# **Appendix A**

# **Alternative G Modified**

Interchange Evaluation Worksheets

	۶	<b>→</b>	•	•	+	•	4	<b>†</b>	<i>&gt;</i>	<b>/</b>	ţ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	16.00		7	7		7	ሻሻ	<b>↑</b>	7	7	<b>↑</b>	7
Volume (vph)	385	0	855	125	0	90	685	105	115	135	80	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	10.0		10.0	10.0		10.0	10.0	9.5	10.0	10.0	9.5	10.0
Lane Util. Factor	0.97		1.00	1.00		1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	405	0	900	132	0	95	721	111	121	142	84	426
RTOR Reduction (vph)	0	0	211	0	0	39	0	0	82	0	0	63
Lane Group Flow (vph)	405	0	689	132	0	56	721	111	39	142	84	363
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5 6			5 6			16			16
Actuated Green, G (s)	17.8		52.7	17.8		52.7	31.5	11.2	38.5	31.5	11.2	38.5
Effective Green, g (s)	17.8		52.7	17.8		52.7	31.5	11.2	29.0	31.5	11.2	29.0
Actuated g/C Ratio	0.20		0.59	0.20		0.59	0.35	0.12	0.32	0.35	0.12	0.32
Clearance Time (s)	10.0			10.0			10.0	9.5		10.0	9.5	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	679		927	350		927	1202	232	510	620	232	510
v/s Ratio Prot	0.12			0.07			0.21	0.06		80.0	0.05	
v/s Ratio Perm			c0.44			0.04			0.02			c0.23
v/c Ratio	0.60		0.74	0.38		0.06	0.60	0.48	0.08	0.23	0.36	0.71
Uniform Delay, d1	32.8		13.7	31.3		8.0	24.1	36.7	21.2	20.7	36.1	26.8
Progression Factor	0.95		1.27	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4		3.3	0.7		0.0	8.0	6.9	0.1	0.2	4.3	4.7
Delay (s)	32.5		20.7	32.0		8.0	24.9	43.6	21.3	20.9	40.5	31.5
Level of Service	С		С	С		Α	С	D	С	С	D	С
Approach Delay (s)		24.3			22.0			26.6			30.3	
Approach LOS		С			С			С			С	
Intersection Summary												
HCM Average Control Delay			26.1	H	CM Leve	l of Service	e		С			
HCM Volume to Capacity rat	io		0.74									
Actuated Cycle Length (s)			90.0			t time (s)			20.0			
Intersection Capacity Utilizati	ion		87.8%	IC	U Level	of Service	1		Е			
Analysis Period (min)			15									
c Critical Lane Group												

	۶	<b>→</b>	•	•	<b>←</b>	•	4	†	<i>&gt;</i>	<b>/</b>	ţ	-✓
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	16		7	ሻ		7	ሻሻ	<b>†</b>	7	ሻ	<b>↑</b>	7
Volume (vph)	260	0	350	70	0	70	685	55	65	50	40	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.0		9.0	9.0		9.0	9.0	8.5	9.0	9.0	8.5	9.0
Lane Util. Factor	0.97		1.00	1.00		1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	274	0	368	74	0	74	721	58	68	53	42	268
RTOR Reduction (vph)	0	0	123	0	0	25	0	0	41	0	0	91
Lane Group Flow (vph)	274	0	245	74	0	49	721	58	27	53	42	178
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5 6			5 6			16			16
Actuated Green, G (s)	12.5		60.0	12.5		60.0	27.8	23.2	44.2	27.8	23.2	44.2
Effective Green, g (s)	12.5		60.0	12.5		60.0	27.8	23.2	35.7	27.8	23.2	35.7
Actuated g/C Ratio	0.14		0.67	0.14		0.67	0.31	0.26	0.40	0.31	0.26	0.40
Clearance Time (s)	9.0			9.0			9.0	8.5		9.0	8.5	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	477		1055	246		1055	1060	480	628	547	480	628
v/s Ratio Prot	c0.08			0.04			c0.21	0.03		0.03	0.02	
v/s Ratio Perm			0.15			0.03			0.02			c0.11
v/c Ratio	0.57		0.23	0.30		0.05	0.68	0.12	0.04	0.10	0.09	0.28
Uniform Delay, d1	36.3		5.9	34.8		5.2	27.2	25.6	16.7	22.2	25.4	18.4
Progression Factor	1.25		1.91	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7		0.1	0.7		0.0	1.8	0.5	0.0	0.1	0.4	0.2
Delay (s)	46.9		11.4	35.5		5.2	29.0	26.1	16.7	22.2	25.7	18.7
Level of Service	D		В	D		Α	С	С	В	С	С	В
Approach Delay (s)		26.6			20.3			27.8			20.0	
Approach LOS		С			С			С			С	
Intersection Summary												
HCM Average Control Dela	у		25.5	H	CM Leve	el of Servic	е		С			
HCM Volume to Capacity ra	atio		0.52									
Actuated Cycle Length (s)			90.0			st time (s)			27.0			
Intersection Capacity Utiliza	ation		51.8%	IC	U Level	of Service	)		Α			
Analysis Period (min)			15									
c Critical Lane Group												

	۶	<b>→</b>	•	•	+	•	4	<b>†</b>	<i>&gt;</i>	<b>/</b>	ţ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	16.16		7	Ţ		7	14.14	<b>†</b>	7	ħ	<b>†</b>	7
Volume (vph)	385	0	855	125	0	90	685	105	115	135	80	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	10.0		10.0	10.0		10.0	10.0	9.5	10.0	10.0	9.5	10.0
Lane Util. Factor	0.97		1.00	1.00		1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	405	0	900	132	0	95	721	111	121	142	84	426
RTOR Reduction (vph)	0	0	209	0	0	39	0	0	84	0	0	65
Lane Group Flow (vph)	405	0	691	132	0	56	721	111	37	142	84	361
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5 6			5 6			16			16
Actuated Green, G (s)	17.5		53.0	17.5		53.0	33.3	9.7	36.7	33.3	9.7	36.7
Effective Green, g (s)	17.5		53.0	17.5		53.0	33.3	9.7	27.2	33.3	9.7	27.2
Actuated g/C Ratio	0.19		0.59	0.19		0.59	0.37	0.11	0.30	0.37	0.11	0.30
Clearance Time (s)	10.0			10.0			10.0	9.5		10.0	9.5	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	668		932	344		932	1270	201	478	655	201	478
v/s Ratio Prot	0.12			0.07			0.21	0.06		0.08	0.05	
v/s Ratio Perm			c0.44			0.04			0.02			c0.23
v/c Ratio	0.61		0.74	0.38		0.06	0.57	0.55	0.08	0.22	0.42	0.76
Uniform Delay, d1	33.1		13.5	31.6		7.9	22.6	38.1	22.4	19.4	37.5	28.4
Progression Factor	0.96		1.27	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6		3.2	0.7		0.0	0.6	10.5	0.1	0.2	6.3	6.7
Delay (s)	33.3		20.3	32.3		7.9	23.2	48.6	22.5	19.6	43.8	35.1
Level of Service	С		С	С		Α	С	D	С	В	D	D
Approach Delay (s)		24.4			22.1			26.1			32.8	
Approach LOS		С			С			С			С	
Intersection Summary												
HCM Average Control Delay			26.5	H	CM Leve	l of Servic	e		С			
HCM Volume to Capacity rat	io		0.75									
Actuated Cycle Length (s)			90.0			t time (s)			20.0			
Intersection Capacity Utilizati	ion		87.8%	IC	U Level	of Service	1		E			
Analysis Period (min)			15									
c Critical Lane Group												

	٠	<b>→</b>	•	•	<b>←</b>	4	4	<b>†</b>	<i>&gt;</i>	<b>/</b>	ţ	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	75		7	ħ		7	ሻሻ	<b>†</b>	7	ሻሻ	<b>†</b>	7
Volume (vph)	735	0	355	95	0	195	180	60	50	145	60	555
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.0		9.0	9.0		9.0	9.0	8.5	9.0	9.0	8.5	9.0
Lane Util. Factor	0.97		1.00	1.00		1.00	0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770		1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770		1583	3433	1863	1583	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	774	0	374	100	0	205	189	63	53	153	63	584
RTOR Reduction (vph)	0	0	294	0	0	72	0	0	27	0	0	0
Lane Group Flow (vph)	774	0	80	100	0	133	189	63	26	153	63	584
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5			5			16			156
Actuated Green, G (s)	23.5		19.3	23.5		19.3	19.3	20.7	52.7	19.3	20.7	90.0
Effective Green, g (s)	23.5		19.3	23.5		19.3	19.3	20.7	44.2	19.3	20.7	81.5
Actuated g/C Ratio	0.26		0.21	0.26		0.21	0.21	0.23	0.49	0.21	0.23	0.91
Clearance Time (s)	9.0		9.0	9.0		9.0	9.0	8.5		9.0	8.5	
Vehicle Extension (s)	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	896		339	462		339	736	428	777	736	428	1433
v/s Ratio Prot	c0.23			0.06			0.06	0.03		0.04	0.03	
v/s Ratio Perm			0.05			0.08			0.02			c0.37
v/c Ratio	0.86		0.24	0.22		0.39	0.26	0.15	0.03	0.21	0.15	0.41
Uniform Delay, d1	31.7		29.3	26.0		30.3	29.4	27.6	11.8	29.1	27.6	0.6
Progression Factor	1.00		1.00	0.57		0.94	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.7		0.4	0.2		0.7	0.2	0.7	0.0	0.1	0.7	0.2
Delay (s)	40.4		29.6	15.0		29.2	29.6	28.3	11.9	29.2	28.3	0.8
Level of Service	D		С	В		С	С	С	В	С	С	Α
Approach Delay (s)		36.9			24.5			26.2			8.4	
Approach LOS		D			С			С			Α	
Intersection Summary												
HCM Average Control Dela	ıy		25.2	H	CM Leve	el of Servic	e		С			
HCM Volume to Capacity r	atio		0.51									
Actuated Cycle Length (s)			90.0	Sı	um of los	st time (s)			9.0			
Intersection Capacity Utiliza	ation		59.3%	IC	U Level	of Service	:		В			
Analysis Period (min)			15									
c Critical Lane Group												

		RAMP	S AND	RAMI	- JUN	CTIONS	WORK	SHE	ET		
General	Informati	ion				Site In	formati	on			
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	19		Ju	eeway/Dir onction	of Travel			astbound In Ramp	
Analysis Tim		AM Peak	, ,			nalysis Year	ſ	Υ	ear 2030	)	
-	ription Year 2	2030 Traffic C	perations)	Analysis	of the US	160 FEIS					
Inputs		<u> </u>								1	
Upstream Ad	j Ramp	Terrain Rolli	ng								nm Adj Ramp
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off
□ No	C Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft										
Vu =	veh/h		S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0$ $R, V_f$ )	mph		VD =	veh/h
Convers	sion to pc	/h Under									
(pc/h)	V (Veh/hr)	PHF	Terr		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV fp
Freeway	1560	0.95	Rolli		5	0	0.930		1.00	1765	
Ramp	195	0.95	Rolli	ing	2	0	0.971		1.00	211	
UpStream DownStrean	<u> </u>										
Downstream	1,	Merge Areas	 S		<u></u>		<u> </u>	l Dive	erge Area	 as	
Estimati	on of v <sub>12</sub>					Estima	tion of	V <sub>12</sub>			
		<sub>12</sub> = V <sub>F</sub> ( P <sub>FM</sub>	)					V <sub>12</sub> =	V <sub>D</sub> + (V <sub>E</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>FO</sub> = (Equ	ation 25-2 or 2	12 1 110				  L <sub>FO</sub>	quation 25-8	12		K FD	
	using Equation					1 - 4	ing Equation		,		
V <sub>12</sub> = 1765						$V_{12} = pc/$					
	/ Checks						ity Che	cks			
Capaon	Actua	al Max	imum	109	S F?	oapao.		ctual	l Ma	aximum	LOS F?
						V <sub>FI</sub> =V <sub>F</sub>			1	xhibit 25-14	
V <sub>FO</sub>	1976	See Ex	hibit 25-7	N	0	V <sub>12</sub>	<u> </u>			400:All	
V <sub>R12</sub>	1976	460	00:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14	
RIZ						$\frac{R}{V_R}$			See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not	F)		of Servi	ce De	eterm	ination (i	f not F)
	5.475 + 0.0073									/ <sub>12</sub> - 0.009 L <sub>D</sub>	
D <sub>R</sub> =	11.6 (pc/ m/ln)			,,		D <sub>R</sub> =	(pc/ m/ln)				
	B (Exhibit 25-4	1)				LOS=	(Exhibit 25-	4)			
	stimation						Estima	•			
	232 (Exibit 25					D <sub>s</sub> =	(Exhibit 25				
- C	.8 mph (Exhib	-				_	mph (Exhil	oit 25-19	))		
l '`	A mph (Exhibi						mph (Exhi				
	.8 mph (Exhib	-					nph (Exhib		•		
I		•				J	• •				

	RAMPS AND RAMP JUNCTIONS WORKSHEET eneral Information Site Information											
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eway/Dir	of 7	Travel	US 10	60 E	astboun	d
Agency or Co	mpany				Jur	nction			CR 2	33 C	ff Ram	)
Date Performe	ed	11/13/20	09		Jur	isdiction					1	
Analysis Time	Period	PM Peak			Ana	alysis Yea	ar		Year	2030	)	
Project Descri	iption Ye	ar 2030 Tra	affic Op	erations	Analysi	is of the U	JS 1	60 FEIS	3			
Inputs												
Upstream Adj	Ramp	Terrain									Downstr Ramp	eam Adj
☐ Yes ☐	On										Yes	☐ On
□ No □	Off										□ No	
$L_{up} = ft$		S	<sub>EE</sub> = (	60.0 mph	<u> </u>	S	) <sub>ED</sub> =	= 40.0 i	mph		L <sub>down</sub> =	ft
Vu = ve	h/h		• •			es, L <sub>A</sub> , L			•		VD =	veh/h
Conversion t	-	der Rase (				, - <sub>A</sub> , -	טי <b>*</b> F	<b>τ' ' †</b> /				
Conversion	<i>ν</i>	uei base (	Jonana	0113	1	1	1	1			v=V/PHI	F
(pc/h)	(Veh/hr)	PHF		rrain	Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub> f <sub>HV</sub> f <sub>p</sub>			
Freeway	3460	0.95	Rol	ling	5	0	0.	.930	1.00	)	3915	
Ramp	1065	2	0	0.	.971	1.00	)	1155				
UpStream					<u> </u>							
DownStream												
	Me	erge Areas						[	Diverge	Area	IS	
Estimation of	f v <sub>12</sub>					Estimati	ion	of v <sub>12</sub>				
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						V <sub>1</sub> .	<sub>2</sub> = V <sub>D</sub> +	- (V_	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat						L <sub>EQ</sub> = (E	ัดแล			•	K, LD	•
		20 0)										
P <sub>FM</sub> = using E	quation					$P_{FD} = 0.6$		_	Equatio	n 5		
V <sub>12</sub> = pc/h						$V_{12} = 28$						
Capacity Che	1	1		(		Capacity	y Cł		- 1			
	Actual	Maxin	num	LOS	F?		_	Actua	ıl r	Maxii	mum	LOS F?
\/		See Exh	ibit 25-			$V_{FI} = V_{F}$	:	3915		69	00	No
V <sub>FO</sub>		7				$V_{12}$		2836		4400	):All	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	<del>-</del>	2760		690	00	No
					_						No	
Level of Serv	rice Deterr		Level of	Sei	rvice De	etermin	atio	n (if not l	F)			
D <sub>R</sub> = 5.475 +	+ 0.00734 v	/ <sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$						9 L <sub>D</sub>
1 ''	c/ mi /ln)	K	12		A	D <sub>R</sub> =		б (рс/ m			12	D
LOS = (Ex	xhibit 25-4)					LOS=	В (Е	Exhibit 2	25-4)			
Speed Estima	ation					Speed E	stir	mation				
	it 25-19)							57 (Exh	ibit 25-1	9)		
"	•	10)				-		5 mph (			9)	
1	(Exhibit 25	•						-				
	(Exhibit 25	•				-		5 mph (				
S= mph	(Exhibit 25	-14)				S =	54.8	8 mph (	Exhibit	25-1	5)	

	RAMPS AND RAMP JUNCTIONS WORKSHEET eneral Information Site Information											
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eway/Dir	of T	ravel	US 10	60 E	astboun	d
Agency or Co	mpany				Jur	nction			CR 2	33 O	ff Ramp	)
Date Performe	ed	11/13/20	09		Jur	isdiction					•	
Analysis Time	Period	AM Peak			Ana	alysis Yea	ar		Year	2030	)	
Project Descri		ar 2030 Tra		erations				60 FEIS				
Inputs	<u> </u>											
Upstream Adj	Ramp	Terrain									Downstr Ramp	eam Adj
☐ Yes ☐	On										Yes	On
□ No □	Off										□ No	☐ Off
$L_{up} = ft$				60.0 mph	<u> </u>	9	· –	40.0	mnh		L <sub>down</sub> =	ft
\/ \/	eh/h	0					прп		VD =	veh/h		
			snow iar	nes, L <sub>A</sub> , L	D, V <sub>R</sub>	, V <sub>f</sub> )						
Conversion t	to pc/h Un	der Base (	Condit	ions	(				,		1	
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv	1	f <sub>HV</sub>	$f_p$		v=V/PHI f <sub>HV</sub> f <sub>p</sub>	=
Freeway	2650	0.95	Rol	lling	5	0	0.9	930	1.00		2999	
Ramp	1090	2	0		971	1.00		1182				
UpStream	1070	0.95	100	lling			0.7	,,,	1.00	<u> </u>	1102	
DownStream											<u> </u>	
Downoucam		erge Areas	<u> </u>		<u></u>		ļ		Diverge	Area	J IS	
Estimation o		7190711040				Estimati	ion o		2110190	7 11 0 0		
		- \/ (D )							- \/ .	()/	\/ \D	
		= V <sub>F</sub> ( P <sub>FM</sub> )									- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat	ion 25-2 or	25-3)				$L_{EQ} = (E$	quat	ion 25-	8 or 25-	9)		
P <sub>FM</sub> = using E	Equation					$P_{FD} = 0.6$	531	using	Equatio	n 5		
V <sub>12</sub> = pc/h						$V_{12} = 23$	28 r	oc/h				
Capacity Che	ecks					Capacity						
	Actual	Maxin	num	LOS	F?			Actua	u l r	Maxir	num	LOS F?
				ĺ		V <sub>FI</sub> =V <sub>F</sub>		2999		690		No
V <sub>FO</sub>		See Exh	ıbıt 25-		-		-		_			
. 5						V <sub>12</sub>	_	2328		4400	):All	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	-	1817		690	00	No
						$V_R$		1182		210	00	No
Level of Serv	vice Deterr		Level of	Ser	vice D	etermin	atior	if not l	<b>-</b> )			
$D_R = 5.475 +$				,	1.						<sub>12</sub> - 0.009	
	c/ mi /ln)	R 1 0.007	o v <sub>12</sub>	0.00027	<b>-</b> A	D <sub>R</sub> =		(pc/ m		00 V	12 0.00	J <b>−</b> D
LOS = (Ex	xhibit 25-4)					LOS=	В (Е	xhibit 2	25-4)			
Speed Estim						Speed E			,			
									ibit 25-1	9)		
,	it 25-19)					-		•		•	2)	
	(Exhibit 25	-19)				1		-	Exhibit			
$S_0 = mph$	(Exhibit 25	-19)				$S_0 =$	65.8	mph (	Exhibit	25-19	9)	
S= mph	(Exhibit 25	-14)				S = :	54.2	mph (	Exhibit	25-15	5)	

		RAMP	S AND	RAMI	P JUN	CTIONS	WORK	SHE	ET		
General	Informati	ion				Site In:	formati	on			
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	)9		Ju	eeway/Dir on the control of the cont	of Travel		IS 160 W H 172 O	Vestbound In Ramp	
Analysis Tim		PM Peak				nalysis Yea	r	Υ	ear 2030	)	
-	ription Year :	2030 Traffic C	perations	Analysis	of the US	160 FEIS					
Inputs		( <del>-</del>								1	
Upstream Ad	j Ramp	Terrain Rolli	ng								ım Adj Ramp
Yes	C On									☐ Yes ☐ No	☐ On ☐ Off
□ No	C Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft			0 1							
Vu =	veh/h		S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0$	mph		VD =	veh/h
Convers	sion to pc	/h Under				N B	IX I				
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV <sup>f</sup> p
Freeway	1505	0.95	Rolli		5	0	0.930		1.00	1703	
Ramp	1090	0.95	Rolli	ing	2	0	0.971		1.00	1182	
UpStream DownStrean	1				<u> </u>	<u> </u>	<u> </u>	_			
Downstream	<u> </u>	Merge Areas	l				<u></u>	l_ Dive	erge Area	 AS	
Estimati	on of v <sub>12</sub>					Estima	tion of				
	12	' <sub>12</sub> = V <sub>F</sub> (P <sub>FM</sub>	)						V <sub>D</sub> + (V <sub>E</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>FO</sub> = (Equ	ation 25-2 or 2	12 1 110	,			  L <sub>FO</sub> = (Eo	quation 25-	12		, K, FD	
	using Equation					1 - 4	ing Equation		, ,		
V <sub>12</sub> = 1703		,,,				$V_{12} = pc/$	• .				
	/ Checks						ity Che	cks			
Capacity	Actua	al May	imum	109	S F?	Oupuci		ctual	1 M:	aximum	LOS F?
	7 totac	II IVIUX	iiiiidiii		J 1 .	V <sub>FI</sub> =V <sub>I</sub>	<del></del>	ctuui	1	xhibit 25-14	LOST
$V_{FO}$	2885	See Ex	hibit 25-7	N	0	V <sub>12</sub>	F			400:All	
V <sub>R12</sub>	2885	460	00:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14	
RIZ						V <sub>R</sub>			See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not	F)	Level o	of Servi	ce De	eterm	ination (i	f not F)
	5.475 + 0.0073									/ <sub>12</sub> - 0.009 L <sub>D</sub>	
D <sub>R</sub> =	18.2 (pc/ m/ln)					D <sub>R</sub> =	(pc/ m/ln)				
	B (Exhibit 25-4	1)					(Exhibit 25-	4)			
	stimation						Estima	•			
	273 (Exibit 25					D <sub>s</sub> =	(Exhibit 25				
- C	.1 mph (Exhib	-				"	mph (Exhil	oit 25-19	))		
l '`	A mph (Exhibi						,、 mph (Exhi				
	.1 mph (Exhib	-					mph (Exhil		•		
J						<u> </u>		0 10	,		

		RAMP	S AND	RAMI	- JUN	CTIONS	WOR	KSHE	ET		
General	Informati	on				Site In:	format	ion			
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	)9		Ju	eeway/Dir on the control of the cont	of Travel			Vestbound In Ramp	
Analysis Tim		AM Peak				nalysis Year	r	Υ	ear 2030	)	
-	ription Year 2	2030 Traffic C	perations	Analysis	of the US	160 FEIS					
Inputs										1	
Upstream Ad	j Ramp	Terrain Rollii	ng								m Adj Ramp
Yes	C On									☐ Yes ☐ No	☐ On ☐ Off
□ No	Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft			0 1				0 1			
Vu =	veh/h		S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.$ $R'_f(V_f)$	0 mph		VD =	veh/h
Convers	ion to pc	h Under	Base	Condi	tions						
(pc/h)	V (Veh/hr)	PHF	Teri	rain	Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	<sub>HV</sub> f <sub>p</sub>
Freeway	935	0.95	Rolli		5	0	0.930		1.00	1058	
Ramp UpStream	940	0.95	Rolli	ing	2	0	0.971		1.00	1019	
DownStream	<u> </u> 						<u> </u> 				
	J,	Merge Areas	5		J			Dive	rge Area	as	
Estimati	on of v <sub>12</sub>					Estima	tion o	f v <sub>12</sub>			
	V	12 = V <sub>F</sub> ( P <sub>FM</sub> )	)					V <sub>12</sub> =	V <sub>D</sub> + (V <sub>E</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>FO</sub> = (Equ	ation 25-2 or 2					L <sub>FO</sub> = (Ed	quation 25	12		IV ID	
	using Equation					1 - 4	sing Equat		•		
V <sub>12</sub> = 1058						$V_{12} = pc/$	• .				
	/ Checks					Capaci		ecks			
	Actua	I Max	imum	LOS	S F?			Actual	M	aximum	LOS F?
						V <sub>FI</sub> =V <sub>I</sub>	<del></del>		<del> </del>	xhibit 25-14	
V <sub>FO</sub>	2077	See Exl	hibit 25-7	N	0	V <sub>12</sub>				400:All	
V <sub>R12</sub>	2077	460	00:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14	
RIZ						V <sub>R</sub>			See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not	F)	Level	of Serv	rice De	eterm	ination (i	f not F)
	5.475 + 0.0073									/ <sub>12</sub> - 0.009 L <sub>D</sub>	
1	12.0 (pc/ m/ln)	11	12	Λ.		D <sub>R</sub> =	(pc/ m/ln)			12 0	
	B (Exhibit 25-4	1)					Exhibit 2!	5-4)			
	stimation	·				Speed	·				
	235 (Exibit 25					D <sub>s</sub> =	(Exhibit 2				
- C	.8 mph (Exhib	-				"	、 mph (Exh	,	))		
l '`	A mph (Exhibi						mph (Ex		-		
	.8 mph (Exhib	-					mph (Exh		-		
	1 /2//10	,				<u>'</u>	.h., /=///	5 .0	,		

	RAMPS AND RAMP JUNCTIONS WORKSHEET eneral Information Site Information												
General Info	eneral Information  Site Information  alyst SEH Inc. Freeway/Dir of Travel US 160 Westbound												
Analyst		SEH Inc.			Fre	eway/Dir	of Tr	avel	US 160 W	Vestbour	nd		
Agency or Co	mpany				Jur	nction			SH 172 C	ff Ramp	)		
Date Perform	ed	11/13/20	09		Jur	isdiction				•			
Analysis Time	Period	PM Peak			An	alysis Yea	ar		Year 2030	)			
Project Descr	iption Ye	ar 2030 Tra	affic Op	erations	Analys	is of the U	JS 16	0 FEIS					
Inputs													
Upstream Adj	Ramp	Terrain								Downstr Ramp	eam Adj		
☐ Yes ☐	On									Yes	□ On		
□ No □	Off									□ No	☐ Off		
$L_{up} = ft$								40.0		L <sub>down</sub> =	ft		
		S	• •	60.0 mph			1 11	40.0 m <sub>l</sub>	ph	VD =	veh/h		
Vu = ve	eh/h		S	ketch (s	how lar	nes, L <sub>A</sub> , L	$_{D},V_{R},V_{R}$	$V_f$ )			VCH/H		
Conversion to	to pc/h Un	der Base (	Conditi	ons									
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv	f	HV	$f_p$	v=V/PHF f <sub>HV</sub> f <sub>p</sub>	=		
Freeway	1720	0.95	Rol	ling	5	0	0.9	30	1.00	1946			
Ramp	215	0.95		ling	2	0	0.9	71	1.00	233			
UpStream													
DownStream													
	Me	erge Areas			,			Di	verge Area	is			
Estimation o	f v <sub>12</sub>					Estimati	ion o	f v <sub>12</sub>					
	V <sub>40</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )				ĺ		V	= V <sub>R</sub> + (V <sub>F</sub>	- V <sub>2</sub> )P <sub>22</sub>			
l – (Equat						_ (=	auati			· K/· FD			
L <sub>EQ</sub> = (Equat		23-3)				$L_{EQ} = (E$							
P <sub>FM</sub> = using E	equation					'-		_	quation 0				
V <sub>12</sub> = pc/h						$V_{12} = 19$							
Capacity Che	ecks					Capacity	y Che	ecks					
	Actual	Maxin	num	LOS	F?		_	Actual	Maxii	mum	LOS F?		
\ \ <u>\</u>		See Exh	ibit 25-			$V_{FI} = V_{F}$		1946	46	00	No		
V <sub>FO</sub>		7				$V_{12}$		1946	4400	D:All	No		
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$		1713	460	00	No		
						V <sub>R</sub>		233	210	00	No		
Level of Serv	vice Deterr	nination (i	 )		Level of	Serv	vice Dete	erminatio	n (if not l	F)			
D <sub>R</sub> = 5.475 -	+ 0.00734 \	/ <sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		D <sub>P</sub> =	= 4.252 -	+ 0.0086 V	' <sub>12</sub> - 0.009	9 L <sub>D</sub>		
	c/ mi /ln)	IX.	12		A	D <sub>R</sub> =		(pc/ mi /		12	D		
LOS = (E	xhibit 25-4)					LOS=	B (E)	·· khibit 25·	-4)				
Speed Estim	ation					Speed E	stim	ation	•				
	it 25-19)								it 25-19)				
•	,	10)				-		,	xhibit 25-1	9)			
	(Exhibit 25	*				'`		• '		•			
1	(Exhibit 25	•				"		• '	xhibit 25-19	•			
S= mph	•												

	RAMPS AND RAMP JUNCTIONS WORKSHEET eneral Information Site Information												
General Info	eneral Information  Site Information  alyst SEH Inc. Freeway/Dir of Travel US 160 Westbound												
Analyst		SEH Inc.			Fre	eway/Dir	of 7	Travel	US 160	) Westbou	nd		
Agency or Co	mpany				Jur	nction			SH 172	2 Off Ram	р		
Date Perform	ed	11/13/20	09		Jur	isdiction					•		
Analysis Time	Period	AM Peak	ζ.		An	alysis Yea	ar		Year 2	030			
Project Descr	iption Ye	ar 2030 Tra	affic Op	erations	Analys	is of the U	JS 1	60 FEIS	3				
Inputs					•								
Upstream Adj	Ramp	Terrain								Downst Ramp	ream Adj		
☐ Yes ☐	On									Yes	☐ On		
□ No □	Off									□ No	☐ Off		
$L_{up} = ft$		S	= 6	60.0 mpł	<u> </u>	S		= 40.0 r	mph	$L_{\text{down}} =$	ft		
Vu = ve	eh/h		• •							VD =	veh/h		
		don Dona			oriuw idi	nes, L <sub>A</sub> , L	D, V F	۲, ۷ <sub>f</sub> )					
Conversion	1	aer Base (	onditi	1	1	1		v=V/PH					
(pc/h)	V (Veh/hr)	PHF	Те	rrain	Truck	%Rv		f <sub>HV</sub>	$f_p$	f <sub>HV</sub> f <sub>p</sub>	IF.		
Freeway	1075	0.95	Rol	ling	5	0	0.	.930	1.00	1216	5		
Ramp	140	0.95	Rol	ling	2	0	0.	.971	1.00	152			
UpStream													
DownStream						]							
		erge Areas							Diverge A	reas			
Estimation o	f v <sub>12</sub>					Estimation of v <sub>12</sub>							
	V <sub>12</sub> :	= V <sub>F</sub> ( P <sub>FM</sub> )				$V_{12} = V_R + (V_F - V_R)P_{FD}$							
L <sub>EQ</sub> = (Equat						  L=0 = (F	ัดแล		3 or 25-9)		5		
P <sub>FM</sub> = using E		20 0)											
	qualion					'-		_	Equation	U			
V <sub>12</sub> = pc/h						$V_{12} = 12$							
Capacity Che	1					Capacity	y Cl		1				
	Actual	Maxin	num	LOS	F?		_	Actua		aximum	LOS F?		
\/		See Exh	ibit 25-			V <sub>FI</sub> =V <sub>F</sub>	:	1216		4600	No		
V <sub>FO</sub>		7				V <sub>12</sub>		1216	4	400:All	No		
V <sub>R12</sub>		4600	:All			$\begin{vmatrix} V_{FO} = V_F - \\ V_R \end{vmatrix} = 10$		1064		1600	No		
						$V_R$		152		2100	No		
Level of Serv	rice Deterr	)		Level of	Sei	rvice De	etermina	tion (if not	<b>F</b> )				
$D_R = 5.475 -$	+ 0.00734 \	<sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		$D_R$	$\frac{1}{2} = 4.252$	2 + 0.008	6 V <sub>12</sub> - 0.00	9 L <sub>D</sub>		
$D_R = (po)$	c/ mi /ln)					D <sub>R</sub> =	5.7	(pc/ mi /	ln)				
LOS = (E	xhibit 25-4)	)				LOS=	A (I	Exhibit 2	5-4)				
Speed Estim	ation					Speed E	Stir	nation					
	it 25-19)								bit 25-19	)			
_	(Exhibit 25	:_10)				-		•	Exhibit 25				
	•	•				'`		• '		*			
$S_0$ = mph (Exhibit 25-19) $S_0$ = N/A mph (Exhibit 25-19) $S_0$ = 53.2 mph (Exhibit 25-15)													
<u> </u>	(LAHIDIL 25	·- ( <del>*)</del>				<u> </u>	JJ.4	2 mpn (1	LAHIDIL Z	יניו -נ			

		RAMP	S AND	RAME	- JUN	CTIONS	WOR	KSHE	ET		
General	Informati	ion				Site In:	forma	tion			
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	9		Ju	eeway/Dir onction	of Travel			astbound In Ramp	
Analysis Time	e Period	PM Peak			Ar	nalysis Year	r	Y	'ear 2030	0	
	ription Year 2	2030 Traffic C	perations	Analysis	of the US	160 FEIS					
Inputs		Terrain Rollii	าต							1	
Upstream Ad	lj Ramp	TCITAIII TOIIII	19								ım Adj Ramp
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off
□ No	C Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft			0			2 40	0			
Vu =	veh/h	`	S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40$ $S_{R'}V_f$	.u mpn		VD =	veh/h
Convers	ion to pc	/h Under	Base	Condi	tions						
(pc/h)	V (Veh/hr)	PHF	Teri	rain	Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV <sup>f</sup> p
Freeway	1555	0.95	Rolli		5	0	0.930		1.00	1760	
Ramp UpStream	250	0.95	Rolli	ing	2	0	0.971		1.00	271	
DownStream	1										
	,	Merge Areas			,				erge Area	as	
Estimati	on of v <sub>12</sub>					Estima	tion o	f v <sub>12</sub>			
	V	$V_{12} = V_F (P_{FM})$						12		- V <sub>R</sub> )P <sub>FD</sub>	
	ation 25-2 or 2					$L_{EQ} = (Ec$			9)		
	using Equation	on 0				''	sing Equa	tion			
V <sub>12</sub> = 1760						$V_{12} = pc/$					
Capacity	/ Checks	1		1		Capaci	ity Cho	ecks	1	1	1
	Actua	ıl Max	imum	LOS	S F?			Actual	†	aximum	LOS F?
V <sub>FO</sub>	2031	See Ext	nibit 25-7	N <sub>1</sub>	0	$V_{\text{FI}} = V_{\text{I}}$	F			xhibit 25-14	
						$V_{12}$ $V_{FO} = V_{F}$	-			400:All	
V <sub>R12</sub>	2031	460	0:All	N.	0	$V_{R}$			See E	xhibit 25-14	
						$V_R$			See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not i	F)	Level o	of Serv	∕ice De	eterm	ination (i	f not F)
D <sub>R</sub> =	5.475 + 0.0073	34 v <sub>R</sub> + 0.007	'8 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_R$	= 4.252 +	0.0086 \	/ <sub>12</sub> - 0.009 L <sub>D</sub>	
D <sub>R</sub> =	12.0 (pc/ m/ln)					D <sub>R</sub> =	(pc/ m/ln)				
LOS =	B (Exhibit 25-4	1)				LOS=	(Exhibit 2	5-4)			
Speed E	stimation	1				Speed Estimation					
$M_S = 0.2$	233 (Exibit 25	-19)				D <sub>s</sub> =	(Exhibit	25-19)			
$S_R = 55$	.8 mph (Exhib	it 25-19)				$S_R$ = mph (Exhibit 25-19)					
U	A mph (Exhibi	•				$S_0 =$	mph (Ex	hibit 25-1	9)		
S= 55	.8 mph (Exhib	it 25-14)				S = mph (Exhibit 25-15)					

		RAMP	S AND	RAMI	- JUN	CTIONS	WORI	KSHE	ET			
General	Informati	on				Site In	formati	ion				
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	19		Ju	eeway/Dir onction	of Travel			astbound In Ramp		
Analysis Time		AM Peak				nalysis Year	r	Υ	ear 2030	0		
	ription Year 2	2030 Traffic C	perations	Analysis	of the US	160 FEIS						
Inputs	1									1		
Upstream Ad	j Ramp	Terrain Rollii	ng								ım Adj Ramp	
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off	
□ No	☐ Off									L <sub>down</sub> =	ft	
L <sub>up</sub> =	ft			0 1								
Vu =	veh/h	Š	S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0$	) mph		VD =	veh/h	
Convers	ion to pc	/h Under				A, -D, -	R' T'					
(pc/h)	V	PHF	Teri		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	f	
	(Veh/hr)						ļ	_			ни тр	
Freeway Ramp	1145 115	0.95 0.95	Rolli Rolli		5 2	0	0.930	_	1.00	1296 125		
UpStream	110	0.75	TOIL	iig			0.771		1.00	125		
DownStream												
		Merge Areas	3						erge Area	as		
Estimati	on of v <sub>12</sub>					Estima	tion of	v <sub>12</sub>				
	V	$_{12} = V_F (P_{FM})$	)					V <sub>12</sub> =	$V_R + (V_F)$	- V <sub>R</sub> )P <sub>FD</sub>		
L <sub>EQ</sub> = (Equ	ation 25-2 or 2	5-3)				L <sub>EQ</sub> = (Ed	quation 25-	8 or 25-	9)			
P <sub>FM</sub> = 1.000	using Equatio	n 0				$P_{FD} = us$	ing Equation	on				
V <sub>12</sub> = 1296	pc/h					$V_{12} = pc/h$						
Capacity	/ Checks					Capaci	ity Che	cks				
	Actua	l Max	imum	LOS	S F?		Α	ctual	М	aximum	LOS F?	
M	1 101			Ĺ.,		V <sub>FI</sub> =V <sub>I</sub>	F		See E	xhibit 25-14		
V <sub>FO</sub>	1421	See EXI	hibit 25-7	N	0	V <sub>12</sub>			4	400:All		
V <sub>R12</sub>	1421	460	0:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14		
IX12			V <sub>R</sub>			See E	Exhibit 25-3					
Level of	Service L	F)	Level o	of Servi	ice De	eterm	ination (i	f not F)				
	5.475 + 0.0073						D <sub>R</sub> =	4.252 +	0.0086 \	/ <sub>12</sub> - 0.009 L <sub>D</sub>		
D <sub>R</sub> =	7.3 (pc/ m/ln)					$D_R = (pc/ m/ln)$						
LOS =	A (Exhibit 25-4	.)				LOS= (Exhibit 25-4)						
Speed E	stimation					Speed Estimation						
	220 (Exibit 25					D <sub>s</sub> = (Exhibit 25-19)						
~	.0 mph (Exhibi	•				S <sub>R</sub> = ı	mph (Exhi	bit 25-19	))			
1 '`	· · A mph (Exhibit						mph (Exh	ibit 25-1	9)			
	.0 mph (Exhib	-				S = mph (Exhibit 25-15)						

	RAMPS AND RAMP JUNCTIONS WORKSHEET  neral Information Site Information											
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eway/Dir	of -	Travel	US 1	60 E	astboun	d
Agency or Co	mpany				Jur	nction			SH 1	72 O	ff Ramp	)
Date Performe	ed	11/13/20	09		Jur	isdiction					•	
Analysis Time	Period	PM Peak			Ana	alysis Ye	ar		Year	2030	)	
Project Descri	iption Ye	ar 2030 Tra	affic Op	erations	Analysi	is of the l	JS ′	160 FEIS	3			
Inputs												
Upstream Adj	Ramp	Terrain									Downstr Ramp	eam Adj
☐ Yes ☐	On										Yes	On
□ No □	Off										□ No	
$L_{up} = ft$		S	<sub></sub> = (	60.0 mph	<u> </u>	S	) <sub>ED</sub> =	= 40.0 i	mph		L <sub>down</sub> =	ft
Vu = ve	h/h		• •			es, L <sub>A</sub> , L			•		VD =	veh/h
Conversion t	to nc/h l ln	dor Rasa (			TIOW IGI	, <sub>–A</sub> , –	וייטי	۲٬۰ <sub>۱</sub> ۰				
Conversion	.ο <i>ρε/π οπ</i> ∨	uei base C	Jonana	0113	1	1	1	1			v=V/PHI	F
(pc/h)	(Veh/hr)	PHF		rrain	Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>		f <sub>HV</sub> f <sub>p</sub>	
Freeway	2795	0.95	Rol	ling	5	0	0	.930	1.00	)	3163	
Ramp	1240	0.95	Rol	ling	2	0	0.	.971	1.00	)	1344	
UpStream					<u> </u>	<u> </u>					<u> </u>	
DownStream												
	Me	erge Areas						[	Diverge	Area	S	
Estimation of	f v <sub>12</sub>					Estimat	ion	of v <sub>12</sub>				
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						V	_ = V +	+ (V_	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat						L <sub>EQ</sub> = (E	aus			•	א רט	•
		20-0)										
P <sub>FM</sub> = using E	quation					$P_{FD} = 1.000$ using Equation 0						
V <sub>12</sub> = pc/h						$V_{12} = 31$						
Capacity Che	ecks					Capacit	y Cl	hecks				
	Actual	Maxin	num	LOS	F?			Actua	<u>                                     </u>	Maxii	num	LOS F?
V		See Exh	ibit 25-			$V_{FI} = V_{F}$	:	3163		46	00	No
V <sub>FO</sub>		7				V <sub>12</sub>		3163		4400	):All	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{I}$ $V_{R}$	F -	1819		460	00	No
			$V_{R}$		1344		210	00	No			
Level of Serv	rice Detern		Level of	Se	rvice De	etermin	atior	n (if not l	F)			
$D_R = 5.475 +$	+ 0.00734 v	<sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		D	$_{R} = 4.252$	2 + 0.00	86 V	12 - 0.009	9 L <sub>D</sub>
$D_R = (pc)$	c/ mi /ln)					$D_R = 22.5 \text{ (pc/ mi /ln)}$					_	
LOS = (Ex	xhibit 25-4)					LOS=	C (I	Exhibit 2	5-4)			
Speed Estima	ation					Speed E	Estii	mation				
_	it 25-19)					_		84 (Exh	bit 25-1	9)		
"	•	10)				~		3 mph (		•	3)	
1	(Exhibit 25	•						• •			•	
•	•							Amph (				
S= mph	(Exhibit 25	-14)				S = 51.3 mph (Exhibit 25-15)						

	RAMPS AND RAMP JUNCTIONS WORKSHEET  neral Information Site Information											
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eway/Dir	of 7	Travel	US 16	60 East	bound	
Agency or Co	mpany				Jur	nction			SH 17	'2 Off 1	Ramp	
Date Performe	ed	11/13/20	09		Jur	isdiction					-	
Analysis Time	Period	AM Peak	[		Ana	alysis Ye	ar		Year 2	2030		
Project Descri	iption Ye	ar 2030 Tra	affic Op	erations	Analysi	s of the l	JS 1	60 FEIS	3			
Inputs												
Upstream Adj	Ramp	Terrain									wnstre imp	am Adj
☐ Yes ☐	On										Yes	☐ On
□ No □	Off										No	
$L_{up} = ft$				00.0				40.0		L <sub>dc</sub>	own =	ft
	h /h	S	• •	60.0 mph				= 40.0 ı	npn	VD	) =	veh/h
	h/h				show lar	es, L <sub>A</sub> , L	$_{D}, V_{F}$	$(V_f)$				
Conversion t	o pc/h Un	der Base (	Condit	ions		1	1			1		
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv		f <sub>HV</sub>	$\mathbf{f}_{p}$	v=' f <sub>HV</sub>	V/PHF , f <sub>p</sub>	
Freeway	1755	0.95	Rol	lling	5	0	0.	930	1.00		1986	
Ramp	610	0.95		lling	2	0	0.	.971	1.00		661	
UpStream												
DownStream												
	Me	erge Areas			,			Ī	Diverge /	Areas		
Estimation of	f V <sub>12</sub>					Estimat	ion	of V <sub>12</sub>				
	V	= V <sub>F</sub> ( P <sub>FM</sub> )						V	<sub>2</sub> = V <sub>R</sub> +	(V V	_)P	
l – (Equat						_ /=				•	R/' FD	
L <sub>EQ</sub> = (Equat		25-5)				$L_{EQ} = (E$						
P <sub>FM</sub> = using E	quation					$P_{FD} = 1.0$		•	Equation	1 0		
V <sub>12</sub> = pc/h						$V_{12} = 19$	86	pc/h				
Capacity Che	ecks					Capacit	y Cl	hecks				
	Actual	Maxin	num	LOS	F?			Actua	I N	1aximur	n	LOS F?
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		See Exh	ibit 25-			$V_{FI} = V_{F}$	.	1986		4600		No
V <sub>FO</sub>		7				V <sub>12</sub>		1986		4400:Al	I	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	= -	1325		4600		No
						V <sub>R</sub>		661		2100		No
Level of Serv	rice Detern	<u>'</u>	Level of	Sei	rvice De	etermina	ation (if	not F				
D <sub>R</sub> = 5.475 +				,	. L^				2 + 0.008	•		
1	c/ mi /ln)	K	12		А	$D_{R} = 12.3 \text{ (pc/ mi /ln)}$					Б	
LOS = (Ex	khibit 25-4)					LOS=	В (Е	xhibit 2	25-4)			
Speed Estima	ation .					Speed E	<u> </u>					
						_			ibit 25-19	3)		
,	it 25-19)	4.0\				-		,		•		
1 .,	(Exhibit 25	•						• •	Exhibit 2	,		
•	(Exhibit 25	•				~		• '	Exhibit 2	•		
S= mph	(Exhibit 25	-14)				S = 52.4 mph (Exhibit 25-15)						

		RAMP	S AND	RAMI	P JUN	CTIONS	WORKS	SHEE	T		
General	Informati	on				Site In	formatio	n			
Analyst2 Agency or Co		SEH Inc.			Ju	eeway/Dir o	of Travel		160 Wes		
Date Perform Analysis Time		11/13/200 PM Peak	19			ırisdiction nalysis Year	r	Vea	ır 2030		
	ription Year 2		perations	Analysis				100	11 2000		
Inputs											
Upstream Ad	lj Ramp	Terrain Rolli	ng							Downstrea	m Adj Ramp
▼ Yes	<b>™</b> On									Yes	☐ On
□ No	C Off									No No	C Off
L <sub>up</sub> =	1700 ft		S <sub>FF</sub> = 60	0 mnh			$S_{FR} = 40.0 \text{ m}$	ınh		L <sub>down</sub> =	
	565 veh/h			Sketch (		es, L <sub>A</sub> , L <sub>D</sub> ,V		ірі і		VD =	veh/h
Convers	ion to pc	h Under	Base	Condi	tions	1	(				
(pc/h)	V (Veh/hr)	PHF	Ter	rain	Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f <sub>H</sub>	IV f <sub>p</sub>
Freeway	4030	0.95	Roll		5	0	0.930	1.0		4560	
Ramp	590 565	0.95 0.95	Roll		2 2	0	0.971 0.971	1.0		640	
UpStream  DownStream	<del>,                                     </del>	0.93	Roll	iriy	<u>                                     </u>	<u>                                       </u>	0.971	1.0	00	013	
Downoucun		Merge Areas	l S		J		<u> </u>	Diverg	e Areas		
Estimati	on of v <sub>12</sub>	, i				Estima	tion of v	12			
		<sub>12</sub> = V <sub>F</sub> ( P <sub>FM</sub>	)					-	+ (V <sub>F</sub> - \	/ <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equ	ation 25-2 or 2	5-3)				L <sub>EQ</sub> = (Ed	quation 25-8 (	or 25-9)			
$P_{FM} = 0.619$	using Equatio	n 1				$P_{FD} = us$	ing Equation				
V <sub>12</sub> = 2821	pc/h					$V_{12} = pc/$	'h				
Capacity	/ Checks					Capaci	ity Checl	ks			
	Actua	l Max	imum	LOS	S F?		Act	ual	Maxi	mum	LOS F?
.,						V <sub>FI</sub> =V <sub>I</sub>	F .		See Exhi	bit 25-14	
V <sub>FO</sub>	5200	See Ex	hibit 25-7	N	0	V <sub>12</sub>			4400	D:All	
V <sub>R12</sub>	3461	460	0:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-	!	See Exhi	bit 25-14	
						V <sub>R</sub>			See Exh	ibit 25-3	
Level of	Service L	Determin	ation (	if not	F)	Level o	of Servic	e Det	ermin	ation (if	not F)
D <sub>R</sub> =	5.475 + 0.0073	34 v <sub>R</sub> + 0.007	78 V <sub>12</sub> - 0.	00627 L <sub>A</sub>			$\overline{D_R} = 4.2$	252 + 0.0	0086 V <sub>12</sub>	- 0.009 L <sub>D</sub>	
D <sub>R</sub> =	23.0 (pc/ m/ln)					D <sub>R</sub> =	(pc/ m/ln)				
LOS =	C (Exhibit 25-4	)				LOS=	(Exhibit 25-4)				
Speed E	stimation	1				Speed	Estimati	on			
-	328 (Exibit 25-					D <sub>s</sub> =	(Exhibit 25-1				
	.1 mph (Exhibi	t 25-19)				S <sub>R</sub> = I	mph (Exhibit	25-19)			
11	.5 mph (Exhibi	•				S <sub>0</sub> = 1	mph (Exhibi	t 25-19)			
	.6 mph (Exhibi	•				S =	mph (Exhibit	25-15)			

		RAMP	S AND	RAMI	P JUN	CTIONS	S WOR	KSHE	ET				
General	Informatio					Site In:							
Analyst2 Agency or Co	ompany	SEH Inc.			Ju	eeway/Dir onction		l		/estbound w Ramp e			
Date Perform		11/13/200	19			risdiction	-	\	/oor 2020	1			
Analysis Time	ription Year 20	AM Peak	)norations	Analysis		nalysis Year	<u>[</u>	Y	ear 2030	J			
Inputs	ipilon real 20	Journallic C	регашонз	Allalysis	or the US	100 1 L13							
прис	ĺΤ	errain Rolli	na							1			
Upstream Adj	j Ramp	cirum rtom	ng .								ım Adj Ramp		
✓ Yes	<b>☑</b> On									☐ Yes ☐ No	☐ On ☐ Off		
□ No	Off									L <sub>down</sub> =	ft		
uρ	1700 ft		S <sub>FF</sub> = 60	.0 mph			$S_{FR} = 40.$	0 mph		VD =	veh/h		
	945 veh/h			Sketch (		es, L <sub>A</sub> , L <sub>D</sub> ,V	1 11	'			VOIIII		
Convers	ion to pc/l	h Under	Base	Condi	tions	<b>S</b>							
(pc/h)	V (Veh/hr)	PHF	Ter	rain	Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV <sup>f</sup> p		
Freeway	2940	0.95	Roll		5	0	0.930		1.00	3327			
Ramp	385	0.95	Roll		2	0	0.971		1.00	417			
UpStream	945	0.95	Roll	ing	2	0	0.971		1.00	1025			
DownStream		Merge Areas			<u> </u>	<u> </u>		Div	erge Area				
Estimation	on of v <sub>12</sub>	vierge Areas	)			Estima	etion o		erge Area	15			
LStillati		= V <sub>F</sub> ( P <sub>FM</sub> )	)			<b>Estimation of <math>v_{12}</math></b> $V_{12} = V_R + (V_F - V_R)P_{FD}$							
$L_{EO} = (Equation Equation $	ation 25-2 or 25					  L <sub>FO</sub>	guation 25	12		R' FD			
	using Equation						· sing Equat		,				
V <sub>12</sub> = 2058		•				$V_{12} = pc$							
								oko					
Capacity	/ Checks	May	imum	100	S F?	Capac			1 1	aximum	LOS F?		
	Actual	IVIAX	IIIIuIII	LOS	5 F ?		<del></del>	Actual	<del>                                     </del>		LUSF?		
$V_{FO}$	3744	See Ext	hibit 25-7	N	0	$\frac{V_{FI}=V_{I}}{V_{12}}$	F			xhibit 25-14 400:All			
V <sub>R12</sub>	2475	460	00:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14			
R12	2170	100	70.7 til		O	V <sub>R</sub>			See E	Exhibit 25-3			
Level of	Service D	etermin	ation (	if not	F)	Level o	of Serv	rice De	etermi	ination (i	f not F)		
	5.475 + 0.00734		•							/ <sub>12</sub> - 0.009 L <sub>D</sub>			
1	15.4 (pc/ m/ln)	K	12	,,		D <sub>R</sub> =	(pc/ m/ln)			12 0			
	B (Exhibit 25-4)						(Exhibit 2	5-4)					
	stimation					Speed Estimation							
_	50 (Exibit 25-1	9)				D <sub>s</sub> =	(Exhibit 2						
o .	5 mph (Exhibit	25-19)				S <sub>R</sub> = mph (Exhibit 25-19)							
	2 mph (Exhibit	•				S <sub>0</sub> = mph (Exhibit 25-19)							
O .	1 mph (Exhibit					S = mph (Exhibit 25-15)							

		RAMPS	S AND	RAMI	P JUN	CTIONS	WORKS	SHEI	ET		
General	Information						formatio				
Analyst2 Agency or Co Date Perform Analysis Tim	ned e Period	SEH Inc. 11/13/200 PM Peak			Ju Ju Ar	eeway/Dir conction risdiction nalysis Year		G	S 160 We: randview I ear 2030		
	ription Year 2	030 Traffic O	perations	Analysis	of the US	160 FEIS					
Inputs	[-	Forrain Dallin	.~							1	
Upstream Ad	lj Ramp	Terrain Rollir	ıy								m Adj Ramp
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off
☐ No	Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft _									]	
Vu =	veh/h	S	FF = 60		show lane	S s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0 \text{ m}$ $S_{R}, V_f$	nph		VD =	veh/h
Convers	sion to pc/	h Under				, в	<u> </u>				
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	<sub>HV</sub> f <sub>p</sub>
Freeway	3440	0.95	Rolli		5	0	0.930	<del></del>	1.00	3893	
Ramp	590	0.95	Rolli	ing	2	0	0.971		1.00	640	
UpStream DownStrean					<u> </u> 			}			
Downstream		Merge Areas			J			Dive	rge Areas	I,	
Estimati	ion of v <sub>12</sub>					Estima	tion of v	12			
P <sub>FM</sub> = 0.631	uation 25-2 or 25 using Equatior					$P_{FD} = us$	uation 25-8 ( ing Equation		/ <sub>R</sub> + (V <sub>F</sub> -	V <sub>R</sub> )P <sub>FD</sub>	
V <sub>12</sub> = 2455						$V_{12} = pc/$	h 				
Capacity	/ Checks			-		Capaci	ty Checi	ks			
	Actual	Maxi	mum	LOS	S F?		Act	ual		imum	LOS F?
$V_{FO}$	4533	See Exh	nibit 25-7	N	0	$\frac{V_{FI}=V_{F}}{V_{12}}$	=			nibit 25-14 00:All	
V <sub>R12</sub>	3095	460	0:All	N	0	$V_{FO} = V_F$ $V_R$	-		See Exh	nibit 25-14	
						$V_R$			See Exl	hibit 25-3	
Level of	Service D	etermina	ation (	if not	F)	Level c	of Servic	e De	termin	nation (i	f not F)
	5.475 + 0.0073		-							- 0.009 L <sub>D</sub>	
D <sub>R</sub> =	17.4 (pc/ m/ln)					$D_R = $ (	pc/ m/ln)				
LOS =	B (Exhibit 25-4)					LOS= (	(Exhibit 25-4)				
Speed E	stimation					Speed	Estimati	ion			
_	255 (Exibit 25-	19)				D <sub>s</sub> = (Exhibit 25-19)					
J	.4 mph (Exhibit	•				S <sub>R</sub> = mph (Exhibit 25-19)					
	.6 mph (Exhibit	•				$S_0$ = mph (Exhibit 25-19)					
	.8 mph (Exhibit	-				ľ	nph (Exhibit		•		

		RAMPS	AND	RAMI	P JUN	CTIONS	WORKS	SHEET				
General	Informatio						formation					
Analyst2 Agency or Co	ompany	SEH Inc.			Ju	eeway/Dir o		US 160 V	Vestbound w Ramp C			
Date Perform Analysis Tim		11/13/2009 AM Peak				ırisdiction nalysis Year		Year 203	n			
	ription Year 20		erations	Analysis				Tour 200	<u> </u>			
Inputs												
Upstream Ad		errain Rollin	9						Downstrea	m Adj Ramp		
☐ Yes	□ On								Yes	Con On		
□ No	☐ Off								No No	Off		
L <sub>up</sub> =	ft		40	0 mnh			10.0 m	n <b>h</b>	L <sub>down</sub> =	ft		
Vu =	veh/h	5	<sub>FF</sub> = 60		show lane	es, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0 \text{ m}$ $R, V_f$ )	pn	VD =	veh/h		
Convers	ion to pc/l	under l	Base	Condi	itions							
(pc/h)	V (Veh/hr)	PHF	Teri	rain	Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v=V/PHF f <sub>l</sub>	HV <sup>f</sup> p		
Freeway	1940	0.95	Rolli		5	0	0.930	1.00	2195			
Ramp	1000	0.95	Rolli	ing	2	0	0.971	1.00	1084			
UpStream DownStream						<u> </u>						
Downstream		 ∕lerge Areas			J.	<u> </u>		Diverge Area	I BS			
Estimati	on of v <sub>12</sub>					Estima	tion of v					
		, = V <sub>F</sub> ( P <sub>FM</sub> )						$V_{12} = V_R + (V_F)$	- V <sub>D</sub> )P <sub>ED</sub>			
L <sub>FO</sub> = (Equ	ء . ation 25-2 or 25					L <sub>FO</sub> = (Ec	juation 25-8 c	12 11 1	- KV. FD			
	using Equation						ing Equation	. 20 7)				
V <sub>12</sub> = 1384		·				$V_{12} = pc/$						
12	/ Checks					1-2		<b>1</b> 5				
Сараспу	1	Maxir	num	109	S F?	Capaci	ty Check Actu	1	aximum	LOS F?		
	Actual	IVIANII	IIUIII	LO.	3 Γ !	\/ _\/	<del></del>		xhibit 25-14	LUST		
$V_{FO}$	3279	See Exhi	bit 25-7	N	lo	$V_{FI} = V_{FI}$	-					
						$V_{12}$ $V_{FO} = V_{F}$	-		400:All xhibit 25-14			
V <sub>R12</sub>	2468	4600	:All	N	10	V <sub>R</sub>			Exhibit 25-14			
	0 . 0		4. /	•••	<b>-</b> \	V <sub>R</sub>				c ( =\		
	Service De					Level c			<u>ination (i</u>	not F)		
11	5.475 + 0.00734	v <sub>R</sub> + 0.0078	v <sub>12</sub> - 0.0	00627 L <sub>A</sub>				252 + 0.0086 \	/ <sub>12</sub> - 0.009 L <sub>D</sub>			
11	12.3 (pc/ m/ln)					1	(pc/ m/ln)					
	B (Exhibit 25-4)					LOS= (	Exhibit 25-4)					
Speed E	stimation					Speed	Estimati	on				
$M_{S} = 0.2$	215 (Exibit 25-1	9)				$D_s = $ (Exhibit 25-19)						
J	.1 mph (Exhibit	25-19)				S <sub>R</sub> = mph (Exhibit 25-19)						
13	.9 mph (Exhibit					S <sub>0</sub> = mph (Exhibit 25-19)						
O .	.8 mph (Exhibit					S = mph (Exhibit 25-15)						

		RAMPS A	ND RAM	IP JUN	CTIONS	WORKS	SHEET			
General	Informatio					formation				
Analyst2 Agency or Co	ompany	SEH Inc.		Ju	eeway/Dir o		US 160 E Grandviev			
Date Perform Analysis Time		11/13/2009 PM Peak			ırisdiction nalysis Year		Year 2030	)		
	ription Year 20		ions Analysi				1 Cui 2000	,		
Inputs	<u>'</u>		,							
Upstream Ad		errain Rolling						Downstrea	m Adj Ramp	
☐ Yes	☐ On							☐ Yes	On	
□ No	☐ Off							□ No	☐ Off	
L <sub>up</sub> =	ft		/0.0 mmh			. 40.0	l-	L <sub>down</sub> =	ft	
Vu =	veh/h	5 <sub>FF</sub> =	60.0 mph Sketch	( show lane	es, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0 \text{ m}$ $R'_f$	pn	VD =	veh/h	
Convers	ion to pc/h	Under Ba	se Cond	litions						
(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v=V/PHF f <sub>l</sub>	HV <sup>f</sup> p	
Freeway	2980	0.95	Rolling	5	0	0.930	1.00	3372		
Ramp	480	0.95	Rolling	2	0	0.971	1.00	520		
UpStream  DownStream					<u> </u>					
Downstream		 lerge Areas			<u> </u>	ļ	Diverge Area	I IS		
Estimati	on of v <sub>12</sub>				Estima	tion of v				
		= V <sub>F</sub> ( P <sub>FM</sub> )					$V_{12} = V_R + (V_F)$	- V <sub>D</sub> )P <sub>ED</sub>		
L <sub>FO</sub> = (Equ	ation 25-2 or 25-				L <sub>FO</sub> = (Ec	quation 25-8 c	12 11 1	. KA. ED		
	using Equation					ing Equation	7 25 7)			
$V_{12} = 2086$		1			$V_{12} = pc/$	-				
12					1-2					
Capacity	/ Checks	1	1 10	20. 50	Capaci	ity Check	1		1.00.50	
	Actual	Maximum	LC	OS F?	\ \ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	Actu	<del></del>	aximum	LOS F?	
$V_{FO}$	3892	See Exhibit 2	25-7	No	$V_{FI} = V_{F}$	=		xhibit 25-14		
					V <sub>12</sub>		4	400:All		
V <sub>R12</sub>	2606	4600:All		No	$V_{FO} = V_{F}$ $V_{R}$	-	See E	xhibit 25-14		
					V <sub>R</sub>		See E	Exhibit 25-3		
Level of	Service De	eterminatio	n (if not	: F)		of Service	e Determi	ination (i	f not F)	
	5.475 + 0.00734		1 1				252 + 0.0086 V	•		
i.v.	16.3 (pc/ m/ln)	л I.		П	D <sub>R</sub> = (	(pc/ m/ln)		12 D		
11	B (Exhibit 25-4)				1	(Exhibit 25-4)				
	istimation					Estimati	on			
_	256 (Exibit 25-1	9)			D <sub>s</sub> = (Exhibit 25-19)					
	.4 mph (Exhibit)	•			S <sub>R</sub> = mph (Exhibit 25-19)					
10	.2 mph (Exhibit)	· ·			$S_0$ = mph (Exhibit 25-19)					
· ·	.0 mph (Exhibit				*	mph (Exhibit	25-15)			

		RAMPS	AND	RAMI	P JUN	CTIONS	WORKS	SHEET			
General	Informatio						formation				
Analyst2 Agency or Co	ompany	SEH Inc.			Ju	eeway/Dir c		US 160 E	astbound w Ramp B		
Date Perform Analysis Time		11/13/2009 AM Peak				ırisdiction nalysis Year		Year 203	n		
	ription Year 20		erations	Analysis				Teal 203	J		
Inputs				7	0	100 1 2.0					
Upstream Ad		errain Rolling							Downstrea	m Adj Ramp	
☐ Yes	☐ On								Yes	☐ On	
□ No	☐ Off								□ No	☐ Off	
L <sub>up</sub> =	ft								L <sub>down</sub> =	ft	
Vu =	veh/h	S <sub>F</sub>	<sub>F</sub> = 60		show lane	S s, L <sub>A</sub> , L <sub>D</sub> ,V <sub>I</sub>	$S_{FR} = 40.0 \text{ m}$ $R_f V_f$	ph	VD =	veh/h	
Convers	ion to pc/h	n Under E	Base	Condi	tions						
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v=V/PHF f	HV fp	
Freeway	2030	0.95	Rolli		5	0	0.930	1.00	2297		
Ramp	620	0.95	Rolli	ing	2	0	0.971	1.00	672		
UpStream DownStream					<u> </u>	<u> </u>					
Downstream					<u> </u>			Diverge Area	l as		
Estimati	on of v <sub>12</sub>	norge 7 ii ede				Estima	tion of v				
	·	= V <sub>F</sub> ( P <sub>FM</sub> )						$V_{12} = V_R + (V_F)$	- V <sub>p</sub> )P <sub>sp</sub>		
L <sub>FO</sub> = (Equ	ation 25-2 or 25					$ L_{EO} = (Eo$	juation 25-8 c	12 11 1	· · R/· FD		
	using Equation						ing Equation	7 25 7)			
V <sub>12</sub> = 1421		•				$V_{12} = pc/$					
1.2								<b>70</b>			
Capacity	/ Checks	Mayim		1.00	C F2	Capaci	ty Check	1	ovinov mo	100.53	
	Actual	Maxim	lulli	LU.	S F?	\ \ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	Actu		aximum	LOS F?	
$V_{FO}$	2969	See Exhib	oit 25-7	N	0	$V_{FI} = V_{F}$	:		xhibit 25-14		
						V <sub>12</sub>		4	400:All		
V <sub>R12</sub>	2093	4600:	All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-	See E	xhibit 25-14		
						V <sub>R</sub>		See I	Exhibit 25-3		
Level of	Service De	etermina	tion (	if not	F)	Level c	of Service	e Determ	ination (i	f not F)	
	5.475 + 0.00734							252 + 0.0086 \			
i.v.	12.3 (pc/ m/ln)	13	14	A		$D_R = $ (	pc/ m/ln)		,		
IX.	B (Exhibit 25-4)						Exhibit 25-4)				
	stimation						Estimati	on			
_	235 (Exibit 25-1	9)				D <sub>s</sub> = (Exhibit 25-19)					
J	.8 mph (Exhibit	•				I	mph (Exhibit	25-19)			
13	.6 mph (Exhibit	•				$S_0 = mph$ (Exhibit 25-19)					
o .	.6 mph (Exhibit					-	mph (Exhibit	25-15)			

General Info	alyst SEH Inc. Freeway/Dir of Travel US 160 Eastbound ency or Company Junction Grandview Ramp A												
Analyst		SEH Inc.			Fre	eway/Dir	of <sup>-</sup>	Travel	US 16	0 Eastbour	nd		
Agency or Co	mpany				Jur	nction			Grand	view Ram	o A		
Date Perform	ed	11/13/20	09		Jur	risdiction				1			
Analysis Time	Period	PM Peak			An	alysis Yea	ar		Year 2	.030			
Project Descr		ar 2030 Tra		erations				160 FEIS					
Inputs													
Upstream Adj	Ramp	Terrain								Downst Ramp	ream Adj		
☐ Yes ☐	On									☐ Yes	☐ On		
□ No □	Off									□ No	☐ Off		
$L_{up} = ft$		s	<sub></sub> = (	60.0 mpł	າ	S	) <sub>ED</sub> =	= 40.0 r	mph	L <sub>down</sub> =	ft		
Vu = ve	eh/h		• •			nes, L <sub>A</sub> , L			•	VD =	veh/h		
		dor Boss (			silow iai	103, L <sub>A</sub> , L	D, V F	₹, <b>v</b> f/					
Conversion t	1	der base C	Jonaili	0115	1					v=V/PH	 łF		
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	$f_{HV} f_{p}$			
Freeway	4525	Rol	ling	5	0	0.	.930	1.00	5120	)			
Ramp	1545	Rol	ling	2	0	0.	.971	1.00	1675	5			
UpStream													
DownStream						<u> </u>							
	Me	rge Areas							Diverge A	reas			
Estimation o	f v <sub>12</sub>					Estimati	ion	of v <sub>12</sub>					
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						V <sub>1</sub> ,	<sub>2</sub> = V <sub>D</sub> +	(V <sub>F</sub> - V <sub>R</sub> )P <sub>FI</sub>			
L <sub>EQ</sub> = (Equat						$L_{EQ} = (E$	ัดแล				Ь		
		20 0)											
P <sub>FM</sub> = using E	equation					P <sub>FD</sub> =0.555 using Equation 5							
V <sub>12</sub> = pc/h						$V_{12} = 35$		<u> </u>					
Capacity Che	ecks				<del> </del>	Capacity	y CI	hecks					
	Actual	Maxin	num	LOS	F?			Actua	I M	aximum	LOS F?		
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		See Exh	ibit 25-			$V_{FI} = V_{F}$	.	5120		6900	No		
V <sub>FO</sub>		7				V <sub>12</sub>		3587	4	400:All	No		
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	= -	3445		6900	No		
						V <sub>R</sub>		1675	,	2100	No		
Level of Serv	Level of Service Determination (if not F)							Level of Service Determination (if not F)					
$D_R = 5.475 -$					. L^		D	= 4.252	2 + 0.008	6 V <sub>12</sub> - 0.00	)9 L <sub>D</sub>		
1 '`	c/ mi /ln)	N	12		A	$D_{R} = 26.1 \text{ (pc/ mi /ln)}$							
	xhibit 25-4)							Exhibit 2	•				
Speed Estim						Speed Estimation							
_	it 25-19)					T-			bit 25-19	)			
"	(Exhibit 25	-19)				$S_R = 50.8 \text{ mph (Exhibit 25-19)}$							
								$S_0 = 63.7 \text{ mph (Exhibit 25-19)}$					
1	_												
S= mph	(Exhibit 25	-14)				S = :	<b>34.</b>	ı mph (	Exhibit 2	5-15)			

General Info	alyst SEH Inc. Freeway/Dir of Travel US 160 Eastbound ency or Company Junction Grandview Ramp A											
Analyst		SEH Inc.			Fre	eway/Dir	of	Travel	US 1	60 E	astbound	<u>1</u>
Agency or Co	mpany				Jur	nction			Gran	dvie	w Ramp	A
Date Perform	ed	11/13/20	09		Jur	risdiction					1	
Analysis Time	Period	AM Peak	ζ.		An	alysis Yea	ar		Year	2030	0	
Project Descr		ar 2030 Tra		erations				160 FEIS				
Inputs												
Upstream Adj	Ramp	Terrain									Downstr Ramp	eam Adj
☐ Yes ☐	On										Yes	☐ On
□ No □	Off										□ No	☐ Off
$L_{up} = ft$		s	= (	60.0 mph	<u> </u>	S	ED =	= 40.0 i	mph		L <sub>down</sub> =	ft
Vu = ve	h/h		• •			nes, L <sub>A</sub> , L			•		VD =	veh/h
Conversion	-	dor Page (			ovv idi	, L <sub>A</sub> , L	יט, יט	K' * f/			<u> </u>	
Conversion		der base C	Jonaili	0115	1	1	1	1	,\\ <i>II</i> F		v=V/PHF	=
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv	f <sub>HV</sub> f <sub>p</sub> f <sub>t</sub>			f <sub>HV</sub> f <sub>p</sub>		
Freeway	2830	5	0	0	.930	1.00	)	3202				
Ramp	800	2	0	0	.971	1.00	)	867				
UpStream												
DownStream					<u> </u>	<u> </u>						
	Me	rge Areas							Diverge	Area	as	
Estimation o	f v <sub>12</sub>					Estimati	ion	of V <sub>12</sub>				
	V <sub>12</sub> =	V <sub>F</sub> (P <sub>FM</sub> )						V	_ = V	+ (V_	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat						 	aus			•	R/ FD	
		20-0)				$L_{EQ}$ = (Equation 25-8 or 25-9) $P_{ED}$ = 0.640 using Equation 5						
P <sub>FM</sub> = using E	quation					P <sub>FD</sub> =0.640 using Equation 5						
V <sub>12</sub> = pc/h						$V_{12} = 23$	62	pc/h				
Capacity Che	ecks					Capacity	y C	hecks				
	Actual	Maxin	num	LOS	F?		]	Actua	ıl	Maxi	mum	LOS F?
		See Exh	ibit 25-			$V_{FI} = V_{F}$	.	3202		69	00	No
V <sub>FO</sub>		7				V <sub>12</sub>		2362		4400	D:All	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	= -	2335		690	00	No
N1Z						V <sub>R</sub>		867		210	00	No
Level of Serv	vice Detern		Level of	Se	rvice De	etermin	atio	n (if not F	=)			
$D_R = 5.475 -$	+ 0.00734 v	<sub>R</sub> + 0.007	$L_{\Delta}$		D	$_{2} = 4.252$	2 + 0.00	)86 V	1 <sub>2</sub> - 0.009	) L <sub>D</sub>		
	c/ mi /ln)	IX.	12		^	$D_{R} = 15.6 \text{ (pc/ mi /ln)}$					D	
	xhibit 25-4)					'`			•			
						, , , ,						
Speed Estim						Speed Estimation  D = 0.441 (Cybibit 25.40)						
,	it 25-19)					$D_s = 0.441$ (Exhibit 25-19) $S_R = 52.1$ mph (Exhibit 25-19)						
S <sub>R</sub> = mph	(Exhibit 25	-19)				1		-				
$S_0 = mph$	mph (Exhibit 25-19)							$S_0 = 65.8 \text{ mph (Exhibit 25-19)}$				
_	(Exhibit 25	-14)			S = 55.1 mph (Exhibit 25-15)							

## HCS2000: Freeway Weaving Release 4.1f

# Operational Analysis\_\_\_\_\_

Analyst: SEH Inc.

Agency/Co.:

Date Performed:

11/13/2009

Date Performed: 11/13/20 Analysis Time Period: PM Peak Freeway/Dir of Travel: US 160 Westbound

Weaving Location:

Weaving ratio, R

CR 233 On US 550 Off

Jurisdiction:

Analysis Year:

Year 2030

Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS

Inputs_		
Freeway free-flow speed, SFF	60	mph
Weaving number of lanes, N	4	
Weaving segment length, L	2070	ft
Terrain type	Rolling	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.47	

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

0.19

	Non-Wea	ving	Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1975	40	340	1460	veh/h
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	
Peak 15-min volume, v15	520	11	89	384	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	2.5	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.930	0.930	0.930	0.930	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2234	45	384	1652	pc/h

## \_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.59	0.27
Weaving and non-weaving speeds, Si	34.27	54.43
Number of lanes required for		
unconstrained operation, Nw (Exhibit 24	1-7)	2.18
Maximum number of lanes, Nw (max) (Exh	ibit 24-7)	1.40
Type of operation is		Constrained

\_Weaving Segment Speed, Density, Level of Service and Capacity\_\_\_\_\_

Weaving segment speed, S	42.61	mph
Weaving segment density, D	25.32	pc/mi/ln
Level of service, LOS	С	_
Capacity of base condition, cb	7176	pc/h
Capacity as a 15-minute flow rate, c	6675	pc/h
Capacity as a full-hour volume, ch	6341	pc/h

		If Max Exce	eded See Note	
	Analyzed	Maximum	Note	
Weaving flow rate, Vw	2036	2800	a	
Average flow rate (pcphpl)	1078	2300	b	
Volume ratio, VR	0.47	0.35	C	
Weaving ratio, R	0.19	N/A	d	
Weaving length (ft)	2070	2500	е	
Notes:				

- a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- b. Capacity constrained by basic freeway capacity.
- c. Capacity occurs under constrained operating conditions.
- d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

## HCS2000: Freeway Weaving Release 4.1f

# Operational Analysis\_\_\_\_\_

Analyst: SEH Inc.

Agency/Co.:

Date Performed: 11/13/2009
Analysis Time Period: AM Peak
Freeway/Dir of Travel: US 160 Westbound

Weaving Location:

CR 233 On US 550 Off

Jurisdiction:

Analysis Year:

Year 2030

Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS

Inputs	5
TIIDULE	j

Freeway free-flow speed, SFF Weaving number of lanes, N	60 4	mph
Weaving segment length, L	2070	ft
Terrain type	Rolling	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.45	
Weaving ratio, R	0.33	

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

	Non-Wea	ving	Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1240	40	345	695	veh/h
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	
Peak 15-min volume, v15	326	11	91	183	V
Trucks and buses	5	5	5	5	왕
Recreational vehicles	0	0	0	0	용
Trucks and buses PCE, ET	2.5	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.930	0.930	0.930	0.930	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1403	45	390	786	pc/h

## \_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.95	0.13
Weaving and non-weaving speeds, Si	40.65	59.18
Number of lanes required for		
unconstrained operation, Nw (Exhibit 24	1-7)	2.00
Maximum number of lanes, Nw (max) (Exh	ibit 24-7)	1.40
Type of operation is		Constrained

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

Weaving segment speed, S	49.14	mph
Weaving segment density, D	13.35	pc/mi/ln
Level of service, LOS	В	
Capacity of base condition, cb	7176	pc/h
Capacity as a 15-minute flow rate, c	6675	pc/h
Capacity as a full-hour volume, ch	6341	pc/h

		If Max Exce	eded See Note
	Analyzed	Maximum	Note
Weaving flow rate, Vw	1176	2800	a
Average flow rate (pcphpl)	656	2300	b
Volume ratio, VR	0.45	0.35	С
Weaving ratio, R	0.33	N/A	d
Weaving length (ft)	2070	2500	е
Notes:			

- a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- b. Capacity constrained by basic freeway capacity.
- c. Capacity occurs under constrained operating conditions.
- d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eeway/Dir of Travel US 160			60 W	estbour	nd	
Agency or Co	mpany		Jur	-			33 O	ff Ramp	)			
Date Perform	ed	11/13/20	09		Jur	risdiction						
Analysis Time	Period	PM Peak			Ana	alysis Ye	ar		Year	2030	)	
Project Descr	iption Ye	ar 2030 Tra	2030 Traffic Operations Analysis of the US 160 FEIS									
Inputs												
Upstream Adj	Ramp	Terrain	Terrain Downstream A							eam Adj		
☐ Yes ☐	On		☐ Yes ☐ On								☐ On	
□ No □	Off										□ No	
$L_{up} = ft$		S	<sub></sub> = (	60.0 mph	<u> </u>	S	) <sub>ED</sub> =	= 40.0 i	mph		L <sub>down</sub> =	ft
Vu = ve	h/h		• •			es, L <sub>A</sub> , L					VD =	veh/h
Conversion to		der Rase (				, - <sub>A</sub> , -	יטי "	K' ' †/				
Conversion	V	uei base (	Jonana	0113	1	1	1	1			v=V/PHI	F
(pc/h)	(Veh/hr)	PHF		rrain	Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>		f <sub>HV</sub> f <sub>p</sub>	•
Freeway	2595	0.95	Rol	ling	5	0	0	.930	1.00	)	2936	
Ramp	280	0.95	Rol	ling	2	0	0	.971	1.00	)	304	
UpStream					<u> </u>							
DownStream												
	Me	erge Areas						[	Diverge	Area	S	
Estimation o	f v <sub>12</sub>					Estimat	ion	of v <sub>12</sub>				
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						V <sub>1</sub> .	<sub>2</sub> = V <sub>D</sub> +	- (V_	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat						L <sub>EQ</sub> = (E	ัดแล			•	K, LD	,
		20 0)										
P <sub>FM</sub> = using E	qualion					$P_{FD} = 1.0$		_	Equation	n U		
V <sub>12</sub> = pc/h						$V_{12} = 29$						
Capacity Che	1 -	1		(		Capacit	y C				1	
	Actual	Maxin	num	LOS	F?			Actua	ıl N	Maxir	num	LOS F?
\ \ <u>\</u>		See Exh	ibit 25-			$V_{FI} = V_{F}$	:	2936		4600		No
V <sub>FO</sub>		7				$V_{12}$		2936		4400	:All	No
V <sub>R12</sub>		4600	:All			$\begin{array}{c c} V_{FO} = V_F - \\ V_R \end{array} 2632$			4600		No	
						$V_R$		304		2100		No
Level of Serv	rice Deterr	nination (i	f not F	)		Level of	<sup>F</sup> Se	rvice De	etermin	ation	i (if not l	F)
$D_R = 5.475 + 10^{-1}$	+ 0.00734 v	<sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		$D_{F}$	$_{R} = 4.252$	2 + 0.00	86 V	12 - 0.00	9 L <sub>D</sub>
$D_R = (pc)$	c/ mi /ln)					D <sub>R</sub> =	20.	5 (pc/ m	i /ln)		_	_
LOS = (Ex	xhibit 25-4)					LOS=	C (I	Exhibit 2	25-4)			
Speed Estim	ation					Speed E	Estii	mation				
_	it 25-19)					D <sub>s</sub> =	0.3	90 (Exh	ibit 25-1	9)		
"	(Exhibit 25	-19)				~		0 mph (		•	9)	
1	•	•				1		A mph (			•	
1	(Exhibit 25 (Exhibit 25	•						3 mpn ( 0 mph (				
S- Inpii	(LAHIDIL 20	- 1 <i>41)</i>				<u> </u>	JJ.	o mhn (	LXI IIDIL A	∠∪- I (	וי	

RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Information Site Information												
Analyst	SEH Inc. Fr				eway/Dir	of	Travel	US 16	US 160 Westbound			
Agency or Co					nction			CR 233 Off Ramp				
Date Performe	11/13/2009 Ju				isdiction			1				
Analysis Time	AM Peak Ar				alysis Yea	ar		Year 2	Year 2030			
Project Description Year 2030 Traffic Operations Analysis of the US 160 FEIS												
Inputs												
Upstream Adj Ramp		Terrain								Downst Ramp	ream Adj	
☐ Yes ☐									☐ Yes	☐ On		
□ No □									□ No			
$L_{up} = ft$		S	S = 40.0 mph				L <sub>down</sub> =	ft				
\/ \/	h/h	3	$S_{FR} = 40.0 \text{ mph}$				VD =	veh/h				
	-		snow iar	nes, L <sub>A</sub> , L <sub>D</sub> ,V <sub>R</sub> ,V <sub>f</sub> )								
Conversion t	to pc/h Un	der Base (	Condit	ions	1	1	1			1	_	
(pc/h)	V (Veh/hr)	PHF	Те	rrain	Truck	%Rv		f <sub>HV</sub>	$f_p$	v=V/PH f <sub>HV</sub> f <sub>p</sub>	F	
Freeway	1875	0.95	Rol	lling	5	0	0.	.930	1.00	2122	2	
Ramp	290	0.95	Rolling		2	0	0.	.971	1.00	314		
UpStream				<u> </u>								
DownStream												
	Me	rge Areas	,		,	Diverge Areas						
Estimation o	f v <sub>12</sub>					Estimation of v <sub>12</sub>						
	V	= V <sub>F</sub> ( P <sub>FM</sub> )				$V_{12} = V_R + (V_F - V_R)P_{FD}$						
l – (Equat												
L <sub>EQ</sub> = (Equation 25-2 or 25-3)					L <sub>EQ</sub> = (Equation 25-8 or 25-9)							
P <sub>FM</sub> = using E	quation					$P_{FD} = 1.000$ using Equation 0						
V <sub>12</sub> = pc/h						$V_{12} = 2122$ pc/h						
Capacity Che	ecks					Capacity Checks						
	Actual	Maxin	num	LOS	F?			Actua	I M	aximum	LOS F?	
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		See Exhibit 25-				$V_{FI}=V_{F}$ 2122		2122		4600	No	
V <sub>FO</sub>		7			-			2122	4	400:All	No	
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F} - V_{R}$		1808	4600		No	
						V <sub>R</sub>		314	314 2100		No	
Level of Serv	rice Deterr	nination (i	f not F	 )		Level of	Se	rvice De	etermina	tion (if not	<i>F</i> )	
$D_R = 5.475 + 0.00734 \text{ V}_R + 0.0078 \text{ V}_{12} - 0.00627 \text{ L}_A$ $D_R = 4.252 + 0.0086 \text{ V}_{12} - 0.009 \text{ L}_D$								9 L <sub>D</sub>				
$D_R = (pc/mi/ln)$					D <sub>R</sub> = 13.5 (pc/ mi /ln)							
LOS = (Exhibit 25-4)						LOS= B (Exhibit 25-4)						
,							Speed Estimation					
						$D_{\rm s} = 0.391 \text{ (Exhibit 25-19)}$						
$M_{S} = (Exibit 25-19)$						, ,						
S <sub>R</sub> = mph (Exhibit 25-19)						S <sub>R</sub> = 53.0 mph (Exhibit 25-19)						
$S_0 = mph$ (Exhibit 25-19)						$S_0 = N/A \text{ mph (Exhibit 25-19)}$						
S= mph (Exhibit 25-14) $S = 53.0 \text{ mph (Exhibit 25-15)}$												

		RAMPS AN	D RAMI	P JUN	CTIONS	WORKS	SHEET					
General	Informatio					formation						
Analyst2 Agency or Co	st2 SEH Inc. cy or Company			Ju	eeway/Dir o		US 160 Eastbound CR 223 On Ramp					
Date Perform		11/13/2009 PM Peak			ırisdiction		Voor 2020	(oor 2020				
Analysis Time Project Desci		Analysis Year Year 2030										
Inputs	ilphon real 20	30 Traine Operation	13 7 (Tuly 515	or the oc	7 100 1 213							
Terrain Rolling Upstream Adj Ramp							Downstrea	Downstream Adj Ramp				
▼Yes □ On							☐ Yes	☐ On				
□ No	☐ Off							□ No	Cff Off			
L <sub>up</sub> =	ft							L <sub>down</sub> =	ft			
Vu =	veh/h	S <sub>FF</sub> = 6	S es, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0 \text{ m}$ $R'_f$	VD =	veh/h						
Convers	sion to pc/h	Under Base			7, 0							
(pc/h)	V (Veh/hr)		errain	Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v=V/PHF f	HV fp			
Freeway	2395		olling	5 2	0	0.930	1.00	2710				
Ramp	400	0.95 Ro	Rolling		0	0.971	1.00	434				
UpStream												
DownStream		l 1erge Areas		]	<u> </u> 		Diverge Area	 PS				
Estimati	on of v <sub>12</sub>	10190711043			Estimation of V <sub>12</sub>							
		= V <sub>F</sub> ( P <sub>FM</sub> )					-	V \D				
I – /Ган		$V_{12} = V_R + (V_F - V_R)P_{FD}$										
L <sub>EQ</sub> = (Equation 25-2 or 25-3)					L <sub>EQ</sub> = (Equation 25-8 or 25-9)							
P <sub>FM</sub> = 1.000 using Equation 0					P <sub>FD</sub> = using Equation							
$V_{12} = 2710$					$V_{12} = pc/$		,					
Capacity	/ Checks	1	1		Capaci	ty Check	1					
	Actual	Maximum	LO:	LOS F?		Actu		aximum	LOS F?			
V <sub>FO</sub>	3144	See Exhibit 25-	7 N	No		=	See E	xhibit 25-14				
- +0	0111	OCC EXHIBIT 20	<u></u>			V <sub>12</sub>		4400:All				
V <sub>R12</sub>	3144	4600:All	N	No		-	See E	See Exhibit 25-14				
KIZ					V <sub>R</sub>		See E	See Exhibit 25-3				
Level of	Service De	etermination	(if not	F)		of Service	e Determ	ination (i	f not F)			
		v <sub>R</sub> + 0.0078 V <sub>12</sub> -					252 + 0.0086 \	•				
$D_{R} = 20.6 \text{ (pc/ m/ln)}$					$D_{R} = (pc/m/ln)$							
LOS = C (Exhibit 25-4)						LOS= (Exhibit 25-4)						
Speed E	Speed Estimation											
$M_{S} = 0.2$	$D_s = $ (Exhibit 25-19)											
$S_R = 54$	$S_R$ = mph (Exhibit 25-19)											
$S_0 = N/N$	$S_0$ = mph (Exhibit 25-19)											
S= 54	S = mph (Exhibit 25-15)											

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: SH 172 to CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1875 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 493 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1061 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1061 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2

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

Density, D

Level of service, LOS

17.7

pc/mi/ln

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: US 550/CR 233 to SH 172 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2795 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 736 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1581 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1581 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 26.4 pc/mi/ln

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

Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: CR 233 to SH 172 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1755 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 462 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 993 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 993 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

2

16.5

pc/mi/ln

#### Operational Analysis Analyst: Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: Between CR 233 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2315 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 609 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1310 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1310 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2

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

Density, D

Level of service, LOS

21.8

pc/mi/ln

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: Between CR 233 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1585 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 417 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 897 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 897 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 14.9 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: Between CR 233 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2395 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 630 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1355 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_ pc/h/ln Flow rate, vp 1355 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 22.6 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between CR 233 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1560 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 411 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 883 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 883 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 14.7 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: CR 233 to Grandview Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 3815 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 1004 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1439 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1439

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

Free-flow speed, FFS

Number of lanes, N

Level of service, LOS

Density, D

Average passenger-car speed, S

60.0

60.0

24.0

3

mi/h

mi/h

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: CR 233 to Grandview Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2320 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 611 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 875 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 875 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

3

14.6

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: Grandview to CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments 3460 veh/h Volume, V Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 911 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1305 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1305 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

21.8

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Grandview to CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2650 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 697 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1000 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1000 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

16.7

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: Between ramp C and D Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 3440 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 905 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1298 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_ pc/h/ln Flow rate, vp 1298 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3 Density, D 21.6 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: Between ramp C and D Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1940 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 511 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 732 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 732 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3 Density, D 12.2 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between Ramp A & B Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments 3460 veh/h Volume, V Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 911 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1305 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1305 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

21.8

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between Ramp A & B Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2650 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 697 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1000 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1000 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

16.7

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: Between ramp C and E Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 4030 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 1061 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1520 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1520 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3 Density, D 25.3 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: Between ramp C and E Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2940 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 774 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1109 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1109 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3 Density, D 18.5 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: Between Ramp A & B Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2980 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 784 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1124 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1124 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

18.7

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between Ramp A & B Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2030 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 534 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 766 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 766 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

12.8

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: West of Grandview Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 4620 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 1216 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1743 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1743 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 59.9 mi/h Number of lanes, N 3

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

Density, D

Level of service, LOS

29.1

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: West of Grandview Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 3325 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 875 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1254 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1254 Free-flow speed, FFS 60.0 mi/h

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

Average passenger-car speed, S

Number of lanes, N

Level of service, LOS

Density, D

60.0

20.9

3

mi/h

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: West of Grandview Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 4525 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 1191 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1707 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1707 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 59.9 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

3

28.5

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: West of Grandview Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2830 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 745 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1067 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1067 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

3

17.8

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1505 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 396 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 852 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 852 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 14.2 pc/mi/ln Level of service, LOS В

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 935 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 246 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 529 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 529 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 8.8 pc/mi/ln Level of service, LOS Α

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1555 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 409 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 880 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 880 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 14.7 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1145 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 301 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 648 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 648 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 10.8 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: SH 172 to CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2595 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 683 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: o Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1468 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1468 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

2

24.5

# **Appendix B**

# **Alternative G Modified**

At-Grade Intersection Evaluation Worksheets

	۶	<b>→</b>	•	•	•	•	•	<b>†</b>	<b>/</b>	<b>&gt;</b>	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1/1	<b>^</b>	7	ሻ	<b>^</b>	7	ሻሻ	<b>†</b>	7	ሻ	<b>1</b>	7
Volume (vph)	385	1555	855	125	1505	90	685	105	115	135	80	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	4.0	5.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	405	1637	900	132	1584	95	721	111	121	142	84	426
RTOR Reduction (vph)	0	0	352	0	0	40	0	0	0	0	0	0
Lane Group Flow (vph)	405	1637	548	132	1584	55	721	111	121	142	84	426
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Actuated Green, G (s)	17.0	70.0	70.0	11.0	64.0	64.0	30.0	26.0	145.0	20.0	16.0	145.0
Effective Green, g (s)	17.0	70.0	70.0	11.0	64.0	64.0	30.0	26.0	145.0	20.0	16.0	145.0
Actuated g/C Ratio	0.12	0.48	0.48	0.08	0.44	0.44	0.21	0.18	1.00	0.14	0.11	1.00
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	402	1708	764	134	1562	699	710	334	1583	244	206	1583
v/s Ratio Prot	c0.12	0.46		0.07	c0.45		c0.21	0.06		0.08	c0.05	
v/s Ratio Perm			0.35			0.03			0.08			0.27
v/c Ratio	1.01	0.96	0.72	0.99	1.01	0.08	1.02	0.33	0.08	0.58	0.41	0.27
Uniform Delay, d1	64.0	36.1	29.7	66.9	40.5	23.4	57.5	51.9	0.0	58.6	60.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	46.8	13.9	5.7	73.9	26.3	0.2	37.7	2.7	0.1	9.8	5.9	0.4
Delay (s)	110.8	50.0	35.4	140.8	66.8	23.7	95.2	54.6	0.1	68.3	66.0	0.4
Level of Service	F	D	D	F	Е	С	F	D	А	Е	Е	Α
Approach Delay (s)		53.9			69.9			78.4			23.7	
Approach LOS		D			E			E			С	
Intersection Summary												
HCM Average Control Delay			59.0	Н	CM Level	of Service	:e		Е			
HCM Volume to Capacity ration	0		0.94									
Actuated Cycle Length (s)			145.0		um of los				18.0			
Intersection Capacity Utilization	on		90.5%	IC	CU Level	of Service	:		Е			
Analysis Period (min)			15									

	۶	<b>→</b>	•	•	<b>←</b>	•	4	<b>†</b>	/	<b>/</b>	<b>↓</b>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻሻ	<b>^</b>	7	ሻ	<b>^</b>	7	ሻሻ	<b>†</b>	7	44	<b>†</b>	7
Volume (vph)	720	2395	345	90	2315	190	570	85	150	250	85	930
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	4.0	4.0	5.0	5.0	4.0	5.0	4.0	4.0	5.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	758	2521	363	95	2437	200	600	89	158	263	89	979
RTOR Reduction (vph)	0	0	0	0	0	60	0	0	0	0	0	0
Lane Group Flow (vph)	758	2521	363	95	2437	140	600	89	158	263	89	979
Turn Type	Prot		Free	Prot		Perm	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			8			Free			Free
Actuated Green, G (s)	23.0	88.0	150.0	12.0	77.0	77.0	20.0	14.0	150.0	18.0	12.0	150.0
Effective Green, g (s)	23.0	88.0	150.0	12.0	77.0	77.0	20.0	14.0	150.0	18.0	12.0	150.0
Actuated g/C Ratio	0.15	0.59	1.00	0.08	0.51	0.51	0.13	0.09	1.00	0.12	0.08	1.00
Clearance Time (s)	4.0	5.0		4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	526	2076	1583	142	1817	813	458	174	1583	412	149	1583
v/s Ratio Prot	c0.22	0.71		0.05	c0.69		c0.17	0.05		0.08	0.05	
v/s Ratio Perm			0.23			0.09			0.10			c0.62
v/c Ratio	1.44	1.21	0.23	0.67	1.34	0.17	1.31	0.51	0.10	0.64	0.60	0.62
Uniform Delay, d1	63.5	31.0	0.0	67.1	36.5	19.5	65.0	64.7	0.0	62.9	66.7	0.0
Progression Factor	0.94	1.11	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	199.5	96.9	0.0	22.3	157.3	0.5	154.5	10.3	0.1	7.4	16.4	1.8
Delay (s)	259.1	131.3	0.0	89.4	193.8	19.9	219.5	75.1	0.1	70.3	83.1	1.8
Level of Service	F	F	Α	F	F	В	F	Е	А	Е	F	Α
Approach Delay (s)		144.8			177.5			163.4			20.8	
Approach LOS		F			F			F			С	
Intersection Summary												
HCM Average Control Delay			137.8	Н	CM Level	of Service	e		F			
HCM Volume to Capacity rati	0		1.27									
Actuated Cycle Length (s)			150.0		um of los				13.0			
Intersection Capacity Utilizati	on		119.1%	IC	CU Level	of Service	:		Н			
Analysis Period (min)			15									

	ၨ	-	•	•	<b>\</b>	4	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	ሻሻ	<b>^</b>	<b>^</b>	7	ሻሻ	7	
Volume (vph)	550	3290	3675	135	170	590	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	5.0	4.0	4.0	
Lane Util. Factor	0.97	0.95	0.95	1.00	0.97	1.00	
Frt	1.00	1.00	1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	3539	1583	3433	1583	
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	3539	1583	3433	1583	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	579	3463	3868	142	179	621	
RTOR Reduction (vph)	0	0	0	28	0	0	
Lane Group Flow (vph)	579	3463	3868	114	179	621	
Turn Type	Prot			Perm		Free	
Protected Phases	7	4	8		1		
Permitted Phases				8		Free	
Actuated Green, G (s)	18.0	129.0	107.0	107.0	12.0	150.0	
Effective Green, g (s)	18.0	129.0	107.0	107.0	12.0	150.0	
Actuated g/C Ratio	0.12	0.86	0.71	0.71	0.08	1.00	
Clearance Time (s)	4.0	5.0	5.0	5.0	4.0		
Lane Grp Cap (vph)	412	3044	2524	1129	275	1583	
v/s Ratio Prot	c0.17	0.98	c1.09		c0.05		
v/s Ratio Perm				0.07		0.39	
v/c Ratio	1.41	1.14	1.53	0.10	0.65	0.39	
Uniform Delay, d1	66.0	10.5	21.5	6.6	67.0	0.0	
Progression Factor	1.00	1.00	1.15	2.08	1.00	1.00	
Incremental Delay, d2	196.5	66.5	239.8	0.0	11.4	0.7	
Delay (s)	262.5	77.0	264.5	13.8	78.3	0.7	
Level of Service	F	Е	F	В	Е	Α	
Approach Delay (s)		103.6	255.6		18.1		
Approach LOS		F	F		В		
Intersection Summary							
HCM Average Control Delay			164.7	H	CM Level	of Service	
HCM Volume to Capacity rati	0		1.44				
Actuated Cycle Length (s)			150.0		um of lost		
Intersection Capacity Utilizati	on		136.4%	IC	U Level	of Service	
Analysis Period (min)			15				

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1/1	<b>^</b>	7	¥	<b>^</b>	7	ሻሻ	<b>†</b>	7	7	<b>†</b>	7
Volume (vph)	260	1145	350	70	935	70	685	55	65	50	40	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	4.0	5.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	274	1205	368	74	984	74	721	58	68	53	42	268
RTOR Reduction (vph)	0	0	245	0	0	49	0	0	0	0	0	0
Lane Group Flow (vph)	274	1205	123	74	984	25	721	58	68	53	42	268
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Actuated Green, G (s)	10.0	33.5	33.5	10.0	33.5	33.5	22.5	28.5	100.0	10.0	16.0	100.0
Effective Green, g (s)	10.0	33.5	33.5	10.0	33.5	33.5	22.5	28.5	100.0	10.0	16.0	100.0
Actuated g/C Ratio	0.10	0.34	0.34	0.10	0.34	0.34	0.22	0.28	1.00	0.10	0.16	1.00
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	343	1186	530	177	1186	530	772	531	1583	177	298	1583
v/s Ratio Prot	c0.08	c0.34		0.04	0.28		c0.21	0.03		0.03	0.02	
v/s Ratio Perm			0.08			0.02			0.04			c0.17
v/c Ratio	0.80	1.02	0.23	0.42	0.83	0.05	0.93	0.11	0.04	0.30	0.14	0.17
Uniform Delay, d1	44.0	33.2	24.0	42.3	30.6	22.5	38.0	26.4	0.0	41.8	36.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	17.5	30.2	1.0	7.1	6.8	0.2	19.8	0.4	0.1	4.3	1.0	0.2
Delay (s)	61.5	63.4	25.0	49.4	37.4	22.6	57.8	26.8	0.1	46.0	37.1	0.2
Level of Service	Е	Е	С	D	D	С	Е	С	Α	D	D	Α
Approach Delay (s)		55.5			37.2			51.0			11.2	
Approach LOS		Е			D			D			В	
Intersection Summary												
HCM Average Control Dela			45.8	H	CM Level	of Service	e		D			
HCM Volume to Capacity ra	atio		0.77									
Actuated Cycle Length (s)			100.0		um of lost				13.0			
Intersection Capacity Utiliza	ation		77.9%	IC	U Level	of Service	:		D			
Analysis Period (min)			15									
c Critical Lang Group												

	۶	<b>→</b>	*	•	<b>←</b>	4	1	<b>†</b>	/	<b>/</b>	<del> </del>	1
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	14.14	<b>^</b>	7	ň	<b>^</b>	7	ሻሻ	<b>†</b>	7	14.54	<b>†</b>	7
Volume (vph)	735	1560	355	95	1585	195	180	60	50	145	60	555
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	4.0	4.0	5.0	5.0	4.0	5.0	4.0	4.0	5.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	774	1642	374	100	1668	205	189	63	53	153	63	584
RTOR Reduction (vph)	0	0	0	0	0	96	0	0	0	0	0	0
Lane Group Flow (vph)	774	1642	374	100	1668	109	189	63	53	153	63	584
Turn Type	Prot		Free	Prot		Perm	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			8			Free			Free
Actuated Green, G (s)	31.0	74.0	140.0	22.0	65.0	65.0	10.0	16.0	140.0	10.0	16.0	140.0
Effective Green, g (s)	31.0	74.0	140.0	22.0	65.0	65.0	10.0	16.0	140.0	10.0	16.0	140.0
Actuated g/C Ratio	0.22	0.53	1.00	0.16	0.46	0.46	0.07	0.11	1.00	0.07	0.11	1.00
Clearance Time (s)	4.0	5.0		4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	760	1871	1583	278	1643	735	245	213	1583	245	213	1583
v/s Ratio Prot	c0.23	0.46		0.06	c0.47		c0.06	0.03		0.04	0.03	
v/s Ratio Perm			0.24			0.07			0.03			c0.37
v/c Ratio	1.02	0.88	0.24	0.36	1.02	0.15	0.77	0.30	0.03	0.62	0.30	0.37
Uniform Delay, d1	54.5	29.0	0.0	52.7	37.5	21.6	63.9	56.8	0.0	63.2	56.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.4	6.2	0.4	3.6	26.1	0.4	20.7	3.5	0.0	11.4	3.5	0.7
Delay (s)	91.9	35.2	0.4	56.3	63.6	22.0	84.5	60.3	0.0	74.6	60.3	0.7
Level of Service	F	D	А	Е	Е	С	F	Е	А	Е	Е	Α
Approach Delay (s)		46.3			58.9			64.9			19.5	
Approach LOS		D			E			E			В	
Intersection Summary												
<b>HCM Average Control Dela</b>			47.8	Н	CM Level	of Service	e		D			
HCM Volume to Capacity ra	atio		0.89									
Actuated Cycle Length (s)			140.0		um of los	` '			13.0			
Intersection Capacity Utiliza	ation		88.3%	IC	CU Level	of Service	:		Ε			
Analysis Period (min)			15									

<i>→</i> • • • • •
Movement EBL EBT WBT WBR SBL SBR
Lane Configurations ነካ ተተ ተተ ነሻ
Volume (vph) 550 2535 2175 140 110 385
Ideal Flow (vphpl) 1900 1900 1900 1900 1900
Total Lost time (s) 4.0 5.0 5.0 5.0 4.0 4.0
Lane Util. Factor 0.97 0.95 0.95 1.00 0.97 1.00
Frt 1.00 1.00 1.00 0.85 1.00 0.85
Flt Protected 0.95 1.00 1.00 0.95 1.00
Satd. Flow (prot) 3433 3539 3539 1583 3433 1583
Flt Permitted 0.95 1.00 1.00 0.95 1.00
Satd. Flow (perm) 3433 3539 3539 1583 3433 1583
Peak-hour factor, PHF 0.95 0.95 0.95 0.95 0.95
Adj. Flow (vph) 579 2668 2289 147 116 405
RTOR Reduction (vph) 0 0 0 55 0 0
Lane Group Flow (vph) 579 2668 2289 92 116 405
Turn Type Prot Perm Free
Protected Phases 7 4 8 1
Permitted Phases 8 Free
Actuated Green, G (s) 18.0 91.0 69.0 69.0 10.0 110.0
Effective Green, g (s) 18.0 91.0 69.0 69.0 10.0 110.0
Actuated g/C Ratio 0.16 0.83 0.63 0.63 0.09 1.00
Clearance Time (s) 4.0 5.0 5.0 5.0 4.0
Lane Grp Cap (vph) 562 2928 2220 993 312 1583
v/s Ratio Prot c0.17 0.75 c0.65 c0.03
v/s Ratio Perm 0.06 0.26
v/c Ratio 1.03 0.91 1.03 0.09 0.37 0.26
Uniform Delay, d1 46.0 6.7 20.5 8.1 47.0 0.0
Progression Factor 1.00 1.00 1.00 1.00 1.00 1.00
Incremental Delay, d2 45.9 5.5 27.6 0.2 3.4 0.4
Delay (s) 91.9 12.2 48.1 8.3 50.4 0.4
Level of Service F B D A D A
Approach Delay (s) 26.4 45.7 11.5
Approach LOS C D B
Intersection Summary
HCM Average Control Delay 32.7 HCM Level of Service
HCM Volume to Capacity ratio 0.96
Actuated Cycle Length (s) 110.0 Sum of lost time (s)
Intersection Capacity Utilization 95.0% ICU Level of Service
Analysis Period (min) 15

# **Appendix C**

# **Alternative F Modified**

Interchange Evaluation Worksheets

	۶	<b>→</b>	•	•	+	•	•	†	<i>&gt;</i>	<b>/</b>	<b>+</b>	-√
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻሻ		7	ሻ		7	44	<b>↑</b>	7	ሻ	<b>↑</b>	7
Volume (vph)	625	0	855	125	0	155	685	105	115	220	120	700
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.0		9.0	9.0		9.0	9.0	8.5	9.0	9.0	8.5	9.0
Lane Util. Factor	0.97		1.00	1.00		1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	658	0	900	132	0	163	721	111	121	232	126	737
RTOR Reduction (vph)	0	0	267	0	0	23	0	0	65	0	0	37
Lane Group Flow (vph)	658	0	633	132	0	140	721	111	56	232	126	700
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5 6			5 6			16			16
Actuated Green, G (s)	35.0		67.5	35.0		67.5	37.7	20.8	64.3	37.7	20.8	64.3
Effective Green, g (s)	35.0		67.5	35.0		67.5	37.7	20.8	55.8	37.7	20.8	55.8
Actuated g/C Ratio	0.29		0.56	0.29		0.56	0.31	0.17	0.46	0.31	0.17	0.46
Clearance Time (s)	9.0			9.0			9.0	8.5		9.0	8.5	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1001		890	516		890	1079	323	736	556	323	736
v/s Ratio Prot	0.19			0.07			0.21	0.06		0.13	0.07	
v/s Ratio Perm			c0.40			0.09			0.04			c0.44
v/c Ratio	0.66		0.71	0.26		0.16	0.67	0.34	0.08	0.42	0.39	0.95
Uniform Delay, d1	37.2		19.1	32.5		12.6	35.7	43.6	17.8	32.5	44.0	30.8
Progression Factor	0.94		0.87	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5		2.7	0.3		0.1	1.6	2.9	0.0	0.5	3.5	21.8
Delay (s)	36.6		19.3	32.8		12.7	37.3	46.5	17.9	33.0	47.5	52.6
Level of Service	D		В	С		В	D	D	В	С	D	D
Approach Delay (s)		26.6			21.7			35.9			47.9	
Approach LOS		С			С			D			D	
Intersection Summary												
HCM Average Control Delay			34.5	H	CM Leve	of Service	e		С			
HCM Volume to Capacity ra	tio		0.91									
Actuated Cycle Length (s)			120.0			st time (s)			27.0			
Intersection Capacity Utilizat	tion		86.1%	IC	U Level	of Service	!		Е			
Analysis Period (min)			15									
c Critical Lane Group												

	۶	<b>→</b>	•	•	<b>+</b>	•	1	<b>†</b>	<b>/</b>	<b>/</b>	ţ	-√
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻሻ		7	7		7	ሻሻ	<b>↑</b>	7	7	<b>↑</b>	7
Volume (vph)	500	0	350	70	0	140	685	55	65	105	65	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00		1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770		1583	3433	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	526	0	368	74	0	147	721	58	68	111	68	468
RTOR Reduction (vph)	0	0	254	0	0	102	0	0	29	0	0	39
Lane Group Flow (vph)	526	0	114	74	0	45	721	58	39	111	68	429
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5			5			16			16
Actuated Green, G (s)	22.3		27.8	22.3		27.8	27.8	24.9	52.2	27.8	24.9	52.2
Effective Green, g (s)	22.3		27.8	22.3		27.8	27.8	24.9	52.2	27.8	24.9	52.2
Actuated g/C Ratio	0.25		0.31	0.25		0.31	0.31	0.28	0.58	0.31	0.28	0.58
Clearance Time (s)	5.0		5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	851		489	439		489	1060	515	918	547	515	918
v/s Ratio Prot	c0.15			0.04			c0.21	0.03		0.06	0.04	
v/s Ratio Perm			0.07			0.03			0.02			c0.27
v/c Ratio	0.62		0.23	0.17		0.09	0.68	0.11	0.04	0.20	0.13	0.47
Uniform Delay, d1	30.1		23.2	26.6		22.1	27.2	24.3	8.1	22.9	24.4	10.9
Progression Factor	1.02		0.88	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3		0.2	0.2		0.1	1.8	0.4	0.0	0.2	0.5	0.4
Delay (s)	32.0		20.6	26.8		22.2	29.0	24.7	8.2	23.1	25.0	11.3
Level of Service	С	27.2	С	С	22.7	С	С	C	Α	С	C	В
Approach Delay (s)		27.3			23.7			27.1			14.7	
Approach LOS		С			С			С			В	
Intersection Summary												
HCM Average Control Delay			23.8	H	CM Leve	l of Servic	e		С			
HCM Volume to Capacity ra	tio		0.61	-								
Actuated Cycle Length (s)			90.0			t time (s)			15.0			
Intersection Capacity Utiliza	tion		55.4%	IC	U Level	of Service			В			
Analysis Period (min)			15									
c Critical Lane Group												

**EBL** 

ሻሻ

960

1900

0.97

1.00

0.95

3433

0.95

3433

0.95

1011

1011

Prot

36.0

36.0

0.30

9.0

3.0

1030

0.29

0.98

41.7

1.00

23.5

65.2

Ε

42.1

D

0

9.0

**EBT** 

1900

0.95

0

0

0

0

**EBR** 

77

1410

1900

9.0

0.88

0.85

1.00

2787

1.00

2787

0.95

1484

189

1295

56

66.5

66.5

0.55

1544

0.46

0.84

22.3

1.00

4.2

26.4

С

custom

**WBL** 

ሻሻ

330

1900

0.97

1.00

0.95

3433

0.95

3433

0.95

347

347

Prot

36.0

36.0

0.30

9.0

3.0

1030

0.10

0.34

32.7

0.90

0.2

29.6

С

0

9.0

WBT

1900

0.95

0

0

0

0

**WBR** 

7

260

1900

9.0

1.00

0.85

1.00

1583

1.00

1583

0.95

274

269

56

66.5

66.5

0.55

877

0.17

0.31

14.4

0.75

0.2

10.9

В

custom

5

**NBL** 

ሻሻ

1160

1900

9.0

0.97

1.00

0.95

3433

0.95

3433

0.95

1221

1221

Prot

42.0

42.0

0.35

9.0

3.0

1202

0.36

1.02

39.0

1.00

30.0

69.0

Ε

5

0

**NBT** 

٨

190

8.5

1.00

1.00

1.00

1863

1.00

1863

0.95

200

200

0

6

15.5

15.5

0.13

8.5

3.0

241

0.11

0.83

51.0

1.00

26.9

77.9

58.7

Ε

Ε

1900

Movement

Volume (vph)

Lane Configurations

Ideal Flow (vphpl)

Total Lost time (s)

Lane Util. Factor

Satd. Flow (prot)

Satd. Flow (perm)

Adj. Flow (vph)

Turn Type

Peak-hour factor, PHF

RTOR Reduction (vph)

Lane Group Flow (vph)

Protected Phases

Permitted Phases

Actuated Green, G (s)

Effective Green, q (s)

Actuated g/C Ratio

Clearance Time (s)

Vehicle Extension (s)

Lane Grp Cap (vph)

v/s Ratio Prot

v/s Ratio Perm

Uniform Delay, d1

**Progression Factor** 

Level of Service

Approach LOS

Approach Delay (s)

Incremental Delay, d2

v/c Ratio

Delay (s)

Flt Protected

Flt Permitted

Frt

NBR

460

9.0

1.00

0.85

1.00

1583

1.00

1583

0.95

484

168

316

16

60.0

51.5

0.43

679

0.20

0.46

24.4

1.00

0.5

24.9

С

28.3

1.00

0.1

28.4

С

49.1

1.00

9.4

58.5

15.8

Ε

В

1.6

1.00

6.2

7.8

Α

custom

1900

e Sprir		<b>550</b> 17/2009
<b>&gt;</b>	ţ	1
SBL	SBT	SBR
44	<b>†</b>	7
335	130	1225
1900	1900	1900
9.0	8.5	9.0
0.97	1.00	1.00
1.00	1.00	0.85
0.95	1.00	1.00
3433	1863	1583
0.95	1.00	1.00
3433	1863	1583
0.95	0.95	0.95
353	137	1289
0	0	0
353	137	1289
Prot		custom
5	6	
		156
42.0	15.5	120.0
42.0	15.5	111.5
0.35	0.13	0.93
9.0	8.5	
3.0	3.0	
1202	241	1471
0.10	0.07	
		c0.81
0.29	0.57	0.88

Intersection Summary			
HCM Average Control Delay	38.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	123.5%	ICU Level of Service	Н
Analysis Period (min)	15		
c Critical Lane Group			

21.4

C

1	1	11	$\sim$	12	$\sim$	$\sim$	0
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	۶	<b>→</b>	•	•	<b>←</b>	•	•	†	<b>/</b>	<b>/</b>	ļ	✓
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	14.54		77	1/4		7	ሻሻ	<b>†</b>	7	14.54	<b>†</b>	7
Volume (vph)	976	0	675	335	0	265	1180	165	560	200	90	750
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		0.88	0.97		1.00	0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00		0.85	1.00		0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433		2787	3433		1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433		2787	3433		1583	3433	1863	1583	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1027	0	711	353	0	279	1242	174	589	211	95	789
RTOR Reduction (vph)	0	0	200	0	0	6	0	0	261	0	0	0
Lane Group Flow (vph)	1027	0	511	353	0	273	1242	174	328	211	95	789
Turn Type	Prot		custom	Prot		custom	Prot		custom	Prot		custom
Protected Phases	1			1			5	6		5	6	
Permitted Phases			5 6			5 6			16			156
Actuated Green, G (s)	29.0		51.0	29.0		51.0	34.0	12.0	46.0	34.0	12.0	90.0
Effective Green, g (s)	29.0		51.0	29.0		51.0	34.0	12.0	46.0	34.0	12.0	90.0
Actuated g/C Ratio	0.32		0.57	0.32		0.57	0.38	0.13	0.51	0.38	0.13	1.00
Clearance Time (s)	5.0			5.0			5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1106		1579	1106		897	1297	248	809	1297	248	1583
v/s Ratio Prot	c0.30			0.10			c0.36	0.09		0.06	0.05	
v/s Ratio Perm			0.18			0.17			0.21			c0.50
v/c Ratio	0.93		0.32	0.32		0.30	0.96	0.70	0.41	0.16	0.38	0.50
Uniform Delay, d1	29.5		10.3	23.0		10.2	27.3	37.3	13.6	18.6	35.6	0.0
Progression Factor	1.00		1.00	0.74		1.38	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.1		0.1	0.1		0.2	15.8	15.3	0.3	0.1	4.4	0.2
Delay (s)	42.6		10.5	17.2		14.3	43.1	52.6	13.9	18.6	40.1	0.2
Level of Service	D		В	В		В	D	D	В	В	D	Α
Approach Delay (s)		29.5			15.9			35.3			7.2	
Approach LOS		С			В			D			Α	
Intersection Summary												
HCM Average Control Delay			25.6	H	CM Leve	l of Servic	e		С			
HCM Volume to Capacity ra	tio		0.85									
Actuated Cycle Length (s)			90.0			t time (s)			10.0			
Intersection Capacity Utiliza	tion		88.4%	IC	U Level	of Service	)		Е			
Analysis Period (min)			15									
c Critical Lane Group												

		RAMP	S AND	RAME	- JUN	CTIONS	S WOF	RKSHE	ET		
General	Informati	ion				Site In:	forma	tion			
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	9		Ju	eeway/Dir onction	of Travel			astbound In Ramp	
Analysis Tim	e Period	PM Peak			Ar	nalysis Year	r	Y	'ear 2030	)	
	ription Year 2	2030 Traffic C	perations	Analysis	of the US	160 FEIS					
Inputs		Terrain Rollii	าต							1	
Upstream Ad	lj Ramp	TCITAIII TOIIII	19								ım Adj Ramp
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off
□ No	C Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft			0			2 40				
Vu =	veh/h		S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40$ $S_{R'}V_f$	).U mpn		VD =	veh/h
Convers	ion to pc	/h Under	Base	Condi	tions					,	
(pc/h)	V (Veh/hr)	PHF	Teri	rain	Truck	%Rv	f <sub>HV</sub>	,	f <sub>p</sub>	v=V/PHF f	HV <sup>f</sup> p
Freeway	1470	0.95	Rolli		5	0	0.930		1.00	1663	
Ramp UpStream	335	0.95	Rolli	ing	2	0	0.971	l	1.00	363	
DownStream	1										
	,	Merge Areas			,		'		erge Area	as	
Estimati	on of v <sub>12</sub>					Estima	tion c	of v <sub>12</sub>			
	V	$V_{12} = V_F (P_{FM})$						12		· · V <sub>R</sub> )P <sub>FD</sub>	
	ation 25-2 or 2					$L_{EQ} = (Ec$			9)		
	using Equation	on 0				''	sing Equa	ation			
V <sub>12</sub> = 1663						$V_{12} = pc/$					
Capacity	/ Checks	1		1		Capaci	ity Ch		1	1	1
	Actua	ıl Max	imum	LOS	S F?			Actual	†	aximum	LOS F?
V <sub>FO</sub>	2026	See Ext	nibit 25-7	N <sub>1</sub>	0	$V_{\text{FI}} = V_{\text{I}}$	F			xhibit 25-14	
						$V_{12}$ $V_{FO} = V_{F}$	-			400:All	
V <sub>R12</sub>	2026	460	0:All	N.	0	V <sub>R</sub>			See E	xhibit 25-14	
						$V_R$	,		See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not i	F)	Level o	of Ser	vice De	eterm	ination (i	f not F)
D <sub>R</sub> =	5.475 + 0.0073	34 v <sub>R</sub> + 0.007	'8 V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_R$	= 4.252 +	0.0086 \	/ <sub>12</sub> - 0.009 L <sub>D</sub>	
D <sub>R</sub> =	11.9 (pc/ m/ln)					D <sub>R</sub> =	(pc/ m/ln)	)			
LOS =	B (Exhibit 25-4	1)				LOS=	(Exhibit 2	25-4)			
Speed E	stimation	1				Speed	Estim	nation			
$M_S = 0.2$	233 (Exibit 25	-19)				D <sub>s</sub> =	(Exhibit	25-19)			
$S_R = 55$	.8 mph (Exhib	it 25-19)				S <sub>R</sub> =	mph (Ex	hibit 25-19	9)		
U	A mph (Exhibi	•				$S_0 =$	mph (Ex	xhibit 25-1	9)		
S= 55	.8 mph (Exhib	it 25-14)				S =	mph (Ex	hibit 25-15	5)		

		RAMP	S AND	RAMI	P JUN	CTIONS	WORK	(SHE	ET		
General	Informatio					Site In:					
Analyst2 Agency or Co	ompany	SEH Inc.				eeway/Dir o		l	JS 160 E SH 172 O	astbound n Ramp	
Date Perform		11/13/200	)9			risdiction		,	, ,,,,,,		
Analysis Tim		AM Peak	norations	Analysis		nalysis Year	<u> </u>	Y	'ear 2030	)	
_	ription Year 20	30 Trailie C	peralions	Analysis	or the US	100 FEIS					
Inputs	ĺτ	errain Rolli	na								
Upstream Ad		citalii Kolli	ng								nm Adj Ramp
Yes	On									☐ Yes ☐ No	☐ On ☐ Off
□ No	☐ Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft _		S <sub>FF</sub> = 60	.0 mph		9	$S_{FR} = 40.0$	mph		VD =	veh/h
Vu =	veh/h			Sketch (		es, L <sub>A</sub> , L <sub>D</sub> ,V	111	'			VOIIII
Convers	ion to pc/l	Under	Base	Condi	tions	(	1			1	
(pc/h)	V (Veh/hr)	PHF	Ter		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV fp
Freeway	1090	0.95	Roll		5	0	0.930		1.00	1233	
Ramp	170	0.95	Roll	ing	2	0	0.971		1.00	184	
UpStream  DownStrean					<u> </u>		<u> </u>				
Downstream		Merge Areas	J S		<u> </u>			l Dive	erge Area	I NS	
Estimati	on of v <sub>12</sub>	<u> </u>				Estima	tion of		<u> </u>		
		= V <sub>F</sub> ( P <sub>FM</sub>	)						V <sub>R</sub> + (V <sub>F</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equ	ation 25-2 or 25	-3)				L <sub>EQ</sub> = (Ed	quation 25-	8 or 25-	9)		
P <sub>FM</sub> = 1.000	using Equation	0				$P_{FD} = us$	ing Equation	on			
V <sub>12</sub> = 1233	pc/h					$V_{12} = pc/$	h'				
Capacity	/ Checks					Capaci	ity Che	cks			
	Actual	Max	imum	LO:	S F?		A	ctual	Ma	aximum	LOS F?
						V <sub>FI</sub> =V <sub>I</sub>	F		See E	xhibit 25-14	
V <sub>FO</sub>	1417	See Ex	hibit 25-7	N	0	V <sub>12</sub>			4	400:All	
V <sub>R12</sub>	1417	460	00:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14	
						V <sub>R</sub>			See E	Exhibit 25-3	
	Service De					Level of	of Servi	ice D	etermi	ination (i	f not F)
D <sub>R</sub> =	5.475 + 0.00734	$V_{R} + 0.007$	78 V <sub>12</sub> - 0.	00627 L <sub>A</sub>			$D_R =$	4.252 +	0.0086 V	/ <sub>12</sub> - 0.009 L <sub>D</sub>	
D <sub>R</sub> =	7.2 (pc/ m/ln)					D <sub>R</sub> =	(pc/ m/ln)				
LOS =	A (Exhibit 25-4)					LOS=	(Exhibit 25	-4)			
Speed E	stimation					Speed	Estima	tion			
$M_S = 0.2$	219 (Exibit 25-1	9)				D <sub>s</sub> =	(Exhibit 2	5-19)			
Ü	.0 mph (Exhibit	•				S <sub>R</sub> =	mph (Exhi	bit 25-19	9)		
	A mph (Exhibit 2	•					mph (Exh	ibit 25-1	9)		
· ·	.0 mph (Exhibit						mph (Exhi	bit 25-15	5)		

		RAM	PS AN	D RAMF	JUNC	TIONS W	/OR	KSHEE	T			
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eway/Dir	of -	Travel	US 16	60 Ea	stbound	d
Agency or Co	mpany				Jur	nction			SH 17	72 Oi	ff Ramp	)
Date Performe	ed	11/13/20	09		Jur	isdiction					-	
Analysis Time	Period	PM Peak			Ana	alysis Ye	ar		Year	2030		
Project Descri	iption Ye	ar 2030 Tra	affic Op	erations	Analys	is of the l	JS 1	160 FEIS	3			
Inputs												
Upstream Adj	Ramp	Terrain									Downstr Ramp	eam Adj
☐ Yes ☐	On										☐ Yes	On
□ No □	Off										□ No	
$L_{up} = ft$		S	<sub>EE</sub> = (	60.0 mph	า	S	) <sub>ED</sub> =	= 40.0	mph		L <sub>down</sub> =	ft
Vu = ve	h/h		• •			es, L <sub>A</sub> , L			•	ľ	VD =	veh/h
Conversion t	•	dor Rose (			IV IUI	.55, L <sub>A</sub> , L	יטי ۲	≺' * f/				
Conversion		der base C	oriaiti	Oris	1	1	1	1		[,	v=V/PHF	=
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>		$f_{HV} f_p$	
Freeway	2950	0.95	Rol	ling	5	0	0.	.930	1.00		3338	
Ramp	1480	0.95	Rol	ling	2	0	0.	.971	1.00		1605	
UpStream												
DownStream					<u> </u>							
	Me	erge Areas						[	Diverge	Areas	3	
Estimation of	f v <sub>12</sub>					Estimat	ion	of v <sub>12</sub>				
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						V	0 = VD +	(V <sub>-</sub> -	· V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat						  L <sub>EQ</sub> = (E	์ดเเล	•		•	א רט	
		20-0)										
P <sub>FM</sub> = using E	quation					$P_{FD} = 1.0$		_	Equation	า บ		
V <sub>12</sub> = pc/h						$V_{12} = 33$						
Capacity Che	ecks					Capacit	y Cl	hecks			<del></del>	
	Actual	Maxin	num	LOS	F?			Actua	ıl N	/laxin	num	LOS F?
V		See Exh	ibit 25-			$V_{FI} = V_{F}$	.	3338		460	00	No
V <sub>FO</sub>		7				V <sub>12</sub>		3338		4400	:All	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{FO}$	F -	1733		460	O	No
						$V_{R}$		1605		210	0	No
Level of Serv	rice Detern	nination (i	f not F	5)		Level of	Se	rvice De	etermina	ation	(if not F	F)
$D_R = 5.475 +$	+ 0.00734 v	<sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		D	= 4.252	2 + 0.00	86 V <sub>1</sub>	2 - 0.009	9 L <sub>D</sub>
$D_R = (pc)$	c/ mi /ln)				,,	D <sub>R</sub> =		0 (pc/ m		•	_	J
LOS = (Ex	khibit 25-4)					LOS=	C (1	Exhibit 2	25-4)			
Speed Estima	ation					Speed E	Estir	mation				
_	it 25-19)							07 (Exh	ibit 25-1	9)		
"	•	10)				~		9 mph (		•	)	
1	(Exhibit 25	•				1					•	
•	(Exhibit 25	•						A mph (				
S= mph	(Exhibit 25	-14)				S =	50.9	9 mph (	Exhibit 2	25-15	)	

		RAM	PS AN	D RAMF	JUNC	TIONS W	OR	KSHEE	Т			
General Info	rmation			Sit	te Infori	mation						
Analyst		SEH Inc.			Fre	eway/Dir	of <sup>-</sup>	Travel	US 10	60 E	astbound	d
Agency or Co	mpany				Jur	nction			SH 1'	72 O	ff Ramp	)
Date Performe	ed	11/13/20	09		Jur	isdiction					-	
Analysis Time	Period	AM Peak	[		Ana	alysis Yea	ar		Year	2030	)	
Project Descri	iption Ye	ar 2030 Tra	affic Op	erations	Analysi	s of the U	JS 1	160 FEIS	3			
Inputs												
Upstream Adj	Ramp	Terrain									Downstr Ramp	eam Adj
☐ Yes ☐	On										☐ Yes	□ On
□ No □	Off										□ No	
$L_{up} = ft$								40.0			L <sub>down</sub> =	ft
		S	• •	60.0 mph				= 40.0 i	mpn		VD =	veh/h
Vu = ve	h/h		S	sketch ( s	show lar	es, L <sub>A</sub> , L	$_{D}, V_{F}$	$_{R},V_{f})$				
Conversion t	o pc/h Un	der Base (	Conditi	ions								
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv		f <sub>HV</sub>	$f_p$		v=V/PHF f <sub>HV</sub> f <sub>p</sub>	=
Freeway	1940	0.95	Rol	ling	5	0	0.	.930	1.00	)	2195	
Ramp	850	0.95		lling	2	0	0.	.971	1.00	)	922	
UpStream												
DownStream												
	Me	rge Areas			,			[	Diverge	Area	S	
Estimation of	f V <sub>12</sub>					Estimati	ion	of V <sub>12</sub>				
		= V <sub>F</sub> ( P <sub>FM</sub> )						\/	- \/ +	- (\/	- V <sub>R</sub> )P <sub>FD</sub>	
_ /Favet										•	'R' FD	
$L_{EQ} = (Equat$		25-3)				$L_{EQ} = (E$						
P <sub>FM</sub> = using E	quation					$P_{FD} = 1.0$		-	Equatio	n 0		
V <sub>12</sub> = pc/h						$V_{12} = 21$	95	pc/h				
Capacity Che	ecks					Capacity	y Cl	hecks				
	Actual	Maxin	num	LOS	F?			Actua	ıl l	Maxir	num	LOS F?
.,		See Exh	ihit 25-			$V_{FI} = V_{F}$	. [	2195		460	00	No
V <sub>FO</sub>		7	IDIT 20			V <sub>12</sub>		2195		4400	):All	No
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	= -	1273		460	0	No
KIZ						V <sub>R</sub>		922		210	0	No
Level of Serv	rice Detern	nination (i	f not F	)		Level of	Se	rvice De	etermin	atior	(if not l	F)
$D_R = 5.475 + 1.00$				,	L						12 - 0.009	,
1	c/ mi /ln)	к	12		А	D <sub>R</sub> =		1 (pc/ m			12 2700	ט
'` "	khibit 25-4)							Exhibit 2	•			
Speed Estima						Speed E	<u> </u>		,			
								46 (Exh	ihit 25-1	9)		
,	it 25-19)	4.0\				~		•		•	2)	
1 .,	(Exhibit 25	•				1 .,		0 mph (			•	
•	(Exhibit 25	•						A mph (				
S= mph	(Exhibit 25	-14)				S = .	52.0	0 mph (	Exhibit	25-15	5)	

		RAMP	S AND	RAME	- JUN	CTIONS	WOR	KSHE	ET		
General	Informati	ion				Site In:	formati	ion			
Analyst2 Agency or Co Date Perform	ned	SEH Inc.	19		Ju Ju	eeway/Dir onction		U	S 550/C	/estbound R 233 On Ra	mp
Analysis Time Project Descri	e Period ription Year 2	PM Peak	nerations	Analysis		nalysis Year 160 FFIS		Y	ear 2030	J	
Inputs	ription real 2	2030 Traine C	perations	Allalysis	or the ob	100 1 213					
Upstream Ad	li Ramp	Terrain Rolli	ng							Downstrea	ım Adj Ramp
☐ Yes	☐ On									☐ Yes	☐ On
□ No	Coff Off									□ No	Off
L <sub>up</sub> =	ft									L <sub>down</sub> =	ft
Vu =	veh/h	``	S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0$ $S_{R'}V_f$	) mph		VD =	veh/h
Convers	sion to pc	h Under	Base	Condi	tions						
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV fp
Freeway Ramp	2235 2385	0.95 0.95	Rolli Rolli		5 2	0	0.930 0.971	<del></del>	1.00 1.00	2529 2586	
UpStream DownStream	<u> </u>			V							
		Merge Areas	5						erge Area	as	
Estimati	on of v <sub>12</sub>					Estima	tion of	<sup>f</sup> V <sub>12</sub>			
	ation 25-2 or 2 using Equatio						quation 25- ing Equati ⁄h	-8 or 25-		- V <sub>R</sub> )P <sub>FD</sub>	
Capacity	/ Checks					Capaci	ity Che	cks			
	Actua	ıl Max	imum	LOS	S F?	V -V		Actual	1	aximum xhibit 25-14	LOS F?
$V_{FO}$	5115	See Ex	hibit 25-7	Y€	es	$\frac{V_{FI}=V_{I}}{V_{12}}$	F			400:All	
V <sub>R12</sub>	5115	460	00:All	Υe	es	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14	
						$V_R$			See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not	F)	Level o	of Serv	ice De	etermi	ination (i	f not F)
$D_R = $	5.475 + 0.0073	34 v <sub>R</sub> + 0.007	78 V <sub>12</sub> - 0.	00627 L <sub>A</sub>			D <sub>R</sub> =	4.252 +	0.0086 V	/ <sub>12</sub> - 0.009 L <sub>D</sub>	
D <sub>R</sub> =	21.4 (pc/ m/ln)					D <sub>R</sub> =	(pc/ m/ln)				
LOS =	F (Exhibit 25-4	1)				LOS=	(Exhibit 25	-4)			
Speed E	stimation	1				Speed	Estima	ation			
$M_{S} = 0.6$	579 (Exibit 25	-19)				D <sub>s</sub> =	(Exhibit 2	5-19)			
$S_R = 47$	.8 mph (Exhib	it 25-19)				'`	mph (Exhi		-		
U	A mph (Exhibi	•				ľ	mph (Exh				
S= 47.	.8 mph (Exhib	it 25-14)				S = 1	mph (Exhi	ıbit 25-15	)		

		RAMP	S AND	RAMI	- JUN	CTIONS	WORK	SHE	ET		
General	Informati	ion				Site In	formati	on			
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	Q		Ju	eeway/Dir onction	of Travel			Vestbound R 233 On Rai	mp
Analysis Tim		AM Peak				nalysis Year	r	Υ	ear 2030	)	
Project Desc	ription Year 2	2030 Traffic C	perations	Analysis	of the US	160 FEIS					
Inputs										1	
Upstream Ad	lj Ramp	Terrain Rollii	ng								m Adj Ramp —
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off
□ No	C Off									L <sub>down</sub> =	ft
L <sub>up</sub> =	ft			0 1							
Vu =	veh/h		S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0$ $R'_{f}$	mpn		VD =	veh/h
Convers	sion to pc	h Under	Base	Condi	tions						
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV <sup>f</sup> p
Freeway	1395	0.95	Rolli		5	0	0.930		1.00	1579	
Ramp UpStream	1930	0.95	Rolli	ing	2	0	0.971		1.00	2093	
DownStream	<u> </u>						<u> </u>				
	J.	Merge Areas			J		Į.	Dive	erge Area	as	
Estimati	on of v <sub>12</sub>					Estima	tion of	V <sub>12</sub>			
	V	12 = V <sub>F</sub> ( P <sub>FM</sub> )	)					V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>FO</sub> = (Equ	ation 25-2 or 2	25-3)				L <sub>FO</sub> = (Ed	quation 25-8	3 or 25-	9)	K IB	
	using Equation					1 - 4	ing Equatio				
V <sub>12</sub> = 1579						$V_{12} = pc/$	h .				
	/ Checks						ity Che	cks			
	Actua	ıl Max	imum	LOS	S F?	<u> </u>		ctual	Ma	aximum	LOS F?
,,						V <sub>FI</sub> =V <sub>I</sub>	F		See E	xhibit 25-14	
V <sub>FO</sub>	3672	See Ext	nibit 25-7	N	0	V <sub>12</sub>			4	400:All	
V <sub>R12</sub>	3672	460	0:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-		See E	xhibit 25-14	
K12						$\frac{v}{v_{R}}$			See E	Exhibit 25-3	
Level of	Service L	Determin	ation (	if not	F)		of Servi	ce De	eterm	ination (i	f not F)
	5.475 + 0.0073									/ <sub>12</sub> - 0.009 L <sub>D</sub>	11001)
1	10.3 (pc/ m/ln)	11	12	А		D <sub>R</sub> =	(pc/ m/ln)			12 D	
	B (Exhibit 25-4						(Exhibit 25-	4)			
	stimation						Estima				
	183 (Exibit 25					D <sub>s</sub> =	(Exhibit 25				
- C	.7 mph (Exhib	•				_	mph (Exhil	•	))		
l '`	. / IIIpii (Exilib A mph (Exhibi						mph (Exhi				
U	.7 mph (Exhibi	-					mph (Exhil		•		
30	., mpn (Exilio	20 17)				<u>                                     </u>	bii (Evilli	/π ∠U <sup>-</sup> Γ	′/		

		RAMPS	AN			TIONS W	/OR	KSHEE	Т			
General Info	rmation			Si	te Infor							
Analyst		SEH Inc.			Fre	eway/Dii	r of	Travel			Vestboun	
Agency or Co	mpany				Jur	nction			US	550/C	CR 233 O	ff Ramp
Date Perform	ed	11/13/2009			Jur	risdiction						
Analysis Time	e Period	PM Peak			An	alysis Ye	ar		Yea	ar 2030	0	
Project Descr	iption Yea	ar 2030 Traffi	с Ор	erations	Analys	is of the l	US	160 FEI	S			
Inputs											_	
Upstream Adj	Ramp	Terrain									Downstre Ramp	eam Adj
Yes	On										☐ Yes	On
□ No □	Off										□ No	
$L_{up} = ft$				20.0				40.0	1		L <sub>down</sub> =	ft
<u> </u>	eh/h	S <sub>FF</sub>		60.0 mph ketch ( s		es, L <sub>a</sub> , L		= 40.0	mpn		VD =	veh/h
Conversion	to pc/h Und	der Base Co	nditi	ons		, , , , , , , , , , , , , , , , , , ,						
(pc/h)	V (Veh/hr)	PHF	Tei	rain	Truck	%Rv		f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f <sub>HV</sub> f <sub>p</sub>	
Freeway	2825	0.95	Rol	ling	5	0	0	.930	1.0	00	3197	
Ramp	590	0.95	Rol		2	0	+	.971	1.0		640	
UpStream	370	0.75	101	iiig				.,,,,,	1.		0.10	
DownStream												
	Me	erge Areas			'		1	ĺ	Diverg	je Area	as	
Estimation o	f v <sub>12</sub>					Estimat	ion	of v <sub>12</sub>				
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						V <sub>1</sub>	<sub>2</sub> = V <sub>E</sub>	+ (V <sub>F</sub>	- V <sub>R</sub> )P <sub>FD</sub>	
L <sub>EQ</sub> = (Equat						$L_{EQ} = (E$	aua	•			10 15	
P <sub>FM</sub> = using E		,				$P_{FD} = 1.0$						
	-quation					1 '-		_	Lquai	.1011 0		
V <sub>12</sub> = pc/h						$V_{12} = 31$						
Capacity Ch	1	1 84- 1	. 1	1.00	F0 1	Capacit	y C			N4 - '		100 50
	Actual	Maximur	n	LOS	F?			Actua	11	Maxir		LOS F?
V <sub>FO</sub>		See Exhibit	25-		_	V <sub>FI</sub> =V <sub>F</sub>	=	3197		46	00	No
FO		7				V <sub>12</sub>		3197		4400	D:All	No
V <sub>R12</sub>		4600:AI	,			$V_{FO} = V_{R}$	F -	2557		460	00	No
						V <sub>R</sub>		640		210	00	No
Level of Serv	ice Detern	nination (if n	ot F			Level of	f Se	rvice D	eterm	ination	n (if not F	)
D <sub>R</sub> = 5.475	+ 0.00734 v	<sub>R</sub> + 0.0078 \	/ <sub>12</sub> -	0.00627	'L <sub>A</sub>		D	$_{R} = 4.252$	2 + 0.0	0086 V	' <sub>12</sub> - 0.009	L <sub>D</sub>
$D_R = (p_0)$	c/ mi /ln)					D <sub>R</sub> =	22.	7 (pc/ m	i /ln)			
L //						LOS=	C (	Exhibit 2	25-4)			
"	xhibit 25-4)					i	١,		,			
LOS = (E						Speed E	Esti	mation				
LOS = (E Speed Estim						<b>Speed E</b> D <sub>s</sub> =		<i>mation</i> 21 (Exh	ibit 25	5-19)		
LOS = (E  Speed Estim  M <sub>S</sub> = (Exib	ation					D <sub>s</sub> =	0.4			,	9)	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	<b>ation</b> it 25-19) (Exhibit 25	-19)				D <sub>s</sub> = S <sub>R</sub> =	0.4 52.	21 (Exh 4 mph (	Exhib	it 25-19		
LOS = (E  Speed Estim $M_S = $ (Exib $S_R = $ mph $S_0 = $ mph	<b>ation</b> it 25-19)	-19) -19)				$D_s = S_R = S_0 = S_0 = S_0$	0.4 52. N/A	21 (Exh	Exhib Exhib	it 25-19 it 25-19	9)	

		RAM	PS AN	D RAMF	JUNC	TIONS W	ORK	SHEET			
General Infor	rmation			Si	te Infor						
Analyst		SEH Inc.			Fre	eway/Dir	of T		JS 160 W		
Agency or Co	mpany				Jur	nction		J	JS 500/C	CR 233 C	off Ramp
Date Performe	ed	11/13/20	09		Jur	isdiction					
Analysis Time	Period	AM Peak	(		An	alysis Yea	ar	7	Year 2030	0	
Project Descri	ption Yea	ar 2030 Tra	affic Op	erations	Analys	is of the L	JS 16	60 FEIS			
Inputs	1	<del>-</del>								1	
Upstream Adj	·	Terrain								Downstr Ramp	eam Adj
Yes	On									☐ Yes	On
□ No □	Off									□ No	☐ Off
$L_{up} = ft$										L <sub>down</sub> =	ft
up		S	• •	60.0 mph				40.0 mp	h	VD =	veh/h
Vu = ve	h/h		S	ketch (s	show lar	nes, L <sub>A</sub> , L	$_{D},V_{R}$	,V <sub>f</sub> )			VO11/11
Conversion t	o pc/h Und	der Base (	Conditi	ons	1	1	1	1		1	_
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv	1	f <sub>HV</sub>	$f_p$	v=V/PHF f <sub>HV</sub> f <sub>p</sub>	-
Freeway	1995	0.95	Rol	ling	5	0	0.9	930	1.00	2257	
Ramp	600	0.95	Rol	ling	2	0	0.9	971	1.00	651	
UpStream											
DownStream											
						1					
F-4'4'		rge Areas				F - 1' 1'	•		erge Area	as	
Estimation of	f v <sub>12</sub>					Estimati	ion c	of V <sub>12</sub>			
Estimation of	f v <sub>12</sub>	erge Areas = V <sub>F</sub> ( P <sub>FM</sub> )				Estimati	ion c	of V <sub>12</sub>	erge Area		
Estimation of $L_{EQ} = (Equation for example of the content of t$	f v <sub>12</sub> V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )						of V <sub>12</sub>	V <sub>R</sub> + (V <sub>F</sub>		
	<b>f v<sub>12</sub></b> V <sub>12</sub> = ion 25-2 or	= V <sub>F</sub> ( P <sub>FM</sub> )				L <sub>EQ</sub> = (E	quat	of v <sub>12</sub> V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub> or 25-9)		
L <sub>EQ</sub> = (Equat	<b>f v<sub>12</sub></b> V <sub>12</sub> = ion 25-2 or	= V <sub>F</sub> ( P <sub>FM</sub> )				L <sub>EQ</sub> = (E	quat	of v <sub>12</sub> V <sub>12</sub> = ion 25-8 o using Eq	V <sub>R</sub> + (V <sub>F</sub> or 25-9)		
L <sub>EQ</sub> = (Equating E	<b>f v<sub>12</sub></b> V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> )				L <sub>EQ</sub> = (E P <sub>FD</sub> =1.(	quat )00 57 p	of v <sub>12</sub> V <sub>12</sub> = ion 25-8 o using Equ oc/h	V <sub>R</sub> + (V <sub>F</sub> or 25-9)		
L <sub>EQ</sub> = (Equat P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	<b>f v<sub>12</sub></b> V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> )		LOS	F?	L <sub>EQ</sub> = (E P <sub>FD</sub> =1.( V <sub>12</sub> = 22	quat )00 57 p	of v <sub>12</sub> V <sub>12</sub> = ion 25-8 o using Equ oc/h	V <sub>R</sub> + (V <sub>F</sub> or 25-9)	- V <sub>R</sub> )P <sub>FD</sub>	LOS F?
L <sub>EQ</sub> = (Equate P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)	num	LOS	F?	L <sub>EQ</sub> = (E P <sub>FD</sub> =1.( V <sub>12</sub> = 22	quat )00 57 p	of v <sub>12</sub> V <sub>12</sub> = ion 25-8 o using Equ oc/h ecks	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0	- V <sub>R</sub> )P <sub>FD</sub>	LOS F? No
L <sub>EQ</sub> = (Equat P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)   Maxin	num	LOS	F?	$L_{EQ} = (E$ $P_{FD} = 1.(V_{12} = 22)$ $Capacit$	quat )00 57 p	V <sub>12</sub> = v <sub>12</sub> = v <sub>12</sub> = v <sub>12</sub> = v <sub>13</sub> = v <sub>14</sub> = v <sub>15</sub> = v <sub>16</sub>	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0	- V <sub>R</sub> )P <sub>FD</sub>	i
L <sub>EQ</sub> = (Equating Equating Equ	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3) Maxin	num ibit 25-	LOS	F?	$L_{EQ} = (E$ $P_{FD} = 1.(I)$ $V_{12} = 22$ $Capacit$ $V_{FI} = V_{FI}$ $V_{12}$ $V_{FO} = V_{FI}$	quat )00 57 p y <b>Ch</b>	V <sub>12</sub> = ion 25-8 o using Equation between the control of the contr	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxii 460	- V <sub>R</sub> )P <sub>FD</sub> mum 00 D:All	No
L <sub>EQ</sub> = (Equate P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3) Maxin See Exh	num ibit 25-	LOS	F?	$L_{EQ} = (E$ $P_{FD} = 1.(I)$ $V_{12} = 22$ $Capacit$ $V_{FI} = V_{FI}$ $V_{12}$	quat )00 57 p y <b>Ch</b>	V <sub>12</sub> = ion 25-8 o using Equation 25-8 o using Equation 25-8 o using Equation 25-8 o using Equation 25-9 o usi	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxii 460	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All	No No
L <sub>EQ</sub> = (Equating Equating Equ	V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)   Maxin   See Exh   7	num ibit 25- :All		F?	$L_{EQ} = (E$ $P_{FD} = 1.(I)$ $V_{12} = 22$ $Capacit$ $V_{Fi} = V_{Fi}$ $V_{12}$ $V_{FO} = V_{Fi}$ $V_{R}$	quat 000 57 p y Ch	V <sub>12</sub> = ion 25-8 o using Equation between the control of the contr	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxim 460 460 210	- V <sub>R</sub> )P <sub>FD</sub> mum   00   0:All   00	No No No
L <sub>EQ</sub> = (Equate P <sub>FM</sub> = using E V <sub>12</sub> = pc/h  Capacity Che  V <sub>FO</sub>	V <sub>12</sub> = ion 25-2 or quation  ccks Actual	See Exh 4600	num ibit 25- :All	)	-	$L_{EQ} = (E$ $P_{FD} = 1.(I)$ $V_{12} = 22$ $Capacit$ $V_{Fi} = V_{Fi}$ $V_{12}$ $V_{FO} = V_{Fi}$ $V_{R}$	quat 000 57 p Ch	V <sub>12</sub> = ion 25-8 o using Equation 25/8 oc/h  ecks  Actual 2257  2257	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxim 460 4400 210  rmination	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  00  1 (if not F	No No No No
L <sub>EQ</sub> = (Equate P <sub>FM</sub> = using E V <sub>12</sub> = pc/h  Capacity Che  V <sub>FO</sub> V <sub>R12</sub> Level of Server D <sub>R</sub> = 5.475 + 1	V <sub>12</sub> = ion 25-2 or quation  ccks Actual	See Exh 4600	num ibit 25- :All	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 1.( &V_{12} = 22 \\ &Capacit \end{aligned}$ $\begin{aligned} &V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \end{aligned}$ $V_{R}$ $Level of$	quat 000 57 p Ch	V <sub>12</sub> = ion 25-8 o using Equation 25/8 o using Equation 2257 2257 1606 651	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxim 460 4400 210  rmination 0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  00  1 (if not F	No No No No
$L_{EQ}$ = (Equation P <sub>FM</sub> = using E $V_{12}$ = pc/h $V_{FO}$ $V_{FO}$ $V_{R12}$ $V_{$	V <sub>12</sub> = ion 25-2 or quation  ecks Actual	See Exh 7 4600	num ibit 25- :All	)	-	$L_{EQ} = (E \\ P_{FD} = 1.0 \\ V_{12} = 22 \\ \hline \textbf{Capacit}$ $V_{Fi} = V_{F}$ $V_{12}$ $V_{FO} = V_{F}$ $V_{R}$ $Level of$ $D_{R} =$	quat 000 57 p <b>y Ch</b>	V <sub>12</sub> = ion 25-8 o using Equation 25/8 oc/h  ecks  Actual 2257  2257  1606  651  vice Determination of the position of the pos	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxim 460 4400 460 210  rmination 0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  00  1 (if not F	No No No No
$L_{EQ} = (Equat)$ $P_{FM} = using E$ $V_{12} = pc/h$ $Capacity Che$ $V_{FO}$ $V_{R12}$ $Level of Serv$ $D_R = 5.475 + D_R = (po)$ $LOS = (Expression)$	V <sub>12</sub> = ion 25-2 or quation  ecks Actual  ice Determination of the color of the col	See Exh 7 4600	num ibit 25- :All	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 1.( &V_{12} = 22 \\ &Capacit \end{aligned} \\ &V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \\ &V_{R} \\ &Level of \\ \\ &D_{R} = \\ &LOS = \end{aligned}$	quat 000 57 r <b>y Ch</b> D <sub>R</sub> 14.7 B (E	V <sub>12</sub> = ion 25-8 o using Equation 25-8 o using Equation 25-7 and a second 2257 and a second 2257 and a second 25-2 and a	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxim 460 4400 460 210  rmination 0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  00  1 (if not F	No No No No
$L_{EQ} = (Equat)$ $P_{FM} = using E$ $V_{12} = pc/h$ $Capacity Che$ $V_{FO}$ $V_{R12}$ $Level of Serv$ $D_R = 5.475 + D_R = (polyabet)$ $LOS = (Extended Extended MS = (Extended Extended Exte$	V <sub>12</sub> = ion 25-2 or quation  ecks Actual  ice Determination of the color of the col	See Exh 7 4600	num ibit 25- :All	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 1.( &V_{12} = 22 \\ &Capacit \end{aligned} \\ &V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \\ &V_{R} \\ &Level of \\ &D_{R} = \\ &LOS = \\ &D_{S} = \end{aligned}$	quat 000 57 p Ch DR 14.7 B (E	V <sub>12</sub> = ion 25-8 o using Equation 25-8 o using Equation 2257 2257 1606 651 vice Determination 2 (Exhibit 25-4 oct 15 oct	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maxim 460 4400  210  rmination 0.0086 V n) 4)	- V <sub>R</sub> )P <sub>FD</sub> mum   00   0:All   00   0   0   0   1 (if not F	No No No No
$L_{EQ} = (Equat)$ $P_{FM} = using E$ $V_{12} = pc/h$ $Capacity Che$ $V_{FO}$ $V_{R12}$ $Level of Serv$ $D_R = 5.475 + D_R = (po)$ $LOS = (Exibit)$ $S_R = mph$	V <sub>12</sub> = ion 25-2 or quation  ecks Actual  rice Determination of the color of the co	See Exh 4600	num ibit 25- :All	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 1.0 \\ &V_{12} = 22 \\ &Capacity \end{aligned}$ $&V_{FI} = V_{F} \\ &V_{12} \\ &V_{R} = V_{R} \\ &V_{R} \end{aligned}$ $&Level\ of$ $&D_{R} = \\ &LOS = \\ &Speed\ E \\ &D_{S} = \\ &S_{R} = \end{aligned}$	quat 000 57 p y Ch D <sub>R</sub> 14.7 B (E Estim 0.42	V <sub>12</sub> = ion 25-8 o using Equation 25-8 o using Equation 2257 2257 1606 651 vice Determination 2 (Exhibit mph (Exhibit 25-4 or at ion 2	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maximation 460 4400 460 210  rmination 0.0086 Ven) 4)	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  10  11  12  10  10  10  11  10  10	No No No No
$L_{EQ} = (Equat)$ $P_{FM} = using E$ $V_{12} = pc/h$ $Capacity Che$ $V_{FO}$ $V_{R12}$ $Level of Serv$ $D_R = 5.475 + D_R = (po)$ $LOS = (Exist)$ $M_S = (Exist)$ $S_R = mph$	V <sub>12</sub> = ion 25-2 or quation  PCKS Actual  Actual  Actual  O.00734 v  C/ mi /ln)  Ahibit 25-4)  ation  it 25-19)	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)    Maxin   See Exh   7   4600   mination (i	num ibit 25- :All	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 1.0 \\ &V_{12} = 22 \\ &Capacity \end{aligned}$ $&V_{FI} = V_{F} \\ &V_{12} \\ &V_{R} = V_{R} \\ &V_{R} \end{aligned}$ $&Level\ of$ $&D_{R} = \\ &LOS = \\ &Speed\ E \\ &D_{S} = \\ &S_{R} = \end{aligned}$	quat 000 57 p y Ch D <sub>R</sub> 14.7 B (E Estim 0.42	V <sub>12</sub> = ion 25-8 o using Equation 25-8 o using Equation 2257 2257 1606 651 vice Determination 2 (Exhibit 25-4 oct 15 oct	V <sub>R</sub> + (V <sub>F</sub> or 25-9) uation 0  Maximation 460 4400 460 210  rmination 0.0086 Ven) 4)	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  10  11  12  10  10  10  11  10  10	No No No No

		RAMP	S AND	RAMI	- JUN	CTIONS	s wo	RKSH	EET				
General	Informati	ion				Site In	forma	ation					
Analyst2 Agency or Co Date Perform		SEH Inc. 11/13/200	)9		Ju					astbound CR 223 On Ra	mp		
Analysis Tim	e Period	PM Peak			Ar	nalysis Yea	r		)				
	ription Year 2	2030 Traffic C	perations	Analysis	of the US	160 FEIS							
Inputs		Torrain Dalli	na										
Upstream Ad	lj Ramp	Terrain Rolli	ny								nm Adj Ramp		
Yes	☐ On									☐ Yes ☐ No	☐ On ☐ Off		
□ No	C Off									L <sub>down</sub> =	ft		
L <sub>up</sub> =	ft												
Vu =	veh/h		S <sub>FF</sub> = 60		show lane	es, L <sub>A</sub> , L <sub>D</sub> ,V	111	0.0 mph		VD =	veh/h		
Convers	sion to pc	/h Under				N B	IX I						
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>H</sub>	IV	f <sub>p</sub>	v=V/PHF f	HV fp		
Freeway	2155	0.95	Rolli	ng	5	0	0.93		1.00	2439			
Ramp	795	0.95	Rolli	ng	2	0	0.97	71	1.00	862			
UpStream  DownStream	 nl					<u> </u>	<u> </u>						
Downstream	<u> </u>	Merge Areas	l S		<u> </u>		<u> </u>	l Di\	erge Are	as			
Estimati	ion of v <sub>12</sub>					Estimation of v <sub>12</sub>							
		<sub>12</sub> = V <sub>F</sub> (P <sub>FM</sub>	)						= V <sub>D</sub> + (V <sub>I</sub>	- V <sub>R</sub> )P <sub>FD</sub>			
L <sub>FO</sub> = (Equ	ation 25-2 or 2	12 1 110				L <sub>FO</sub> = (Eo	quation	12		IC ID			
	using Equation						sing Equ		,				
V <sub>12</sub> = 2439						$V_{12} = pc/h$							
1.2	y Checks					Capac		hecks					
	Actua	al Max	rimum	LOS	S F?			Actual	M	laximum	LOS F?		
.,						V <sub>FI</sub> =V	F		See E	Exhibit 25-14			
V <sub>FO</sub>	3301	See Ex	hibit 25-7	N	0	V <sub>12</sub>	<u>'</u>		4	1400:All			
V <sub>R12</sub>	3301	460	0:All	N	0	$V_{FO} = V_{F}$ $V_{R}$			See E	Exhibit 25-14			
KIZ						V <sub>R</sub>			See	Exhibit 25-3			
Level of	Service L	Determin	ation (	if not	F)	Level of	of Sei	rvice D	eterm	ination (i	f not F)		
	5.475 + 0.0073		•							V <sub>12</sub> - 0.009 L <sub>D</sub>			
D <sub>R</sub> =	21.6 (pc/ m/ln)			,,		D <sub>R</sub> =	(pc/ m/li	า)		5			
LOS =	C (Exhibit 25-4	4)				LOS=	(Exhibit	25-4)					
Speed E	stimation	1				Speed	Estir	nation					
	309 (Exibit 25					D <sub>s</sub> =		it 25-19)					
0	.4 mph (Exhib	•				*	mph (E	xhibit 25-1	19)				
	A mph (Exhibi	•				$S_0$ = mph (Exhibit 25-19)							
	.4 mph (Exhib	-				S =	mph (E	xhibit 25-1	15)				
						1							

		RAMP	S AND	RAMI	P JUNG	CTIONS	S WC	ORKS	HEE	T			
General	Informatio	on				Site In:	form	nation					
Analyst2 Agency or Co Date Perform Analysis Time	ompany ned	SEH Inc. 11/18/200 AM Peak		Analysis	Ju Ju Ar	Jurisdiction Analysis Year Year 2030					stbound R 223 On Ramp		
Inputs	iipiion rearzi	JJO TTAITIC O	perations	Allalysis	or the US	100 1 113							
Upstream Ad	j Ramp	errain Rollir	ng								Downstrea	ım Adj Ramp	
Yes	☐ On										Yes	□ On	
□ No	Off										No L <sub>down</sub> =	C Off	
L <sub>up</sub> =	ft												
Vu =	veh/h	S	S <sub>FF</sub> = 60		show lane	s, L <sub>A</sub> , L <sub>D</sub> ,V	111	40.0 mp	h		VD =	veh/h	
Convers	ion to pc/	h Under	Base	Condi	tions								
(pc/h)	V (Veh/hr)	PHF		rain	Truck	%Rv		f <sub>HV</sub>		f <sub>p</sub>	v=V/PHF f	HV fp	
Freeway	1180	0.95	Rolli		5	0		930		00	1335		
Ramp UpStream	760	0.95	Rolli	ing	2	0	0.9	971	1.	00	824		
DownStream	<u> </u>				] [								
Downou dun		Merge Areas			J		_l		Diverg	e Areas	I,		
Estimati	on of v <sub>12</sub>					Estima	ation	of V <sub>1</sub>	2				
	•	<sub>2</sub> = V <sub>F</sub> ( P <sub>FM</sub> )						-	_	R + (V <sub>F</sub> -	V <sub>R</sub> )P <sub>FD</sub>		
	ation 25-2 or 25 using Equation					$L_{EQ}$ = (Equation 25-8 or 25-9) $P_{FD}$ = using Equation $V_{12}$ = pc/h							
12	/ Checks					Capac		hock	<u> </u>				
Capacity	Actual	May	imum	100	S F?	Capac	ny C	Actua		May	imum	LOS F?	
	Actual	IVIAX	iiiiuiii	LU	3 Г (	\/ -\/	<del></del>	Actua			nibit 25-14	LUST	
V <sub>FO</sub>	2159	See Ext	nibit 25-7	N	0	V <sub>FI</sub> =V V <sub>12</sub>	F				00:All		
V <sub>R12</sub>	2159	460	0:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-			See Exh	nibit 25-14		
						$V_R$				See Exl	hibit 25-3		
Level of	Service D	etermina	ation (	if not	F)	Level o	of Se	ervice	Det	ermin	nation (i	f not F)	
	5.475 + 0.0073							$O_{R} = 4.25$	52 + 0.	0086 V <sub>12</sub>	- 0.009 L <sub>D</sub>		
1	12.7 (pc/ m/ln)		·=	,,		D <sub>R</sub> =	(pc/ m	/ln)		12	D		
'`	B (Exhibit 25-4)					''	(Exhib	it 25-4)					
	stimation						·		n				
•	237 (Exibit 25-		<b>Speed Estimation</b> D <sub>s</sub> = (Exhibit 25-19)										
_	.7 mph (Exhibit	•					mph (	Exhibit 2	5-19)				
	A mph (Exhibit	•				$S_0 = \text{mph (Exhibit 25-17)}$							
	.7 mph (Exhibit	-				'	•	` Exhibit 2					

		RAMP	S AN			TIONS W	OR	KSHEE	Т					
General Info	rmation			Si	te Infor									
Analyst		SEH Inc.			Fre	eeway/Dir of Travel US 160 Eastbound								
Agency or Co	mpany				Jur	nction US 550/CR 233 Off Ram						ff Ramp		
Date Perform	ed	11/13/200	9		Jur	risdiction								
Analysis Time	Period	PM Peak			An	nalysis Year Year 2030								
Project Descr	iption Yea	ar 2030 Traf	fic Op	erations	sis of the US 160 FEIS									
Inputs														
Upstream Adj	Kanip	Terrain									Downstre Ramp	eam Adj		
Yes	On										☐ Yes	On		
□ No □	Off										□ No			
$L_{up} = ft$	,										L <sub>down</sub> =	ft		
'	eh/h	S <sub>F</sub>		60.0 mph ketch ( s				= 40.0 r <sub>=</sub> ,V <sub>•</sub> )	mph		VD =	veh/h		
$Vu = veh/h$ Sketch (show lanes, $L_A$ , $L_D$ , $V_R$ , $V_f$ )  Conversion to pc/h Under Base Conditions														
(pc/h)	V (Veh/hr)	PHF		rrain	Truck	%Rv		f <sub>HV</sub>	fp	,	v=V/PHF f <sub>HV</sub> f <sub>p</sub>			
Freeway	4525	0.95	Rol	ling	5	0	0	.930	1.00	)	5120			
Ramp	2370	0.95		ling	2	0	_				-			
UpStream	2370	0.93	Koi	mig		0 0.971			1.00 2570					
DownStream					<u> </u>	1								
	Me	rge Areas			J		1		Diverge	Area	as			
Estimation o	f v <sub>12</sub>					Estimati	ion	of v <sub>12</sub>						
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )				$V_{12} = V_R + (V_F - V_R)P_{FD}$								
L <sub>EQ</sub> = (Equat						$L_{EQ} = (Equation 25-8 \text{ or } 25-9)$								
P <sub>FM</sub> = using E		,												
$V_{12} = pc/h$	.qualion					$P_{FD} = 0.450$ using Equation 0 $V_{12} = 3717$ pc/h								
Capacity Che	noko					<u> </u>								
Capacity Cite	1	Maximi	um	LOS	E2	Capacity Checks								
	Actual	Maximi		LOS	Г	\/ _\/			<u> </u>	Maximum 6900		1		
V <sub>FO</sub>		See Exhib	oit 25-		-	V <sub>FI</sub> =V <sub>F</sub>	:	5120				No		
		'				V <sub>12</sub>	_	3717		4400	D:All	No		
V <sub>R12</sub>		4600:	ΑII			$V_{FO} = V_{F}$ $V_{R}$	= -	2550		690	00	No		
						V <sub>R</sub>		2570		410	00	No		
Level of Serv	vice Detern	nination (if	not F	)		Level of	Se	rvice De	etermir	atio	n (if not F	5)		
$D_{R} = 5.475 -$	+ 0.00734 v	<sub>R</sub> + 0.0078	V <sub>12</sub> -	0.00627	'L <sub>A</sub>		$D_F$	$_{R} = 4.252$	2 + 0.00	086 V	' <sub>12</sub> - 0.009	L <sub>D</sub>		
$D_R = (pc)$	c/ mi /ln)					D <sub>R</sub> =	13.	7 (pc/ mi	i /ln)					
LOS = (E	xhibit 25-4)					LOS=	В (І	Exhibit 2	5-4)					
Speed Estim						Speed E								
$M_S = \text{(Exibit 25-19)}$ $D_S = 0.594 \text{ (Exhibit 25-19)}$														
$S_{R}$ = mph (Exhibit 25-19) $S_{R}$ = 49.3 mph (Exhibit 25-19)														
_	(Exhibit 25	•				$S_0 =$	64.	2 mph (	Exhibit	25-1	9)			
-	(Exhibit 25	•				_		7 mph (						
S=   III  II	\													

		RAM	PS AN			TIONS W	ORKSH	ET					
General Infor	mation			Sit	te Infor								
Analyst		SEH Inc.			Fre	eeway/Dir of Travel US 160 Eastbound							
Agency or Cor	mpany				Jur	nction US 550/CR 233 Off Ramp							
Date Performe	ed	11/13/200	09		Jur	risdiction							
Analysis Time	Period	AM Peak			An	alysis Year Year 2030							
Project Descri	ption Yea	ar 2030 Tra	affic Op	erations	Analys	sis of the US 160 FEIS							
Inputs													
Upstream Adj	Ramp	Terrain							Downstr Ramp	eam Adj			
☐ Yes ☐	On									☐ Yes	On		
□ No □	Off									□ No			
$L_{up} = ft$		S	<sub></sub> = 6	60.0 mph	 1	S	<sub>FR</sub> = 40.	0 mpl	 h	L <sub>down</sub> =	ft		
	h/h		s	ketch (s		nes, L <sub>A</sub> , L				VD =	veh/h		
Conversion to	o pc/h Und	der Base C	Conditi	ons		1	1	1					
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv	$f_{HV}$		$f_p$	v=V/PHF f <sub>HV</sub> f <sub>p</sub>	=		
Freeway	2830	0.95	Rol	ling	5	0	0.930		1.00	3202			
Ramp	1650	0.95		ling	2	0	0.971		1.00 3202				
UpStream													
DownStream													
	N 4 -	_											
		rge Areas						Dive	erge Area	ıs			
Estimation of		erge Areas				Estimati	ion of v <sub>12</sub>		erge Area	IS			
Estimation of	f v <sub>12</sub>					Estimati			erge Area				
	F <b>v<sub>12</sub></b> V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )					,	V <sub>12</sub> =	V <sub>R</sub> + (V <sub>F</sub>				
L <sub>EQ</sub> = (Equati	V <sub>12</sub> V <sub>12</sub> = ion 25-2 or	= V <sub>F</sub> ( P <sub>FM</sub> )				L <sub>EQ</sub> = (E	quation 2	v V <sub>12</sub> = 5-8 o	V <sub>R</sub> + (V <sub>F</sub> r 25-9)				
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E	V <sub>12</sub> V <sub>12</sub> = ion 25-2 or	= V <sub>F</sub> ( P <sub>FM</sub> )				L <sub>EQ</sub> = (E P <sub>FD</sub> =0.4	quation 2	v V <sub>12</sub> = 5-8 o	V <sub>R</sub> + (V <sub>F</sub> r 25-9)				
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	V <sub>12</sub> V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> )				$L_{EQ} = (E P_{FD} = 0.4 V_{12} = 24$	quation 2 150 usir 25 pc/h	! √ <sub>12</sub> = 5-8 o g Equ	V <sub>R</sub> + (V <sub>F</sub> r 25-9)				
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)		100	F2 1	$L_{EQ} = (E P_{FD} = 0.4 V_{12} = 24$	quation 2 150 usir 25 pc/h	e V <sub>12</sub> = 5-8 o g Equ	V <sub>R</sub> + (V <sub>F</sub> r 25-9) uation 0	- V <sub>R</sub> )P <sub>FD</sub>	100.50		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	V <sub>12</sub> V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> )	num	LOS	F?	$L_{EQ} = (E$ $P_{FD} = 0.4$ $V_{12} = 24$ $Capacity$	quation 2 150 usir 25 pc/h v Checks	y √ <sub>12</sub> = 5-8 o g Equ s	V <sub>R</sub> + (V <sub>F</sub> r 25-9) uation 0	- V <sub>R</sub> )P <sub>FD</sub>	LOS F?		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h <b>Capacity Che</b>	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)		LOS	F?	$L_{EQ} = (E$ $P_{FD} = 0.4$ $V_{12} = 24$ $Capacit$ $V_{FI} = V_{F}$	quation 2 450 usir 25 pc/h y Checks Act 320	e V <sub>12</sub> = 5-8 o g Equ ual	V <sub>R</sub> + (V <sub>F</sub> r 25-9) uation 0	- V <sub>R</sub> )P <sub>FD</sub>	LOS F? No		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)   Maxim		LOS	F?	$L_{EQ} = (E$ $P_{FD} = 0.4$ $V_{12} = 24$ $Capacity$	quation 2 150 usir 25 pc/h v Checks	e V <sub>12</sub> = 5-8 o g Equ ual	V <sub>R</sub> + (V <sub>F</sub> r 25-9) uation 0	- V <sub>R</sub> )P <sub>FD</sub>	1		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h <b>Capacity Che</b>	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)   Maxim	ibit 25-	LOS	F?	$L_{EQ} = (E  P_{FD} = 0.4  V_{12} = 24  Capacit  V_{FI} = V_F  V_{12}  V_{FO} = V_F $	quation 2 450 usir 25 pc/h y Checks Act 320	$V_{12} = 0.05 = 0.05$ $V_{12} = 0.05$ $V_{12$	V <sub>R</sub> + (V <sub>F</sub> r 25-9) uation 0  Maxir 690	- V <sub>R</sub> )P <sub>FD</sub> mum   00   0:All	No		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h <b>Capacity Che</b>	V <sub>12</sub> = V <sub>12</sub> = ion 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3) Maxim See Exhi	ibit 25-	LOS	F?	$L_{EQ} = (E$ $P_{FD} = 0.4$ $V_{12} = 24$ $Capacit$ $V_{Fi} = V_{F}$ $V_{12}$	quation 2 450 usin 25 pc/h y Checks Act 320 242	$V_{12} = 0.05 - 80$ $V_{12} = 0.05 - 80$ $V_{13} = 0.05$ $V_$	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  uation 0  Maxir  690  4400	- V <sub>R</sub> )P <sub>FD</sub> mum 00 0:All	No No		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h <b>Capacity Che</b>	V <sub>12</sub> = fon 25-2 or quation	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)    Maxim   See Exhi   7   4600:	ibit 25- :All		F?	$L_{EQ} = (E$ $P_{FD} = 0.4$ $V_{12} = 24$ $Capacit$ $V_{Fi} = V_{F}$ $V_{12}$ $V_{FO} = V_{F}$ $V_{R}$	quation 2 450 usir 25 pc/h y Checks Act 320 242	v <sub>12</sub> = 5-8 o g Equal 22 25 39	V <sub>R</sub> + (V <sub>F</sub> r 25-9) uation 0  Maxir 690 4400	- V <sub>R</sub> )P <sub>FD</sub> mum   00   0:All   00   00   00   00   00   00   00	No No No		
L <sub>EQ</sub> = (Equati P <sub>FM</sub> = using E V <sub>12</sub> = pc/h <b>Capacity Che</b> V <sub>FO</sub> V <sub>R12</sub>	V <sub>12</sub> = ion 25-2 or quation  cks Actual	See Exhi	ibit 25- :All <b>f not F</b>	)	-	$L_{EQ} = (E$ $P_{FD} = 0.4$ $V_{12} = 24$ $Capacit$ $V_{Fi} = V_{F}$ $V_{12}$ $V_{FO} = V_{F}$ $V_{R}$	quation 2 450 usir 25 pc/h  / Checks  Act  320  242  141  178	V <sub>12</sub> = 5-8 o g Equal 22 253	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  Juation 0  Maxim  690  4400  410	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  1 (if not I	No No No No		
L <sub>EQ</sub> = (Equation P <sub>FM</sub> = using E V <sub>12</sub> = pc/h  Capacity Che  V <sub>FO</sub> V <sub>R12</sub> Level of Serv D <sub>R</sub> = 5.475 +	V <sub>12</sub> = ion 25-2 or quation  cks Actual	See Exhi	ibit 25- :All <b>f not F</b>	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 0.4 \\ &V_{12} = 24 \\ &Capacit \end{aligned}$ $\begin{aligned} &V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \end{aligned}$ $V_{R}$ $V_{R}$ $Level of$	quation 2 450 usir 25 pc/h  / Checks  Act  320  242  141  178	V <sub>12</sub> = 5-8 o g Equal 22 253	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  uation 0  Maxim 690 4400 410  rminatior 0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  1 (if not I	No No No No		
$L_{EQ}$ = (Equation $P_{FM}$ = using E $V_{12}$ = pc/h $Capacity Che$ $V_{FO}$ $V_{R12}$ $Capacity Che$ $Capa$	V <sub>12</sub> = fon 25-2 or quation  cks Actual	See Exhi 7 4600:	ibit 25- :All <b>f not F</b>	)	-	$L_{EQ} = (E \\ P_{FD} = 0.4 \\ V_{12} = 24 \\ \hline \textbf{Capacity} \\ V_{Fi} = V_{F} \\ V_{12} \\ V_{FO} = V_{F} \\ V_{R} \\ \hline \textbf{Level of} \\ D_{R} = \frac{1}{2} \\ D_{R} = $	quation 2 450 usin 25 pc/h <b>Y Checks</b> Act  320  242  141  178 <b>Service</b> D <sub>R</sub> = 4.2	V <sub>12</sub> = 5-8 o g Equal 22 25 39 Deter	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  uation 0  Maxir  690  410  rminatior  0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  1 (if not I	No No No No		
$L_{EQ} = (Equation P_{FM} = using E)$ $V_{12} = pc/h$ $V_{R12}$ $V_{FO}$ $V_{R12}$	V <sub>12</sub> = fon 25-2 or quation  cks Actual  ice Determination of the color of the colo	See Exhi 7 4600:	ibit 25- :All <b>f not F</b>	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 0.4 \\ &V_{12} = 24 \\ &Capacit \end{aligned}$ $\begin{aligned} &V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \end{aligned}$ $\begin{aligned} &V_{R} &V_{R} \\ &Level of \\ &D_{R} = \\ &LOS = \end{aligned}$	quation 2 450 usin 25 pc/h <b>y Checks</b> Act  242  141  178 <b>Service</b> D <sub>R</sub> = 4.2  2.6 (pc/ r  A (Exhib	V <sub>12</sub> = 5-8 o g Equal 22 25 3	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  uation 0  Maxir  690  410  rminatior  0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  1 (if not I	No No No No		
$L_{EQ} = (Equation P_{FM} = using E)$ $V_{12} = pc/h$ $Capacity Che$ $V_{FO}$ $V_{R12}$ $Level of Serv$ $D_R = 5.475 + D_R = (pc)$ $LOS = (Ex)$ $M_S = (Ex)$	V <sub>12</sub> = ion 25-2 or quation  cks Actual  ice Determ 0.00734 v / mi /ln) chibit 25-4) ation t 25-19)	See Exhi 7 4600:	ibit 25- :All <b>f not F</b>	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 0.4 \\ &V_{12} = 24 \\ &Capacit \end{aligned}$ $&V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \\ &V_{R} \\ &Level of \\ &D_{R} = \\ &LOS = \\ &Speed E \\ &D_{S} = \end{aligned}$	quation 2 450 usin 25 pc/h <b>Y Checks</b> Act  320  242  141  178 <b>Service</b> D <sub>R</sub> = 4.2  2.6 (pc/ r  A (Exhib) <b>Estimatio</b> 0.524 (E.	V <sub>12</sub> = 5-8 o g Equal 22 25 3 3 252 + ni /ln) t 25-4 n xhibit	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  Juation 0  Maxim  690  4400  410  rmination  0.0086 V	- V <sub>R</sub> )P <sub>FD</sub> mum  00  0:All  00  1 (if not I)  12 - 0.009	No No No No		
$L_{EQ}$ = (Equation $P_{FM}$ = using E $V_{12}$ = pc/h $Capacity Che$ $V_{FO}$ $V_{R12}$ $Capacity Che$ $Capacity Che Capacity Che Cap$	V <sub>12</sub> = ion 25-2 or quation  cks Actual  ice Determination of the color of the colo	See Exhi 7 4600:	ibit 25- :All <b>f not F</b>	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 0.4 \\ &V_{12} = 24 \\ &Capacity \end{aligned}$ $&V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \\ &V_{R} \end{aligned}$ $&Level\ of$ $&D_{R} = \\ &LOS = \\ &Speed\ E \\ &D_{S} = \\ &S_{R} = \end{aligned}$	quation 2 450 usin 25 pc/h y Checks 320 242 242 242 242 242 245 246 (pc/ r A (Exhib 50.6 mpl	V <sub>12</sub> = 5-8 o g Equal 02 25 3 9 Deter 1/ln) t 25-4 n (Exhibit n (E	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  Juation 0  Maxim  690  4400  410  rmination  0.0086 V	mum   00   00   00   00   00   00   00	No No No No		
$L_{EQ} = (Equation P_{FM} = using E)$ $V_{12} = pc/h$ $Capacity Che$ $V_{FO}$ $V_{R12}$ $Level of Serv$ $D_R = 5.475 + D_R = (polyabete Estimates)$ $M_S = (Exibition S_R = mph estimates)$	V <sub>12</sub> = ion 25-2 or quation  cks Actual  ice Determ 0.00734 v / mi /ln) chibit 25-4) ation t 25-19)	= V <sub>F</sub> ( P <sub>FM</sub> ) 25-3)    Maxim   See Exhi   7   4600:   mination (iii   r	ibit 25- :All <b>f not F</b>	)	-	$\begin{aligned} &L_{EQ} = (E \\ &P_{FD} = 0.4 \\ &V_{12} = 24 \\ &Capacity \end{aligned}$ $&V_{FI} = V_{F} \\ &V_{12} \\ &V_{FO} = V_{F} \\ &V_{R} \\ &V_{R} \end{aligned}$ $&Level\ of$ $&D_{R} = \\ &LOS = \\ &Speed\ E \\ &D_{S} = \\ &S_{R} = \end{aligned}$	quation 2 450 usin 25 pc/h y Checks 320 242 242 242 242 242 245 246 (pc/ r A (Exhib 50.6 mpl	V <sub>12</sub> = 5-8 o g Equal 02 25 3 9 Deter 1/ln) t 25-4 n (Exhibit n (E	V <sub>R</sub> + (V <sub>F</sub> r 25-9)  Juation 0  Maxim  690  4400  410  rmination  0.0086 V	mum   00   00   00   00   00   00   00	No No No No		

		RAMPS	S AND	RAMI	P JUN	CTIONS	WORKS	SHEET				
General	Information						formation					
Analyst2 Agency or Co	ompany	SEH Inc.			Ju	eeway/Dir o			Vestbound On Ramp			
Date Perform		11/13/200	9			ırisdiction		n				
Analysis Time Project Desc	e Penou ription Year 20	PM Peak 030 Traffic O	nerations	Analysis		nalysis Year S 160 FFIS		Year 203	J			
Inputs	ription real 20	Joo Traine O	perations	7 tridiyələ	or the oc	7 100 1 213						
Upstream Ad		errain Rollir	ng						Downstrea	m Adj Ramp		
Yes	On								Yes	☐ On		
□ No	☐ Off								□ No	C Off		
L <sub>up</sub> =	ft								L <sub>down</sub> =	ft		
Vu =	veh/h	S	FF = 60		show lane	S es, L <sub>A</sub> , L <sub>D</sub> ,V	$S_{FR} = 40.0 \text{ m}$ $S_{FR}$ , $V_f$ )	ph	VD =	veh/h		
Convers	sion to pc/l	h Under				7, 0						
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	f <sub>HV</sub>	f <sub>p</sub>	v=V/PHF f <sub>l</sub>	<sub>HV</sub> f <sub>p</sub>		
Freeway	1440	0.95	Rolli		5	0	0.930	1.00	1629			
Ramp	1385	0.95	Rolli	ng	2	0	0.971	1.00	1502			
UpStream												
DownStream		<u></u> Merge Areas			<u> </u>	<u> </u> 		Diverge Area	 PS			
Estimati	on of v <sub>12</sub>	viorgo / ii ous				Estima	tion of v		40			
		<sub>2</sub> = V <sub>F</sub> ( P <sub>FM</sub> )						$V_{12} = V_R + (V_F)$	V \D			
I - /Egu						 		12 11 1	F VR/VFD			
	ation 25-2 or 25						juation 25-8 c	11 20-9)				
	using Equation	1 0				1 ' 5	ing Equation					
V <sub>12</sub> = 1629						$V_{12} = pc/$						
Capacity	/ Checks	1		1		Capaci	ty Check	1	. 1			
	Actual	Max	mum	LOS	S F?	., ,,	Actu		aximum	LOS F?		
V <sub>FO</sub>	3131	See Ext	nibit 25-7	N	0	$V_{FI} = V_{F}$	:	See E	xhibit 25-14			
						V <sub>12</sub>		4	400:All			
V <sub>R12</sub>	3131	460	0:All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-	See E	xhibit 25-14			
						V <sub>R</sub>		See I	Exhibit 25-3			
Level of	Service D	etermina	ation (	if not	F)		of Service	e Determ	ination (i	f not F)		
	5.475 + 0.0073 <sup>2</sup>							252 + 0.0086 \				
11	20.0 (pc/ m/ln)	П	12	А		D <sub>R</sub> = (	pc/ m/ln)		12 D			
	B (Exhibit 25-4)					1	Exhibit 25-4)					
	stimation						Estimati	on				
_	293 (Exibit 25-1	19)				D <sub>s</sub> =	(Exhibit 25-1					
J	.7 mph (Exhibit	•				$S_R$ = mph (Exhibit 25-19)						
11	A mph (Exhibit)	•					nph (Exhibit	25-19)				
	.7 mph (Exhibit	-				*	mph (Exhibit	25-15)				

		RAMPS	AND	RAMI	P JUN	CTIONS	WORKS	SHEET					
General	Information						formation						
Analyst2 Agency or Co	ompany	SEH Inc.			Ju	eeway/Dir o			Vestbound On Ramp				
Date Perform		11/13/2009	1			risdiction		n					
Analysis Time	e Penou ription Year 20	AM Peak	erations	Δnalvsis		Analysis Year Year 2030							
Inputs	ilpuon rearzo	JJO Traine Op	Ciallons	Analysis	or the OS	1001 LI3							
_		errain Rolling	]										
Upstream Ad	lj Ramp									m Adj Ramp			
Yes	☐ On								Yes	☐ On			
□ No	☐ Off								No	C Off			
L <sub>up</sub> =	ft								L <sub>down</sub> =	ft			
Vu =	veh/h	S	<sub>FF</sub> = 60		show lane	S s, L <sub>A</sub> , L <sub>D</sub> ,V <sub>I</sub>	$S_{FR} = 40.0 \text{ m}$	ph	VD =	veh/h			
Convers	ion to pc/l	h Under i				Λ V I	X 1		I.				
(pc/h)	V (Veh/hr)	PHF	Teri		Truck	%Rv	$f_{HV}$	f <sub>p</sub>	v=V/PHF f <sub>l</sub>	HV fp			
Freeway	865	0.95	Rolli	ng	5	0	0.930	1.00	979				
Ramp	1130	0.95	Rolli	ng	2	0	0.971	1.00	1225				
UpStream													
DownStream								Diverge Area	20				
Fstimati	on of v <sub>12</sub>	vicige Aleas				Fstima	tion of v		23				
<b></b>		V (D )				200,,,,,		-	V \D				
I – /Ган	•	$_2 = V_F (P_{FM})$				 		$V_{12} = V_R + (V_F)$	·· V <sub>R</sub> )P <sub>FD</sub>				
	ation 25-2 or 25						juation 25-8 c	01 25-9)					
	using Equation	1 U				1 ' 5	ing Equation						
V <sub>12</sub> = 979						$V_{12} = pc/$							
Capacity	/ Checks	1		1 10	2.50	Capaci	ty Check	1	. 1	100.50			
	Actual	Maxir	num	LOS	S F?	\ \ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	Actu		aximum	LOS F?			
$V_{FO}$	2204	See Exhi	bit 25-7	N	0	V <sub>FI</sub> =V <sub>F</sub>	:		xhibit 25-14				
						V <sub>12</sub>		4	400:All				
V <sub>R12</sub>	2204	4600	):All	N	0	$V_{FO} = V_{F}$ $V_{R}$	-	See E	xhibit 25-14				
						V <sub>R</sub>		See I	Exhibit 25-3				
Level of	Service D	etermina	tion (	if not	F)	Level c	of Service	e Determ	ination (i	f not F)			
$D_R =$	5.475 + 0.00734	4 v <sub>R</sub> + 0.0078	V <sub>12</sub> - 0.0	00627 L <sub>A</sub>			$D_{R} = 4.2$	252 + 0.0086 \	/ <sub>12</sub> - 0.009 L <sub>D</sub>				
D <sub>R</sub> =	12.9 (pc/ m/ln)					$D_R = $ (	pc/ m/ln)						
LOS =	B (Exhibit 25-4)					LOS= (	Exhibit 25-4)						
Speed E	stimation					Speed	Estimati	on					
$M_S = 0.2$	239 (Exibit 25-	 19)				D <sub>s</sub> = (Exhibit 25-19)							
J	.7 mph (Exhibit	•				S <sub>R</sub> = mph (Exhibit 25-19)							
10	A mph (Exhibit	•					mph (Exhibit	25-19)					
o .	.7 mph (Exhibit					-	mph (Exhibit	25-15)					

RAMPS AND RAMP JUNCTIONS WORKSHEET													
General Info	General Information Site Information												
Analyst		SEH Inc.			Fre	eway/Dir	of T	ravel	US 160	) Westbou	nd		
Agency or Co	mpany				Jur	unction SH 1				Off Ram	p		
Date Perform	ed	11/12/20	09		Jur	urisdiction				1			
Analysis Time	Period	PM Peak			An	nalysis Year Year 2030							
Project Descr	iption Ye	ar 2030 Tra	affic Op	erations	Analys	rsis of the US 160 FEIS							
Inputs													
Upstream Adj							Downst Ramp	ream Adj					
☐ Yes ☐	On									☐ Yes	☐ On		
□ No □	Off									□ No	Off		
$L_{up} = ft$										L <sub>down</sub> =	ft		
		S	FF = 6	60.0 mph	1	S	FR =	40.0 r	nph	VD =	veh/h		
Vu = ve	eh/h		S	ketch (s	how lar	nes, L <sub>A</sub> , L	$_{D}, V_{R}$	$_{c},V_{f})$		VD =	Ven/m		
<b>Conversion</b> to	to pc/h Un	der Base (	Conditi	ions									
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv		f <sub>HV</sub>	$f_p$	v=V/PH f <sub>HV</sub> f <sub>p</sub>	F		
Freeway	1720	0.95	Rol	ling	5	0	0.9	930	1.00	1946	)		
Ramp	280	0.95		ling	2	0	0.	971	1.00	304			
UpStream													
DownStream													
	Me	erge Areas							Diverge A	reas			
Estimation o	f v <sub>12</sub>					Estimation of v <sub>12</sub>							
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )				$V_{12} = V_R + (V_F - V_R)P_{FD}$							
L <sub>EQ</sub> = (Equat						$L_{EQ} = (Equation 25-8 \text{ or } 25-9)$							
		20 0)				1							
P <sub>FM</sub> = using E	quation					$P_{FD} = 1.000$ using Equation 0							
V <sub>12</sub> = pc/h						V <sub>12</sub> = 1946 pc/h							
Capacity Che	1					Capacity Checks							
	Actual	Maxin	num	LOS	F?	Actual Maximum LOS F?							
V <sub>FO</sub>		See Exh	ibit 25-			$V_{FI} = V_{F}$		1946		4600	No		
*FO		7				$V_{12}$		1946	4	400:All	No		
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{F}$ $V_{R}$	-	1642	4	1600	No		
						$V_{R}$		304	2	2100	No		
Level of Serv	vice Deterr	nination (i	f not F	)		Level of	Ser	vice De	eterminat	ion (if not	F)		
$D_R = 5.475 -$	+ 0.00734 \	<sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		$D_R$	= 4.252	2 + 0.0086	6 V <sub>12</sub> - 0.00	9 L <sub>D</sub>		
$D_R = (pc)$	c/ mi /ln)					D <sub>R</sub> =	12.0	) (pc/ mi	i /ln)				
LOS = (E	xhibit 25-4)					LOS=	В (Е	xhibit 2	5-4)				
Speed Estim	Speed Estimation Speed Estimation												
'`	•	*				'`		- '		•			
1	(Exhibit 25	•				$S_0 = N/A \text{ mph (Exhibit 25-19)}$							
S= mph	(Exhibit 25	-14)				S = :	53.0	) mph (I	Exhibit 25	5-15)			

RAMPS AND RAMP JUNCTIONS WORKSHEET													
General Info	rmation			Sit	te Infor	mation							
Analyst		SEH Inc.			Fre	eway/Dir	of 7	Travel	US 16	0 Westbo	und		
Agency or Co	mpany				Jur	inction S				2 Off Ran	np		
Date Perform	ed	11/13/20	09		Jur	ırisdiction					1		
Analysis Time	Period	AM Peak	ζ.		An	nalysis Year Year 2030							
Project Descr	iption Ye	ar 2030 Tra	affic Op	erations	Analys	is of the l	JS 1	160 FEIS	3				
Inputs													
Upstream Adj	Upstream Adj Ramp Terrain									Downs Ramp	stream Adj		
☐ Yes ☐	On									☐ Ye	s 🗆 On		
□ No □	Off									□ No			
$L_{up} = ft$		S	= (	60.0 mpł		S	)-n =	= 40.0 ı	mph	L <sub>down</sub> =	= ft		
Vu = ve	eh/h		• •			nes, $L_A$ , L				VD =	veh/h		
		dor Boss (			niow iai	, L <sub>A</sub> , L	D, <b>v</b> F	۲٬ ۲ f <i>/</i>					
Conversion t	1	der Base C	,onaiti	ions	1	1	1	1		v=V/PI	<u> </u>		
(pc/h)	V (Veh/hr)	PHF	Te	rrain	Truck	%Rv		f <sub>HV</sub>	f <sub>p</sub>	f <sub>HV</sub> f <sub>p</sub>			
Freeway	1075	0.95	Rol	ling	5	0	0.	.930	1.00	121	6		
Ramp	210	0.95	Rol	ling	2	0	0.	.971	1.00	228	3		
UpStream													
DownStream													
	Me	erge Areas				]			Diverge /	Areas			
Estimation o	f v <sub>12</sub>					Estimat	ion	of v <sub>12</sub>					
	V <sub>12</sub> =	= V <sub>F</sub> ( P <sub>FM</sub> )				$V_{12} = V_R + (V_F - V_R)P_{FD}$							
L <sub>EQ</sub> = (Equat						12 11 11 11 11							
		20-0)				$L_{EQ}$ = (Equation 25-8 or 25-9)							
P <sub>FM</sub> = using E	equation					$P_{FD} = 1.000$ using Equation 0							
V <sub>12</sub> = pc/h						$V_{12} = 1216 \text{ pc/h}$							
Capacity Che	ecks					Capacity Checks							
	Actual	Maxin	num	LOS	F?		ļ	Actua	I N	1aximum	LOS F?		
		See Exh	ibit 25-			V <sub>FI</sub> =V <sub>F</sub> 1216			4600	No			
V <sub>FO</sub>		7				V <sub>12</sub>		1216		4400:All	No		
V <sub>R12</sub>		4600	:All			$V_{FO} = V_{I}$ $V_{R}$	F <sup>-</sup>	988		4600	No		
						V <sub>R</sub>		228		2100	No		
Level of Serv	vice Deterr	nination (i	f not F	)		Level of				ation (if no			
$D_R = 5.475 -$	+ 0.00734 \	<sub>R</sub> + 0.007	8 V <sub>12</sub> -	0.00627	L <sub>A</sub>		$D_R$	$_{2} = 4.252$	2 + 0.008	36 V <sub>12</sub> - 0.0	09 L <sub>D</sub>		
'` "	c/ mi /ln)							(pc/ mi /	•				
LOS = (Exhibit 25-4) LOS = $A$ (Exhibit 25-4)													
Speed Estimation Speed Estimation													
$M_S = \text{(Exibit 25-19)}$ $D_S = 0.384 \text{ (Exhibit 25-19)}$										9)			
"	(Exhibit 25	-19)				$S_R = 53.1 \text{ mph (Exhibit 25-19)}$							
1	(Exhibit 25	*				1 .,			Exhibit 2	•			
-	(Exhibit 25	•							Exhibit 2				
	,	,				<u> </u>		P (		,			

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: West of US 550/CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 4525 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 1191 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1707 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1707 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 59.9 mi/h Number of lanes, N 3 Density, D 28.5 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: West of US 550/CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2830 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 745 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1067 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1067 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3 Density, D 17.8 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1440 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 379 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 815 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 815 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 13.6 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 865 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 228 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 489 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 489 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 8.1 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1470 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 387 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 832 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 832 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 13.9 pc/mi/ln Level of service, LOS

Operational Analysis

#### Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between SH 172 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1090 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 287 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 617 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 617 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 10.3 Density, D pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: SH 172 to US 550/CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2825 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 743 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1598 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_ pc/h/ln Flow rate, vp 1598 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 26.6 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: SH 172 to US 550/CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1995 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 525 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1129 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1129 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 18.8 pc/mi/ln

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

Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: US 550/CR 233 to SH 172 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2950 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 776 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1669 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1669 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 27.8 pc/mi/ln

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

Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: US 550/CR 233 to SH 172 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1940 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 511 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1098 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1098 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 18.3 pc/mi/ln

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

Level of service, LOS

### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: Between CR 233/US 550 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2235 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 588 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1265 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_ pc/h/ln Flow rate, vp 1265 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

2

21.1

pc/mi/ln

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: Between CR 233/US 550 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1395 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 367 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 789 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 789 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 13.1 pc/mi/ln Level of service, LOS

### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Eastbound From/To: Between CR 233/US 550 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 2155 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 567 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1219 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1219 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h

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

Number of lanes, N

Level of service, LOS

Density, D

2

20.3

pc/mi/ln

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Eastbound From/To: Between CR 233/US 550 Ramps Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 1180 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 311 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 668 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 4.5 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 668 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 2 Density, D 11.1 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: PM Peak Freeway/Direction: Westbound From/To: West of US 550/CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments veh/h Volume, V 4620 Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 1216 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 1743 pc/h/ln Flow rate, vp Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1743 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 59.9 mi/h Number of lanes, N 3 Density, D 29.1 pc/mi/ln Level of service, LOS

#### Operational Analysis Analyst: SEH Inc. Agency or Company: 11/13/2009 Date Performed: Analysis Time Period: AM Peak Freeway/Direction: Westbound From/To: West of US 550/CR 233 Jurisdiction: Analysis Year: Year 2030 Description: Year 2030 Traffic Operations Analysis of the US 160 FEIS Flow Inputs and Adjustments 3325 veh/h Volume, V Peak-hour factor, PHF 0.95 Peak 15-min volume, v15 875 V Trucks and buses Recreational vehicles 0 Rolling Terrain type: 응 Grade 0.00 0.00 Segment length mi Trucks and buses PCE, ET 2.5 Recreational vehicle PCE, ER 2.0 Heavy vehicle adjustment, fHV Driver population factor, fp 0.930 1.00 pc/h/ln Flow rate, vp 1254 Speed Inputs and Adjustments ft Lane width 12.0 6.0 Right-shoulder lateral clearance ft Interchange density Number of lanes, N 0.50 interchange/mi Free-flow speed: Measured FFS or BFFS mi/h 60.0 Lane width adjustment, fLW 0.0 mi/h Lateral clearance adjustment, fLC 0.0 mi/h Interchange density adjustment, fID 0.0 mi/h Number of lanes adjustment, fN 3.0 mi/h 60.0 Free-flow speed, FFS mi/h Urban Freeway LOS and Performance Measures\_\_ pc/h/ln Flow rate, vp 1254 Free-flow speed, FFS 60.0 mi/h Average passenger-car speed, S 60.0 mi/h Number of lanes, N 3 Density, D 20.9 pc/mi/ln Level of service, LOS