$ 673 pc/h
 V_3 or V_{av34} 3034 pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ 2696 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 $L_{EQ} =$
 $P_{FD} =$ using Equation (Exhibit 13-7)
 $V_{12} =$ pc/h
 V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V_{FO}	7686	Exhibit 13-8	No	V_F		Exhibit 13-8	
				$V_{FO} = V_F - V_R$		Exhibit 13-8	
				V_R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V_{R12}	3963	Exhibit 13-8 4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V_{12}		Exhibit 13-8	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 V_R + 0.0078 V_{12} - 0.00627 L_A$
 $D_R =$ 28.2 (pc/mi/ln)
 LOS = D (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 $D_R =$ (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

$M_S =$ 0.376 (Exhibit 13-11)
 $S_R =$ 59.5 mph (Exhibit 13-11)
 $S_0 =$ 65.5 mph (Exhibit 13-11)
 $S =$ 62.1 mph (Exhibit 13-13)

Speed Determination

$D_s =$ (Exhibit 13-12)
 $S_R =$ mph (Exhibit 13-12)
 $S_0 =$ mph (Exhibit 13-12)
 $S =$ mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 5-Off to Exp from GPL
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 2950 ft V _u = 860 veh/h	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 7170 Ramp Volume, V_R 310 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%;"> Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L_{down} = ft V_D = veh/h </td> </tr> </table>	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 7170 Ramp Volume, V _R 310 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 7170 Ramp Volume, V _R 310 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	7170	0.95	Level	3	0	0.985	1.00	7661
Ramp	310	0.92	Level	2	0	0.990	1.00	340
UpStream	860	0.92	Level	2	0	0.990	1.00	944
DownStream								

Merge Areas	Diverge Areas
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Estimation of v ₁₂	Estimation of v ₁₂
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 0.436 using Equation (Exhibit 13-7) V ₁₂ = 3532 pc/h V ₃ or V _{av34} 2064 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

Capacity Checks				Capacity Checks				
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?	
V _{FO}		Exhibit 13-8		V _F	7661	Exhibit 13-8	9600	No
				V _{FO} = V _F - V _R	7321	Exhibit 13-8	9600	No
				V _R	340	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area	Flow Entering Diverge Influence Area
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	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?	
V _{R12}		Exhibit 13-8		V ₁₂	3532	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
---	---

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 32.8 (pc/mi/ln) LOS = D (Exhibit 13-2)
---	--

Speed Determination	Speed Determination
---------------------	---------------------

M _S = (Exhibit 13-11) S _R = mph (Exhibit 13-11) S ₀ = mph (Exhibit 13-11) S = mph (Exhibit 13-13)	D _s = 0.329 (Exhibit 13-12) S _R = 60.8 mph (Exhibit 13-12) S ₀ = 72.6 mph (Exhibit 13-12) S = 66.7 mph (Exhibit 13-13)
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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 6-South of Off to 10th*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>6860</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1832* pc/h/ln
 S *65.4* mph
 $D = v_p / S$ *28.0* pc/mi/ln
 LOS *D*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

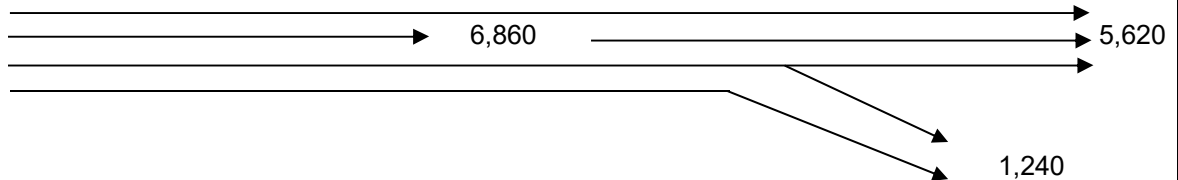
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 7: I-95 NB Off-Ramp to SW 10th St EB & WB
Analysis Period: AM Peak Hour
Analysis Year: 2040 Build 2A



PHF =	0.95	
v_{fr} =	6,860	vph
v_r =	1,240	vph
v_f =	5,620	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain E_T =	1.5	
RV % =	0	
Driver Population adj. f_P =	1.000	
V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	7,329 pc/h
V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,318 pc/h
V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	6,005 pc/h
No. lanes upstream of ramp N =	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

D = 0.0175 (V_{fr}/N) = 32.1 pc/ln

LOS in the Diverge Area (from Density and Exhibit 13-2) =

D

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	7,329	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	6,005	No
2	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	4,200	1,318	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 8-Bet Off & Off Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5620</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ 2002 pc/h/ln
 S *62.5* mph
 $D = v_p / S$ *32.0* pc/mi/ln
 LOS *D*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 9-Off to Hillsboro EB&WB
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{up} = ft V _u = veh/h	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 5620 Ramp Volume, V_R 1370 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%; vertical-align: top;"> Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L_{down} = 2100 ft V_D = 1640 veh/h </td> </tr> </table>	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5620 Ramp Volume, V _R 1370 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1640 veh/h
Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 5620 Ramp Volume, V _R 1370 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1640 veh/h		

Conversion to pc/h Under Base 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	0.95	Level	3	0	0.985	1.00	6005
Ramp	1370	0.92	Level	2	0	0.990	1.00	1504
UpStream								
DownStream	1640	0.92	Level	2	0	0.990	1.00	1800

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.541 using Equation (Exhibit 13-7) V ₁₂ = 3938 pc/h V ₃ or V _{av34} 2067 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	6005	Exhibit 13-8	7200 No
				V _{FO} = V _F - V _R	4501	Exhibit 13-8	7200 No
				V _R	1504	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3938	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 36.3 (pc/mi/ln) LOS = E (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.433 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 57.9 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 72.6 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 62.2 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 10-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4250</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1514* pc/h/ln
 S *68.9* mph
 $D = v_p / S$ *22.0* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

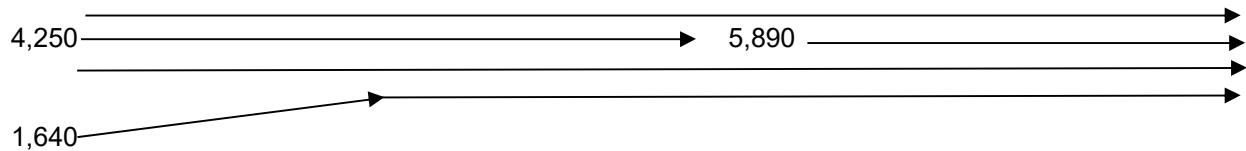
N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 11: I-95 Northbound On-Ramp from EB & WB Sample Road
Analysis Period: AM Peak Hour
Analysis Year: 2040 Build 2A



	PHF =	0.95	
	$V_{fr} =$	5,890	vph
	$V_r =$	1,640	vph
	$V_f =$	4,250	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	$f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985	
Ramp	$f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901	
flat terrain	$E_T =$	1.5	
	RV % =	0	
Driver Population adj.	$f_P =$	1.000	
	$V_{fr} = V_r/(PHF)(f_{HV})(f_P) =$	6,293	pc/h
	$V_r = V_r/(PHF)(f_{HV})(f_P) =$	1,744	pc/h
	$V_f = V_f/(PHF)(f_{HV})(f_P) =$	4,541	pc/h
No. lanes upstream of ramp	$N =$	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,293	0.66	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,541	0.63	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,744	0.83	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 12-Bet On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5890</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1573* pc/h/ln
 S *68.4* mph
 $D = v_p / S$ *23.0* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 13-Bet On & Off to Exp
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	4600ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	5140	0.95	3	0	1.5	1.2	0.985	1.00	5492
V_{RF}	1050	0.92	2	0	1.5	1.2	0.990	1.00	1153
V_{FR}	750	0.92	2	0	1.5	1.2	0.990	1.00	823
V_{RR}	290	0.92	2	0	1.5	1.2	0.990	1.00	318
V_{NW}	7468							V =	7786
V_W	318								
VR	0.041								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	954 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1580 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3354 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4934 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2405

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	7683 veh/h	Weaving intensity factor, W	0.239
Weaving segment capacity, c_w	9005 veh/h	Weaving segment speed, S	54.0 mph
Weaving segment v/c ratio	0.853	Average weaving speed, S_W	59.4 mph
Weaving segment density, D	36.0 pc/mi/ln	Average non-weaving speed, S_{NW}	53.8 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	6107 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 14-North of Hillsboro*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>6190</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1653* pc/h/ln
 S *67.6* mph
 $D = v_p / S$ *24.4* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 1-Bet Copans & Sample
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2380ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4145	0.95	3	0	1.5	1.2	0.985	1.00	4429
V_{RF}	495	0.92	2	0	1.5	1.2	0.990	1.00	543
V_{FR}	1820	0.92	2	0	1.5	1.2	0.990	1.00	1998
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	4429							V =	6970
V_W	2541								
VR	0.365								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	787

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6880 veh/h	Weaving intensity factor, W	
Weaving segment capacity, c_w	6486 veh/h	Weaving segment speed, S	mph
Weaving segment v/c ratio	1.061	Average weaving speed, S_W	mph
Weaving segment density, D	pc/mi/ln	Average non-weaving speed, S_{NW}	mph
Level of Service, LOS	F	Maximum weaving length, L_{MAX}	6287 ft

Notes

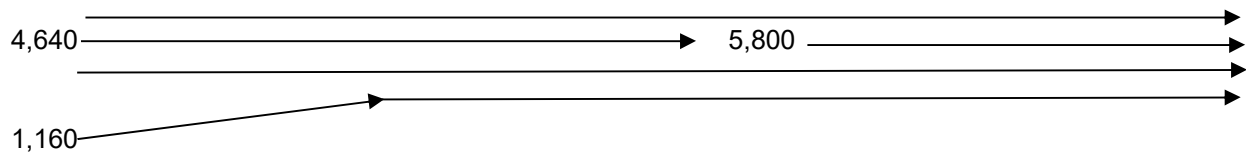
- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst		Highway/Direction of Travel	<i>I-95 NB</i>
Agency or Company	<i>AECOM</i>	From/To	<i>Seg 2-Bet Off & On from Sample</i>
Date Performed		Jurisdiction	
Analysis Time Period	<i>PM</i>	Analysis Year	<i>2040 Build 2A</i>
Project Description <i>SW 10th Street SIMR</i>			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	<i>4640</i>	veh/h	Peak-Hour Factor, PHF
AADT		veh/day	%Trucks and Buses, P _T
Peak-Hr Prop. of AADT, K			%RVs, P _R
Peak-Hr Direction Prop, D			General Terrain:
DDHV = AADT x K x D		veh/h	Grade % Length
			Up/Down %
			<i>0.95</i>
			<i>3</i>
			<i>0</i>
			<i>Level</i>
			<i>mi</i>
Calculate Flow Adjustments			
f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>
Speed Inputs		Calc Speed Adj and FFS	
Lane Width		ft	
Rt-Side Lat. Clearance		ft	f _{LV}
Number of Lanes, N	<i>3</i>		f _{LC}
Total Ramp Density, TRD		ramps/mi	TRD Adjustment
FFS (measured)	<i>70.0</i>	mph	FFS
Base free-flow Speed, BFFS		mph	<i>70.0</i>
			mph
LOS and Performance Measures		Design (N)	
Operational (LOS)		Design (N)	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	<i>1652</i>	pc/h/ln	Design LOS
S	<i>67.6</i>	mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)
D = v _p / S	<i>24.4</i>	pc/mi/ln	S
LOS	<i>C</i>		D = v _p / S
			Required Number of Lanes, N
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LV} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 3: I-95 Northbound On-Ramp from WB Sample Road
Analysis Period: PM Peak Hour
Analysis Year: 2040 Build 2A



PHF =	0.95	
$V_{fr} =$	5,800	vph
$V_r =$	1,160	vph
$V_f =$	4,640	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.985</u>
Ramp $f_{HV} =$	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.9901</u>
flat terrain $E_T =$	1.5	
RV % =	0	
Driver Population adj. $f_P =$	1.000	
$V_{fr} =$	$=V_r/(PHF)(f_{HV})(f_P) =$	6,197 pc/h
$V_r =$	$=V_r/(PHF)(f_{HV})(f_P) =$	1,233 pc/h
$V_f =$	$=V_f/(PHF)(f_{HV})(f_P) =$	4,957 pc/h
No. lanes upstream of ramp $N =$	3	

<u>No. Ln</u>	<u>Capacity Check (see Exhibits 25-3 and 25-7):</u>	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,197	0.65	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,957	0.69	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,233	0.59	No

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 4-On from Exp
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off $L_{up} =$ ft $V_u =$ veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A 1500 Deceleration Lane Length L_D Freeway Volume, V_F 5800 Ramp Volume, V_R 730 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off $L_{down} =$ 2950 ft $V_D =$ 420 veh/h
--	--	--

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5800	0.95	Level	3	0	0.985	1.00	6197
Ramp	730	0.92	Level	2	0	0.990	1.00	801
UpStream								
DownStream	420	0.92	Level	2	0	0.990	1.00	461

Merge Areas

Diverge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 $L_{EQ} =$
 $P_{FM} =$ 0.118 using Equation (Exhibit 13-6)
 $V_{12} =$ 729 pc/h
 V_3 or V_{av34} 2734 pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ 2478 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 $L_{EQ} =$
 $P_{FD} =$ using Equation (Exhibit 13-7)
 $V_{12} =$ pc/h
 V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
 Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No
 Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No
 If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?
V_{FO}	6998	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V_F		Exhibit 13-8	
$V_{FO} = V_F - V_R$		Exhibit 13-8	
V_R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V_{R12}	3576	Exhibit 13-8	4600:All No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V_{12}		Exhibit 13-8	

Level 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 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 $D_R =$ (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

$M_S =$ 0.310 (Exhibit 13-11)
 $S_R =$ 61.3 mph (Exhibit 13-11)
 $S_0 =$ 66.0 mph (Exhibit 13-11)
 $S =$ 63.4 mph (Exhibit 13-13)

Speed Determination

$D_s =$ (Exhibit 13-12)
 $S_R =$ mph (Exhibit 13-12)
 $S_0 =$ mph (Exhibit 13-12)
 $S =$ mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 5-Off to Exp from GPL
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 2950 ft V _u = 730 veh/h	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 6530 Ramp Volume, V_R 420 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%;"> Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L_{down} = ft V_D = veh/h </td> </tr> </table>	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 6530 Ramp Volume, V _R 420 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 6530 Ramp Volume, V _R 420 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h		

Conversion to pc/h Under Base 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	0.95	Level	3	0	0.985	1.00	6977
Ramp	420	0.92	Level	2	0	0.990	1.00	461
UpStream	730	0.92	Level	2	0	0.990	1.00	801
DownStream								

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.436 using Equation (Exhibit 13-7) V ₁₂ = 3302 pc/h V ₃ or V _{av34} 1837 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	6977	Exhibit 13-8	9600 No
				V _{FO} = V _F - V _R	6516	Exhibit 13-8	9600 No
				V _R	461	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3302	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 30.8 (pc/mi/ln) LOS = D (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.339 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 60.5 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 73.5 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 66.7 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 6-South of Off to 10th*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>6110</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1632* pc/h/ln
 S *67.8* mph
 $D = v_p / S$ *24.1* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

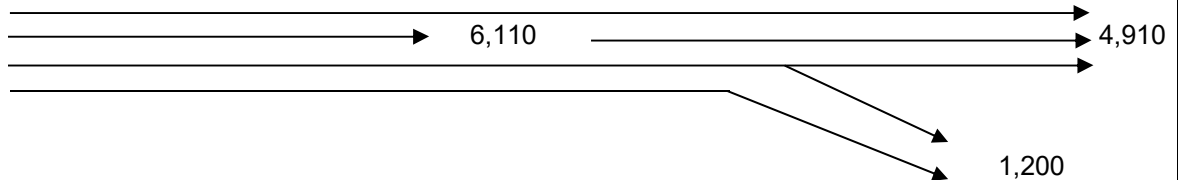
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 7: I-95 NB Off-Ramp to SW 10th St EB & WB
Analysis Period: PM Peak Hour
Analysis Year: 2040 Build 2A



PHF =	0.95	
v_{fr} =	6,110	vph
v_r =	1,200	vph
v_f =	4,910	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain E_T =	1.5	
RV % =	0	
Driver Population adj. f_P =	1.000	
V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,528 pc/h
V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,276 pc/h
V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	5,246 pc/h
No. lanes upstream of ramp N =	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

D = 0.0175 (V_{fr}/N) = 28.6 pc/ln

LOS in the Diverge Area (from Density and Exhibit 13-2) =

D

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	6,528	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	5,246	No
2	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	4,200	1,276	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 8-Bet Off & Off Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4910</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1749* pc/h/ln
 S *66.5* mph
 $D = v_p / S$ *26.3* pc/mi/ln
 LOS *D*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency or Company	AECOM	Junction	Seg 9-Off to Hillsboro EB&WB
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{up} = ft V _u = veh/h	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 4910 Ramp Volume, V_R 1360 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%; vertical-align: top;"> Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L_{down} = 2100 ft V_D = 1800 veh/h </td> </tr> </table>	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 4910 Ramp Volume, V _R 1360 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1800 veh/h
Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 4910 Ramp Volume, V _R 1360 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2100 ft V _D = 1800 veh/h		

Conversion to pc/h Under Base Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	4910	0.95	Level	3	0	0.985	1.00	5246
Ramp	1360	0.92	Level	2	0	0.990	1.00	1493
UpStream								
DownStream	1800	0.92	Level	2	0	0.990	1.00	1976

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.560 using Equation (Exhibit 13-7) V ₁₂ = 3595 pc/h V ₃ or V _{av34} 1651 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	5246	Exhibit 13-8	7200 No
				V _{FO} = V _F - V _R	3753	Exhibit 13-8	7200 No
				V _R	1493	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3595	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 33.4 (pc/mi/ln) LOS = D (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.432 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 57.9 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 74.3 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 62.2 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 10-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>3550</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1264* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *18.1* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

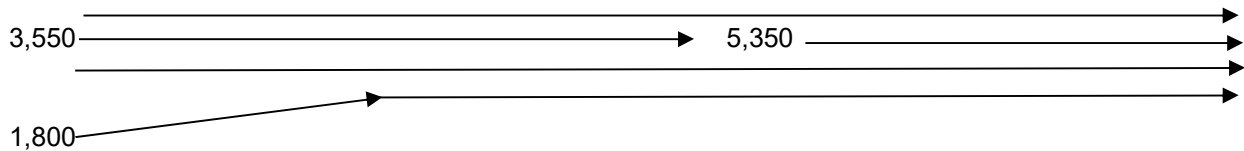
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 11: I-95 Northbound On-Ramp from EB & WB Sample Road
Analysis Period: PM Peak Hour
Analysis Year: 2040 Build 2A



	PHF =	0.95	
	$V_{fr} =$	5,350	vph
	$V_r =$	1,800	vph
	$V_f =$	3,550	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	$f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) =$		0.985
Ramp	$f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) =$		0.9901
flat terrain	$E_T =$	1.5	
	RV % =	0	
Driver Population adj.	$f_P =$	1.000	
	$V_{fr} = v_{fr}/(PHF)(f_{HV})(f_P) =$		5,716 pc/h
	$V_r = v_r/(PHF)(f_{HV})(f_P) =$		1,914 pc/h
	$V_f = v_f/(PHF)(f_{HV})(f_P) =$		3,793 pc/h
No. lanes upstream of ramp	$N =$	3	

No. Ln	Capacity Check (see Exhibits 25-3 and 25-7):	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	5,716	0.60	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	3,793	0.53	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,914	0.91	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 12-Bet On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5350</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1429* pc/h/ln
 S *69.4* mph
 $D = v_p / S$ *20.6* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 NB
Agency/Company	AECOM	Weaving Segment Location	Seg 13-Bet On & Off to Exp
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	4600ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4465	0.95	3	0	1.5	1.2	0.985	1.00	4771
V_{RF}	1145	0.92	2	0	1.5	1.2	0.990	1.00	1257
V_{FR}	885	0.92	2	0	1.5	1.2	0.990	1.00	972
V_{RR}	245	0.92	2	0	1.5	1.2	0.990	1.00	269
V_{NW}	7000							V =	7269
V_W	269								
VR	0.037								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	807 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1433 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3250 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4683 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2254

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	7173 veh/h	Weaving intensity factor, W	0.229
Weaving segment capacity, c_w	9013 veh/h	Weaving segment speed, S	55.6 mph
Weaving segment v/c ratio	0.796	Average weaving speed, S_W	59.7 mph
Weaving segment density, D	32.7 pc/mi/ln	Average non-weaving speed, S_{NW}	55.5 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	6071 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 NB*
 From/To *Seg 14-North of Hillsboro*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5610</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1498* pc/h/ln
 S *69.0* mph
 $D = v_p / S$ *21.7* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 1-Bet Hillsboro & Palmetto*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4810</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1285* pc/h/ln
 S *69.9* mph
 $D = v_p / S$ *18.4* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	195/SB
Agency/Company	AECOM	Weaving Segment Location	Seg 2-Bet On from Exp & Off
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	5200ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3520	0.95	3	0	1.5	1.2	0.985	1.00	3761
V_{RF}	1140	0.92	2	0	1.5	1.2	0.990	1.00	1252
V_{FR}	1290	0.92	2	0	1.5	1.2	0.990	1.00	1416
V_{RR}	130	0.92	2	0	1.5	1.2	0.990	1.00	143
V_{NW}	6429							V =	6572
V_W	143								
VR	0.022								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	429 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1097 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3123 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4220 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2340

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6488 veh/h	Weaving intensity factor, W	0.192
Weaving segment capacity, c_w	9237 veh/h	Weaving segment speed, S	59.1 mph
Weaving segment v/c ratio	0.702	Average weaving speed, S_W	61.2 mph
Weaving segment density, D	27.8 pc/mi/ln	Average non-weaving speed, S_{NW}	59.0 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5929 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 3-Bet Off & On Ramp*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4660</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1660* pc/h/ln
 S *67.5* mph
 $D = v_p / S$ *24.6* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 4-Diverge to SW 10th St
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs			
Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{up} = ft V _u = veh/h	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L_A Deceleration Lane Length L_D 200 Freeway Volume, V_F 4660 Ramp Volume, V_R 1890 Freeway Free-Flow Speed, S_{FF} 70.0 Ramp Free-Flow Speed, S_{FR} 45.0 </td> <td style="width: 50%; vertical-align: top;"> Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L_{down} = 2400 ft V_D = 1660 veh/h </td> </tr> </table>	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 4660 Ramp Volume, V _R 1890 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2400 ft V _D = 1660 veh/h
Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 4660 Ramp Volume, V _R 1890 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{down} = 2400 ft V _D = 1660 veh/h		

Conversion to pc/h Under Base Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	4660	0.95	Level	3	0	0.985	1.00	4979
Ramp	1890	0.92	Level	2	0	0.990	1.00	2075
UpStream								
DownStream	1660	0.92	Level	2	0	0.990	1.00	1822

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.540 using Equation (Exhibit 13-7) V ₁₂ = 3643 pc/h V ₃ or V _{av34} 1336 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	4979	Exhibit 13-8	7200 No
				V _{FO} = V _F - V _R	2904	Exhibit 13-8	7200 No
				V _R	2075	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3643	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 33.8 (pc/mi/ln) LOS = D (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.485 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 56.4 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 75.5 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 60.5 mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 5-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>2770</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *987* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *14.1* pc/mi/ln
 LOS *B*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 6-Merge from Hillsboro E&W
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off	Freeway Number of Lanes, N 3 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 300 Deceleration Lane Length L _D Freeway Volume, V _F 2770 Ramp Volume, V _R 1660 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
L _{up} = 2400 ft V _u = 1890 veh/h		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	2770	0.95	Level	3	0	0.985	1.00	2960
Ramp	1660	0.92	Level	2	0	0.990	1.00	1822
UpStream	1890	0.92	Level	2	0	0.990	1.00	2075
DownStream								

Merge Areas	Diverge Areas
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Estimation of v₁₂

$V_{12} = V_F (P_{FM})$ L _{EQ} = 1369.55 (Equation 13-6 or 13-7) P _{FM} = 0.586 using Equation (Exhibit 13-6) V ₁₂ = 1734 pc/h V ₃ or V _{av34} = 1226 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = 1734 pc/h (Equation 13-16, 13-18, or 13-19)	$V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)
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Estimation of v₁₂

$V_{12} = V_F (P_{FM})$ L _{EQ} = 1369.55 (Equation 13-6 or 13-7) P _{FM} = 0.586 using Equation (Exhibit 13-6) V ₁₂ = 1734 pc/h V ₃ or V _{av34} = 1226 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = 1734 pc/h (Equation 13-16, 13-18, or 13-19)	$V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)
--	--

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	4782	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	3556	Exhibit 13-8 4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 30.5 (pc/mi/ln) LOS = D (Exhibit 13-2)	$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)
---	--

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 30.5 (pc/mi/ln) LOS = D (Exhibit 13-2)	$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)
---	--

Speed Determination

M _S = 0.428 (Exhibit 13-11)
S _R = 58.0 mph (Exhibit 13-11)
S ₀ = 67.4 mph (Exhibit 13-11)
S = 60.2 mph (Exhibit 13-13)

Speed Determination

D _s = (Exhibit 13-12)
S _R = mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 7-Bet On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4430</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1578* pc/h/ln
 S *68.3* mph
 $D = v_p / S$ *23.1* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

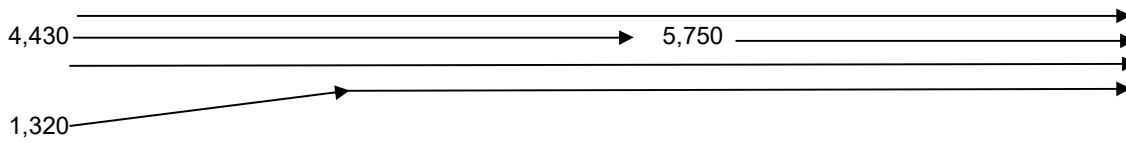
N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 8: I-95 Southbound On-Ramp from SW 10th Street EB & WB
Analysis Period: AM Peak Hour
Analysis Year: 2040 Build 2A



	PHF =	0.95	
	v_{fr} =	5,750	vph
	v_r =	1,320	vph
	v_f =	4,430	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.985</u>
Ramp	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	<u>0.9901</u>
flat terrain	E_T =	1.5	
	RV % =	0	
Driver Population adj.	f_p =	1.000	
	V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_p) =$	6,143 pc/h
	V_r =	$=v_r/(PHF)(f_{HV})(f_p) =$	1,403 pc/h
	V_f =	$=v_f/(PHF)(f_{HV})(f_p) =$	4,733 pc/h
No. lanes upstream of ramp	N =	3	

No. Ln	Capacity Check (see Exhibits 25-3 and 25-7):	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,143	0.64	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	4,733	0.66	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,403	0.67	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 9-Bet 10th & Exit to Exp*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>5750</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1536* pc/h/ln
 S *68.7* mph
 $D = v_p / S$ *22.4* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 10-Merge from Ex to GP
Date Performed		Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 600 Deceleration Lane Length L _D Freeway Volume, V _F 5750 Ramp Volume, V _R 400 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off L _{down} = 1150 ft V _D = 760 veh/h
L _{up} = ft		
V _u = veh/h		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	5750	0.95	Level	3	0	0.985	1.00	6143
Ramp	400	0.92	Level	2	0	0.990	1.00	439
UpStream								
DownStream	760	0.92	Level	2	0	0.990	1.00	834

Merge Areas

Diverge Areas

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 P_{FM} = 0.163 using Equation (Exhibit 13-6)
 V₁₂ = 1001 pc/h
 V₃ or V_{av34} = 2571 pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = 2457 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 P_{FD} = using Equation (Exhibit 13-7)
 V₁₂ = pc/h
 V₃ or V_{av34} = pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	6582	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	2896	Exhibit 13-8	4600:All No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level 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 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 D_R = (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.332 (Exhibit 13-11)
 S_R = 60.7 mph (Exhibit 13-11)
 S₀ = 65.2 mph (Exhibit 13-11)
 S = 63.1 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)
 S_R = mph (Exhibit 13-12)
 S₀ = mph (Exhibit 13-12)
 S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Site Information

Analyst	Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction
Date Performed		Seg 11- Diverge to Express
Analysis Time Period	AM	Jurisdiction
		Analysis Year
		2040 Build 2A

Project Description SW 10th Street SIMR

Inputs

Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 1150 ft V _u = 400 veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 6150 Ramp Volume, V _R 760 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h
--	---	--

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	6150	0.95	Level	3	0	0.985	1.00	6571
Ramp	760	0.92	Level	2	0	0.990	1.00	834
UpStream	400	0.92	Level	2	0	0.990	1.00	439
DownStream								

Merge Areas

Diverge Areas

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 L_{EQ} =
 P_{FM} = using Equation (Exhibit 13-6)
 V₁₂ = pc/h
 V₃ or V_{av34} pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 L_{EQ} =
 P_{FD} = 0.436 using Equation (Exhibit 13-7)
 V₁₂ = 3335 pc/h
 V₃ or V_{av34} 1618 pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8	

Capacity Checks

	Actual	Capacity	LOS F?
V _F	6571	Exhibit 13-8	9600 No
V _{FO} = V _F - V _R	5737	Exhibit 13-8	9600 No
V _R	834	Exhibit 13-10	2100 No

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂	3335	Exhibit 13-8	4400: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 = (pc/mi/ln)
 LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 D_R = 34.0 (pc/mi/ln)
 LOS = D (Exhibit 13-2)

Speed Determination

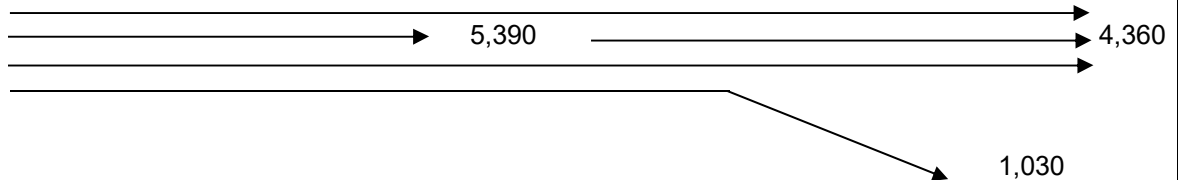
M_S = (Exhibit 13-11)
 S_R = mph (Exhibit 13-11)
 S₀ = mph (Exhibit 13-11)
 S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.373 (Exhibit 13-12)
 S_R = 59.6 mph (Exhibit 13-12)
 S₀ = 75.0 mph (Exhibit 13-12)
 S = 65.5 mph (Exhibit 13-13)

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 12: I-95 SB Off-Ramp to Sample Road EB & WB
Analysis Period: AM Peak Hour
Analysis Year: 2040 Build 2A



PHF =	0.95	
v_{fr} =	5,390	vph
v_r =	1,030	vph
v_f =	4,360	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain E_T =	1.5	
RV % =	0	
Driver Population adj. f_P =	1.000	
V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	5,759 pc/h
V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,095 pc/h
V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	4,658 pc/h
No. lanes upstream of ramp N =	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

D = 0.0175 (V_{fr}/N) = 25.2 pc/ln

LOS in the Diverge Area (from Density and Exhibit 13-2) =

C

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	5,759	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	4,658	No
1	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	2,100	1,095	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *AM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 13-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4360</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1553* pc/h/ln
 S *68.6* mph
 $D = v_p / S$ *22.7* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency/Company	AECOM	Weaving Segment Location	Seg 14- Bet Sample & Copans
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	AM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2520ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3630	0.95	3	0	1.5	1.2	0.985	1.00	3878
V_{RF}	1960	0.92	2	0	1.5	1.2	0.990	1.00	2152
V_{FR}	730	0.92	2	0	1.5	1.2	0.990	1.00	801
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	3878							V =	6831
V_W	2953								
VR	0.432								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6745 veh/h	Weaving intensity factor, W	
Weaving segment capacity, c_w	5470 veh/h	Weaving segment speed, S	mph
Weaving segment v/c ratio	1.233	Average weaving speed, S_W	mph
Weaving segment density, D	pc/mi/ln	Average non-weaving speed, S_{NW}	mph
Level of Service, LOS	F	Maximum weaving length, L_{MAX}	7046 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 1-Bet Hillsboro & Palmetto*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4960</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1325* pc/h/ln
 S *69.8* mph
 $D = v_p / S$ *19.0* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	195/SB
Agency/Company	AECOM	Weaving Segment Location	Seg 2-Bet On from Exp & Off
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	Two-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	5200ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3825	0.95	3	0	1.5	1.2	0.985	1.00	4087
V_{RF}	1125	0.92	2	0	1.5	1.2	0.990	1.00	1235
V_{FR}	1135	0.92	2	0	1.5	1.2	0.990	1.00	1246
V_{RR}	125	0.92	2	0	1.5	1.2	0.990	1.00	137
V_{NW}	6568							V =	6705
V_W	137								
VR	0.020								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	0 lc	Minimum weaving lane changes, LC_{MIN}	411 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1079 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	3154 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	4233 lc/h
Minimum RR lane changes, LC_{RR}	3 lc/pc	Non-weaving vehicle index, I_{NW}	2391

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6619 veh/h	Weaving intensity factor, W	0.192
Weaving segment capacity, c_w	9241 veh/h	Weaving segment speed, S	59.0 mph
Weaving segment v/c ratio	0.716	Average weaving speed, S_W	61.1 mph
Weaving segment density, D	28.4 pc/mi/ln	Average non-weaving speed, S_{NW}	59.0 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	5916 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 3-Bet Off & On Ramp*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4950</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1763* pc/h/ln
 S *66.3* mph
 $D = v_p / S$ *26.6* pc/mi/ln
 LOS *D*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 5-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	3240	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P _T	3
Peak-Hr Prop. of AADT, K			%RVs, P _R	0
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1154* pc/h/ln
 S *70.0* mph
 $D = v_p / S$ *16.5* pc/mi/ln
 LOS *B*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 6-Merge from Hillsboro E&W
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp	Freeway Number of Lanes, N	3	Downstream Adj Ramp
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> On	Ramp Number of Lanes, N	1	<input type="checkbox"/> Yes <input type="checkbox"/> On
<input type="checkbox"/> No <input checked="" type="checkbox"/> Off	Acceleration Lane Length, L _A	300	<input checked="" type="checkbox"/> No <input type="checkbox"/> Off
L _{up} = 2400 ft	Deceleration Lane Length L _D		L _{down} = ft
V _u = 1710 veh/h	Freeway Volume, V _F	3240	V _D = veh/h
	Ramp Volume, V _R	1740	
	Freeway Free-Flow Speed, S _{FF}	70.0	
	Ramp Free-Flow Speed, S _{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	3240	0.95	Level	3	0	0.985	1.00	3462
Ramp	1740	0.92	Level	2	0	0.990	1.00	1910
UpStream	1710	0.92	Level	2	0	0.990	1.00	1877
DownStream								

Merge Areas	Diverge Areas
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Estimation of v₁₂

$V_{12} = V_F (P_{FM})$ L _{EQ} = 1495.81 (Equation 13-6 or 13-7) P _{FM} = 0.586 using Equation (Exhibit 13-6) V ₁₂ = 2028 pc/h V ₃ or V _{av34} = 1434 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = 2028 pc/h (Equation 13-16, 13-18, or 13-19)	$V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)
--	--

Estimation of v₁₂

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	5372	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	3938	Exhibit 13-8	4600:All
			No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level 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 13-2)	$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)
---	--

Level of Service Determination (if not F)

Speed Determination

M _S = 0.491 (Exhibit 13-11)
S _R = 56.2 mph (Exhibit 13-11)
S ₀ = 66.6 mph (Exhibit 13-11)
S = 58.7 mph (Exhibit 13-13)

Speed Determination

D _s = (Exhibit 13-12)
S _R = mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 7-Bet On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4980</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1774* pc/h/ln
 S *66.2* mph
 $D = v_p / S$ *26.8* pc/mi/ln
 LOS *D*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

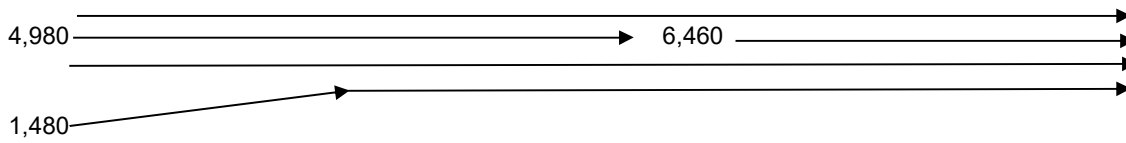
N - Number of lanes S - Speed
 V - Hourly volume D - Density
 v_p - Flow rate FFS - Free-flow speed
 LOS - Level of service BFFS - Base free-flow speed
 DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12 f_{LW} - Exhibit 11-8
 E_T - Exhibits 11-10, 11-11, 11-13 f_{LC} - Exhibit 11-9
 f_p - Page 11-18 TRD - Page 11-11
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 8: I-95 Southbound On-Ramp from SW 10th Street EB & WB
Analysis Period: PM Peak Hour
Analysis Year: 2040 Build 2A



	PHF =	0.95	
	v_{fr} =	6,460	vph
	v_r =	1,480	vph
	v_f =	4,980	
Upstream Freeway	Tr % =	3%	
Ramp	Tr % =	2%	
Downstream Freeway	Tr % =	3%	
Freeway	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp	f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain	E_T =	1.5	
	RV % =	0	
Driver Population adj.	f_P =	1.000	
	V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,902 pc/h
	V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,573 pc/h
	V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	5,321 pc/h
No. lanes upstream of ramp	N =	3	

No. Ln	Capacity Check (see Exhibits 25-3 and 25-7):	Maximum	Actual	V/c	LOS F?
4	Fwy downstream of ramp (assume 70 mph free-flow speed) =	9,600	6,902	0.72	No
3	Fwy upstream of ramp (assume 70 mph free-flow speed) =	7,200	5,321	0.74	No
1	Capacity on On-Ramp (assume 45 mph free-flow speed) =	2,100	1,573	0.75	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 9-Bet 10th & Exit to Exp*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>6460</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *4*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1726* pc/h/ln
 S *66.8* mph
 $D = v_p / S$ *25.8* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 10-Merge from Ex to GP
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build 2A
Project Description SW 10th Street SIMR			

Inputs

Upstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A 600 Deceleration Lane Length L _D Freeway Volume, V _F 6460 Ramp Volume, V _R 390 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 50.0	Downstream Adj Ramp <input checked="" type="checkbox"/> Yes <input type="checkbox"/> On <input type="checkbox"/> No <input checked="" type="checkbox"/> Off L _{down} = 1150 ft V _D = 750 veh/h
--	---	---

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	6460	0.95	Level	3	0	0.985	1.00	6902
Ramp	390	0.92	Level	2	0	0.990	1.00	428
UpStream								
DownStream	750	0.92	Level	2	0	0.990	1.00	823

Merge Areas

Diverge Areas

Estimation of v₁₂

$V_{12} = V_F (P_{FM})$
 (Equation 13-6 or 13-7)
 P_{FM} = 0.164 using Equation (Exhibit 13-6)
 V₁₂ = 1134 pc/h
 V₃ or V_{av34} = 2884 pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = 2760 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v₁₂

$V_{12} = V_R + (V_F - V_R)P_{FD}$
 (Equation 13-12 or 13-13)
 P_{FD} = using Equation (Exhibit 13-7)
 V₁₂ = pc/h
 V₃ or V_{av34} = pc/h (Equation 13-14 or 13-17)
 Is V₃ or V_{av34} > 2,700 pc/h? Yes No
 Is V₃ or V_{av34} > 1.5 * V₁₂/2 Yes No
 If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity	LOS F?
V _{FO}	7330	Exhibit 13-8	No

Capacity Checks

	Actual	Capacity	LOS F?
V _F		Exhibit 13-8	
V _{FO} = V _F - V _R		Exhibit 13-8	
V _R		Exhibit 13-10	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
V _{R12}	3188	Exhibit 13-8	4600:All No

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
V ₁₂		Exhibit 13-8	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 V_R + 0.0078 V_{12} - 0.00627 L_A$
 D_R = 26.4 (pc/mi/ln)
 LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
 D_R = (pc/mi/ln)
 LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.356 (Exhibit 13-11)
 S_R = 60.0 mph (Exhibit 13-11)
 S₀ = 64.3 mph (Exhibit 13-11)
 S = 62.4 mph (Exhibit 13-13)

Speed Determination

D_S = (Exhibit 13-12)
 S_R = mph (Exhibit 13-12)
 S₀ = mph (Exhibit 13-12)
 S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency or Company	AECOM	Junction	Seg 11- Diverge to Express
Date Performed		Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build 2A

Project Description SW 10th Street SIMR

Inputs		
Upstream Adj Ramp <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On <input type="checkbox"/> No <input type="checkbox"/> Off L _{up} = 1150 ft V _u = 390 veh/h	Freeway Number of Lanes, N 4 Ramp Number of Lanes, N 1 Acceleration Lane Length, L _A Deceleration Lane Length L _D 200 Freeway Volume, V _F 6850 Ramp Volume, V _R 750 Freeway Free-Flow Speed, S _{FF} 70.0 Ramp Free-Flow Speed, S _{FR} 45.0	Downstream Adj Ramp <input type="checkbox"/> Yes <input type="checkbox"/> On <input checked="" type="checkbox"/> No <input type="checkbox"/> Off L _{down} = ft V _D = veh/h

Conversion to pc/h Under Base Conditions								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p
Freeway	6850	0.95	Level	3	0	0.985	1.00	7319
Ramp	750	0.92	Level	2	0	0.990	1.00	823
UpStream	390	0.92	Level	2	0	0.990	1.00	428
DownStream								

Merge Areas	Diverge Areas
Estimation of v₁₂ $V_{12} = V_F (P_{FM})$ L _{EQ} = (Equation 13-6 or 13-7) P _{FM} = using Equation (Exhibit 13-6) V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	Estimation of v₁₂ $V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{EQ} = (Equation 13-12 or 13-13) P _{FD} = 0.436 using Equation (Exhibit 13-7) V ₁₂ = 3655 pc/h V ₃ or V _{av34} 1832 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks				Capacity Checks			
	Actual	Capacity	LOS F?		Actual	Capacity	LOS F?
V _{FO}		Exhibit 13-8		V _F	7319	Exhibit 13-8	9600 No
				V _{FO} = V _F - V _R	6496	Exhibit 13-8	9600 No
				V _R	823	Exhibit 13-10	2100 No

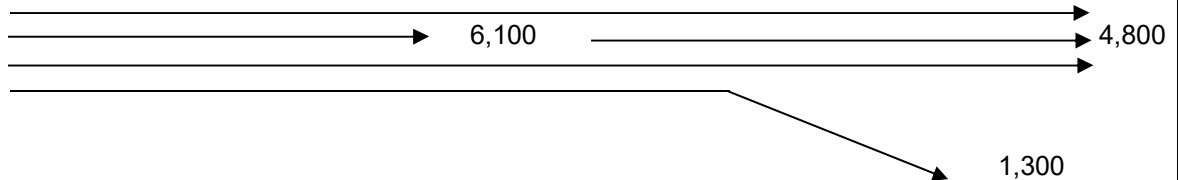
Flow Entering Merge Influence Area				Flow Entering Diverge Influence Area			
	Actual	Max Desirable	Violation?		Actual	Max Desirable	Violation?
V _{R12}		Exhibit 13-8		V ₁₂	3655	Exhibit 13-8	4400:All No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 37.0 (pc/mi/ln) LOS = E (Exhibit 13-2)

Speed Determination	Speed Determination
M _S = (Exhibit 13-11)	D _s = 0.372 (Exhibit 13-12)
S _R = mph (Exhibit 13-11)	S _R = 59.6 mph (Exhibit 13-12)
S ₀ = mph (Exhibit 13-11)	S ₀ = 74.3 mph (Exhibit 13-12)
S = mph (Exhibit 13-13)	S = 65.4 mph (Exhibit 13-13)

Job: SW 10th Street SIMR
Analyst: AECOM

Location: Seg 12: I-95 SB Off-Ramp to Sample Road EB & WB
Analysis Period: PM Peak Hour
Analysis Year: 2040 Build 2A



PHF =	0.95	
v_{fr} =	6,100	vph
v_r =	1,300	vph
v_f =	4,800	
Upstream Freeway Tr % =	3%	
Ramp Tr % =	2%	
Downstream Freeway Tr % =	3%	
Freeway f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.985
Ramp f_{HV} =	$1/(1+P_T(E_T-1)+P_R(E_R-1)) =$	0.9901
flat terrain E_T =	1.5	
RV % =	0	
Driver Population adj. f_P =	1.000	
V_{fr} =	$=v_{fr}/(PHF)(f_{HV})(f_P) =$	6,517 pc/h
V_r =	$=v_r/(PHF)(f_{HV})(f_P) =$	1,382 pc/h
V_f =	$=v_f/(PHF)(f_{HV})(f_P) =$	5,128 pc/h
No. lanes upstream of ramp N =	4	

Average Freeway Density Upstream of Diverge (see Equation 13-26):

D = 0.0175 (V_{fr}/N) = 28.5 pc/ln

LOS in the Diverge Area (from Density and Exhibit 13-2) =

D

No. Ln	Capacity Check (see Exhibits 13-2, 13-8 and 13.10)	Maximum	Actual	LOS F?
4	Fwy upstream of ramp (assume 70 mph free-flow speed) =	9,600	6,517	No
3	Fwy downstream of ramp (assume 70 mph free-flow speed) =	7,200	5,128	No
1	Capacity on Off-Ramp (assume 45 mph free-flow speed) =	2,100	1,382	No

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst
 Agency or Company *AECOM*
 Date Performed
 Analysis Time Period *PM*

Site Information

Highway/Direction of Travel *I-95 SB*
 From/To *Seg 13-Bet Off & On Ramps*
 Jurisdiction
 Analysis Year *2040 Build 2A*

Project Description *SW 10th Street SIMR*

Oper.(LOS)

Des.(N)

Planning Data

Flow Inputs

Volume, V	<i>4800</i>	veh/h	Peak-Hour Factor, PHF	<i>0.95</i>
AADT		veh/day	%Trucks and Buses, P _T	<i>3</i>
Peak-Hr Prop. of AADT, K			%RVs, P _R	<i>0</i>
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>
DDHV = AADT x K x D		veh/h	Grade % Length	<i>mi</i>
			Up/Down %	

Calculate Flow Adjustments

f _p	<i>1.00</i>	E _R	<i>1.2</i>
E _T	<i>1.5</i>	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	<i>0.985</i>

Speed Inputs

Lane Width ft
 Rt-Side Lat. Clearance ft
 Number of Lanes, N *3*
 Total Ramp Density, TRD ramps/mi
 FFS (measured) *70.0* mph
 Base free-flow Speed, BFFS mph

Calc Speed Adj and FFS

f_{LW} mph
 f_{LC} mph
 TRD Adjustment mph
 FFS *70.0* mph

LOS and Performance Measures

Operational (LOS)
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ *1709* pc/h/ln
 S *67.0* mph
 $D = v_p / S$ *25.5* pc/mi/ln
 LOS *C*

Design (N)

Design (N)
 Design LOS
 $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
 S mph
 $D = v_p / S$ pc/mi/ln
 Required Number of Lanes, N

Glossary

N - Number of lanes
 V - Hourly volume
 v_p - Flow rate
 LOS - Level of service
 DDHV - Directional design hour volume
 S - Speed
 D - Density
 FFS - Free-flow speed
 BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
 E_T - Exhibits 11-10, 11-11, 11-13
 f_p - Page 11-18
 LOS, S, FFS, v_p - Exhibits 11-2, 11-3
 f_{LW} - Exhibit 11-8
 f_{LC} - Exhibit 11-9
 TRD - Page 11-11

FREEWAY WEAVING WORKSHEET

General Information		Site Information	
Analyst		Freeway/Dir of Travel	I-95 SB
Agency/Company	AECOM	Weaving Segment Location	Seg 14- Bet Sample & Copans
Date Performed		Analysis Year	2040 Build 2A
Analysis Time Period	PM		

Project Description SW 10th Street SIMR

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2520ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4035	0.95	3	0	1.5	1.2	0.985	1.00	4311
V_{RF}	1560	0.92	2	0	1.5	1.2	0.990	1.00	1713
V_{FR}	765	0.92	2	0	1.5	1.2	0.990	1.00	840
V_{RR}	0	0.95	0	0	1.5	1.2	1.000	1.00	0
V_{NW}	4311							V =	6864
V_W	2553								
VR	0.372								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6775 veh/h	Weaving intensity factor, W	
Weaving segment capacity, c_w	6357 veh/h	Weaving segment speed, S	mph
Weaving segment v/c ratio	1.066	Average weaving speed, S_W	mph
Weaving segment density, D	pc/mi/ln	Average non-weaving speed, S_{NW}	mph
Level of Service, LOS	F	Maximum weaving length, L_{MAX}	6368 ft

Notes

- a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
- b. For volumes that exceed the weaving segment capacity, the level of service is "F".