

Appendix L

HCS Freeway Segment Worksheets

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Sunset Cliffs to Sports Arena		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	2644	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	59018	veh/day	%Trucks and Buses, P_T	1	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	56		General Terrain:	Level	
DDHV = AADT x K x D	2644	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.995	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.75	ramps/mi	TRD Adjustment	5.2	mph
FFS (measured)		mph	FFS	70.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1399	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	69.5	mph	S		
$D = v_p / S$	20.1	pc/mi/ln	$D = v_p / S$		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Sports Arena Boulevard to I-5		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	4196	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	95355	veh/day	%Trucks and Buses, P_T	1	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	55		General Terrain:	Level	
DDHV = AADT x K x D	4196	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.995	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	3		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.28	ramps/mi	TRD Adjustment	6.4	mph
FFS (measured)		mph	FFS	69.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	69.1	mph	S	mph	
$D = v_p / S$	21.4	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To I-5 Interchange to Morena Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6141	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	134671	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	6141	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	3		TRD Adjustment	5.2	mph
Total Ramp Density, TRD	1.75	ramps/mi	FFS	70.2	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2187	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	58.7	mph	S		
$D = v_p / S$	37.3	pc/mi/ln	$D = v_p / S$		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Morena Boulevard to Taylor St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7965	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	174680	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7965	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2127	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	60.0	mph	S		
D = v _p / S	35.4	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Taylor Street to Hotel Circle		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7078	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	155213	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7078	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.76	ramps/mi	TRD Adjustment	7.6	mph
FFS (measured)		mph	FFS	67.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
1891		pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S		64.5 mph	x f _p)		
D = v _p / S		29.3 pc/mi/ln	S		
LOS		D	D = v _p / S		
			pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Hotel Circle to SR-163		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7654	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	167843	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7654	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.09	ramps/mi	TRD Adjustment	8.3	mph
FFS (measured)		mph	FFS	67.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	1636	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	64.2	mph	S		
D = v _p / S	25.5	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To SR-163 to Mission Center Rd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6617	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	145100	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	6617	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.88	ramps/mi	TRD Adjustment	7.8	mph
FFS (measured)		mph	FFS	67.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1767	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	66.3	mph	S		
D = v _p / S	26.7	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Mission Cntr Rd to Q Way/TX St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8568	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	187895	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8568	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.20	ramps/mi	TRD Adjustment	8.6	mph
FFS (measured)		mph	FFS	66.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2289	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	53.8	mph	S		
D = v _p / S	42.6	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Qualcomm Way/TX St to I-805		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6082	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	133380	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	6082	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.94	ramps/mi	TRD Adjustment	8.0	mph
FFS (measured)		mph	FFS	67.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	64.3	mph	S	mph	
$D = v_p / S$	25.3	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To I-805 to I-15		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8871	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	194532	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8871	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.62	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	1896	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	64.4	mph	S		
D = v _p / S	29.4	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To I-15 to Fairmount Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7411	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	157009	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	59		General Terrain:	Level	
DDHV = AADT x K x D	7411	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.26	ramps/mi	TRD Adjustment	6.4	mph
FFS (measured)		mph	FFS	69.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1989	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	62.8	mph	S		
D = v _p / S	31.7	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 NB		
Agency or Company	Chen Ryan Associates		From/To Seaworld Dr/Tecolote Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10478	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	242554	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	10478	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.52	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2239	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	57.5	mph	S		
D = v _p / S	39.0	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 NB		
Agency or Company	Chen Ryan Associates		From/To I-8 to Old Town Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10564	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	244532	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	10564	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2836	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	39.0	mph	S		
D = v _p / S	72.8	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 NB	
Agency or Company	Chen Ryan Associates		From/To	Genesee Avenue to Friars Road	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10924	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	212935	veh/day	%Trucks and Buses, P_T	4	
Peak-Hr Prop. of AADT, K	0.09		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	10924	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	5		TRD Adjustment	7.4	mph
Total Ramp Density, TRD	2.69	ramps/mi	FFS	68.0	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2346	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		pc/h/ln
S	54.8	mph	S		mph
$D = v_p / S$	42.8	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel SR-163 NB		
Agency or Company	Chen Ryan Associates		From/To Friars Road to I-8 Interchange		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7098	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	173978	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7098	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.980		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	3		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.71	ramps/mi	TRD Adjustment	7.4	mph
FFS (measured)		mph	FFS	68.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 2540 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
S 49.2 mph			x f _p)		
D = v _p / S 51.7 pc/mi/ln			S mph		
LOS F			D = v _p / S pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 NB	
Agency or Company	Chen Ryan Associates		From/To	I-8 Interchange to 6th Avenue	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7554	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	185137	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7554	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	3		TRD Adjustment	7.7	mph
Total Ramp Density, TRD	2.81	ramps/mi	FFS	67.7	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2690	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		pc/h/ln
S	44.2	mph	S		mph
$D = v_p / S$	60.8	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 NB	
Agency or Company	Chen Ryan Associates		From/To	6th Avenue to Washington St	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6277	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	153846	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	6277	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	3		TRD Adjustment	7.5	mph
Total Ramp Density, TRD	2.72	ramps/mi	FFS	67.9	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2235	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	57.6	mph	S		
$D = v_p / S$	38.8	pc/mi/ln	$D = v_p / S$		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 NB		
Agency or Company	Chen Ryan Associates		From/To Mesa Col Dr to Murray Ridge Rd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	14917	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	266369	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	70		General Terrain:	Level	
DDHV = AADT x K x D	14917	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.45	ramps/mi	TRD Adjustment	6.8	mph
FFS (measured)		mph	FFS	68.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3250	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	21.3	mph	S		
D = v _p / S	152.9	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 NB		
Agency or Company	Chen Ryan Associates		From/To Murray Ridge Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	11575	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257215	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.06		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	11575	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.07	ramps/mi	TRD Adjustment	5.9	mph
FFS (measured)		mph	FFS	69.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	2522	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	49.7	mph	S		
D = v _p / S	50.7	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel <i>I-805 NB</i>		
Agency or Company	Chen Ryan Associates		From/To <i>I-8 Interchange to Adams Ave</i>		
Date Performed	2018		Jurisdiction <i>City of San Diego</i>		
Analysis Time Period	AM		Analysis Year <i>2050</i>		
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	11418	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	253739	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.06		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	<i>Level</i>	
DDHV = AADT x K x D	11418	veh/h	Grade % Length	<i>mi</i>	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.10	ramps/mi	TRD Adjustment	6.0	mph
FFS (measured)		mph	FFS	69.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3110	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	27.7	mph	S		
D = v _p / S	112.3	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 NB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10128	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	225070	veh/day	%Trucks and Buses, P_T	7	
Peak-Hr Prop. of AADT, K	0.06		%RVs, P_R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	10128	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.29	ramps/mi	TRD Adjustment	6.5	mph
FFS (measured)		mph	FFS	68.9	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	41.8	mph	S	mph	
$D = v_p / S$	66.0	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To Aero Drive to Friars Road		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	12374	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257793	veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	60		General Terrain:	Level	
DDHV = AADT x K x D	12374	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.79	ramps/mi	TRD Adjustment	7.6	mph
FFS (measured)		mph	FFS	67.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3338	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	17.0	mph	S		
D = v _p / S	196.6	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To Friars Road to I-8 Interchange		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10520	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257834	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	10520	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2237	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	57.5	mph	S		
D = v _p / S	38.9	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To I-8 Interchange to Adams Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8786	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	215341	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	8786	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.990		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.53	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2335	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	55.1	mph	S		
D = v _p / S	42.4	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8374	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	205233	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	8374	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.59	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2226	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	57.8	mph	S		
D = v _p / S	38.5	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Sunset Cliffs to Sports Arena		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	2894	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	73816	veh/day	%Trucks and Buses, P_T	1	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	56		General Terrain:	Level	
DDHV = AADT x K x D	2894	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.995	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.49	ramps/mi	TRD Adjustment	4.5	mph
FFS (measured)		mph	FFS	70.9	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1531	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	68.7	mph	S		
$D = v_p / S$	22.3	pc/mi/ln	$D = v_p / S$		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Sports Arena Boulevard to I-5		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	4444	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	115421	veh/day	%Trucks and Buses, P _T	1	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	55		General Terrain:	Level	
DDHV = AADT x K x D	4444	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.995		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	3		f _{LC}	0.0	mph
Total Ramp Density, TRD	1.96	ramps/mi	TRD Adjustment	5.7	mph
FFS (measured)		mph	FFS	69.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1567	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	68.4	mph	S		
D = v _p / S	22.9	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To I-5 Interchange to Morena Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7114	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	178299	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7114	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.64	ramps/mi	TRD Adjustment	4.9	mph
FFS (measured)		mph	FFS	70.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	64.3	mph	S	mph	
$D = v_p / S$	29.5	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Morena Boulevard to Taylor St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9228	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	231269	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	9228	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.51	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1972	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	63.1	mph	S		
D = v _p / S	31.3	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Taylor Street to Hotel Circle		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8199	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	205496	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8199	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.76	ramps/mi	TRD Adjustment	7.6	mph
FFS (measured)		mph	FFS	67.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2190	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	58.6	mph	S		
D = v _p / S	37.4	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Hotel Circle to SR-163		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8866	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	222218	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8866	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.93	ramps/mi	TRD Adjustment	7.9	mph
FFS (measured)		mph	FFS	67.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	1895	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	61.5	mph	S		
D = v _p / S	30.8	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To SR-163 to Mission Center Rd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7665	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	192106	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7665	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.03	ramps/mi	TRD Adjustment	8.2	mph
FFS (measured)		mph	FFS	67.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2047	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	59.1	mph	S		
D = v _p / S	34.7	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Mission Cntr Rd to Q Way/TX St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9926	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	248765	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	9926	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.06	ramps/mi	TRD Adjustment	8.2	mph
FFS (measured)		mph	FFS	67.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2651	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	42.8	mph	S		
D = v _p / S	61.9	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Qualcomm Way/TX St to I-805		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7046	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	176590	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7046	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.09	ramps/mi	TRD Adjustment	8.3	mph
FFS (measured)		mph	FFS	67.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	1882	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	61.7	mph	S		
D = v _p / S	30.5	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To I-805 to I-15		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10276	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257553	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	10276	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.62	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2196	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	58.5	mph	S		
D = v _p / S	37.5	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To I-15 to Fairmount Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9424	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	228194	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	59		General Terrain:	Level	
DDHV = AADT x K x D	9424	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.41	ramps/mi	TRD Adjustment	6.7	mph
FFS (measured)		mph	FFS	68.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	2024	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	62.1	mph	S		
D = v _p / S	32.6	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 SB		
Agency or Company	Chen Ryan Associates		From/To Seaworld Dr/Tecolote Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7810	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	206620	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	7810	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.37	ramps/mi	TRD Adjustment	6.6	mph
FFS (measured)		mph	FFS	68.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1669	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	67.4	mph	S		
D = v _p / S	24.7	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 SB		
Agency or Company	Chen Ryan Associates		From/To I-8 to Old Town Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7874	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	208305	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	7874	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1691	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	67.2	mph	S		
D = v _p / S	25.2	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	Genesee Avenue to Friars Road	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7316	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	160439	veh/day	%Trucks and Buses, P_T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7316	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	4		TRD Adjustment	7.4	mph
Total Ramp Density, TRD	2.69	ramps/mi	FFS	68.0	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1964	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		pc/h/ln
S	63.2	mph	S		mph
$D = v_p / S$	31.1	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	Friars Road to I-8 Interchange	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7359	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	180356	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7359	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.56	ramps/mi	TRD Adjustment	7.1	mph
FFS (measured)		mph	FFS	68.3	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1580	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	68.3	mph	S		
D = v _p / S	23.1	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	I-8 Interchange to 6th Avenue	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7830	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	191924	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7830	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.48	ramps/mi	TRD Adjustment	6.9	mph
FFS (measured)		mph	FFS	68.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2091	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	60.8	mph	S		
D = v _p / S	34.4	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	6th Avenue to Washington St	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	AM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6507	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	159486	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	6507	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	2		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.36	ramps/mi	TRD Adjustment	6.6	mph
FFS (measured)		mph	FFS	68.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3476	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	9.9	mph	S		
D = v _p / S	350.8	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To Mesa Col Dr to Murray Ridge Rd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6411	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	114485	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	70		General Terrain:	Level	
DDHV = AADT x K x D	6411	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.45	ramps/mi	TRD Adjustment	6.8	mph
FFS (measured)		mph	FFS	68.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1397	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	69.5	mph	S		
D = v _p / S	20.1	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		f _{LW} - Exhibit 11-8
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13		f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To Murray Ridge Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	5255	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	87577	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	5255	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.21	ramps/mi	TRD Adjustment	6.3	mph
FFS (measured)		mph	FFS	69.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1145	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	70.0	mph	S		
D = v _p / S	16.4	pc/mi/ln	D = v _p / S		
LOS	B		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To I-8 Interchange to Adams Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	5184	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	86394	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	5184	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	6		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.25	ramps/mi	TRD Adjustment	6.4	mph
FFS (measured)		mph	FFS	69.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	941	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	70.0	mph	S		
D = v _p / S	13.4	pc/mi/ln	D = v _p / S		
LOS	B		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	4598	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	76632	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	4598	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.44	ramps/mi	TRD Adjustment	6.8	mph
FFS (measured)		mph	FFS	68.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1002	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	70.0	mph	S		
D = v _p / S	14.3	pc/mi/ln	D = v _p / S		
LOS	B		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To Aero Drive to Friars Road		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8086	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	168452	veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	60		General Terrain:	Level	
DDHV = AADT x K x D	8086	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.52	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1745	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	66.6	mph	S		
D = v _p / S	26.2	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To Friars Road to I-8 Interchange		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	11157	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	273454	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	11157	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.14	ramps/mi	TRD Adjustment	8.4	mph
FFS (measured)		mph	FFS	67.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2372	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	51.6	mph	S		
D = v _p / S	46.0	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To I-8 Interchange to Adams Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9318	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	228387	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	9318	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.990		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.53	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 1981 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
S 62.9 mph			x f _p)		
D = v _p / S 31.5 pc/mi/ln			S mph		
LOS D			D = v _p / S pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	AM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8881	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	217666	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	8881	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.59	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
1888		pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S		64.5 mph	x f _p)		
D = v _p / S		29.3 pc/mi/ln	S		
LOS		D	D = v _p / S		
			pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2,		
BFFS - Base free-flow speed			11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Sunset Cliffs to Sports Arena		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3307	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	73816	veh/day	%Trucks and Buses, P _T	1	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	56		General Terrain:	Level	
DDHV = AADT x K x D	3307	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.995	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	2		f _{LC}	0.0	mph
Total Ramp Density, TRD	1.75	ramps/mi	TRD Adjustment	5.2	mph
FFS (measured)		mph	FFS	70.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1749	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	66.5	mph	S		
D = v _p / S	26.3	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Sports Arena Boulevard to I-5		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	5079	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	115421	veh/day	%Trucks and Buses, P _T	1	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	55		General Terrain:	Level	
DDHV = AADT x K x D	5079	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.995		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	3		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.28	ramps/mi	TRD Adjustment	6.4	mph
FFS (measured)		mph	FFS	69.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1791	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	65.9	mph	S		
D = v _p / S	27.2	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To I-5 Interchange to Morena Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8130	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	178299	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8130	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	3		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.75	ramps/mi	TRD Adjustment	5.2	mph
FFS (measured)		mph	FFS	70.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
v_p	2895	pc/h/ln	v_p		
S	36.7	mph	S		
$D = v_p / S$	78.9	pc/mi/ln	$D = v_p / S$		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Morena Boulevard to Taylor St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10546	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	231269	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	10546	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
2817 pc/h/ln			pc/h/ln		
S 39.7 mph			S mph		
$D = v_p / S$			$D = v_p / S$		
71.0 pc/mi/ln			pc/mi/ln		
LOS F			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12		f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13		f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18		TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Taylor Street to Hotel Circle		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9371	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	205496	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	9371	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.67	ramps/mi	TRD Adjustment	7.3	mph
FFS (measured)		mph	FFS	68.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2503	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	50.3	mph	S		
D = v _p / S	49.8	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Hotel Circle to SR-163		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10133	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	222218	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	10133	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.09	ramps/mi	TRD Adjustment	8.3	mph
FFS (measured)		mph	FFS	67.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	2165	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	56.7	mph	S		
D = v _p / S	38.2	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To SR-163 to Mission Center Road		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8760	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	192106	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8760	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.88	ramps/mi	TRD Adjustment	7.8	mph
FFS (measured)		mph	FFS	67.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2340	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	54.9	mph	S		
D = v _p / S	42.6	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Mission Cntr Rd to Q Way/TX St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	11344	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	248765	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	11344	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	3.20	ramps/mi	TRD Adjustment	8.6	mph
FFS (measured)		mph	FFS	66.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
v_p	3030	pc/h/ln			
S	27.3	mph	S		
$D = v_p / S$	110.9	pc/mi/ln	$D = v_p / S$		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To Qualcomm Way/Texas St to I-805		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8053	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	176590	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8053	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.94	ramps/mi	TRD Adjustment	8.0	mph
FFS (measured)		mph	FFS	67.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2151	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	57.0	mph	S		
D = v _p / S	37.7	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To I-805 to I-15		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	11744	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257553	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	11744	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	5		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.62	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2510	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	50.1	mph	S		
$D = v_p / S$	50.1	pc/mi/ln	$D = v_p / S$		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 EB		
Agency or Company	Chen Ryan Associates		From/To I-15 to Fairmount Avenue		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10771	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	228194	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	59		General Terrain:	Level	
DDHV = AADT x K x D	10771	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.980		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.26	ramps/mi	TRD Adjustment	6.4	mph
FFS (measured)		mph	FFS	69.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2891	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	36.8	mph	S		
D = v _p / S	78.5	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 NB		
Agency or Company	Chen Ryan Associates		From/To Seaworld Dr/Tecolote Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8926	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	206620	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	8926	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.52	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1907	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	64.2	mph	S		
D = v _p / S	29.7	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 NB		
Agency or Company	Chen Ryan Associates		From/To I-8 to Old Town Avenue		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8999	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	208305	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	8999	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2416	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	52.8	mph	S		
D = v _p / S	45.7	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 NB	
Agency or Company	Chen Ryan Associates		From/To	Genesee Avenue to Friars Road	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8231	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	160439	veh/day	%Trucks and Buses, P_T	4	
Peak-Hr Prop. of AADT, K	0.09		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	8231	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	5		TRD Adjustment	7.4	mph
Total Ramp Density, TRD	2.69	ramps/mi	FFS	68.0	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1767	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		pc/h/ln
S	66.3	mph	S		mph
$D = v_p / S$	26.7	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel SR-163 NB		
Agency or Company	Chen Ryan Associates		From/To Friars Road to I-8 Interchange		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7359	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	180356	veh/day	%Trucks and Buses, P_T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7359	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	3		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.71	ramps/mi	TRD Adjustment	7.4	mph
FFS (measured)		mph	FFS	68.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p)$		
S	46.1	mph	S	mph	
$D = v_p / S$	57.1	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 NB	
Agency or Company	Chen Ryan Associates		From/To	I-8 Interchange to 6th Avenue	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7830	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	191924	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7830	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f _{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f _{LC}	0.0	mph
Number of Lanes, N	3		TRD Adjustment	7.2	mph
Total Ramp Density, TRD	2.60	ramps/mi	FFS	68.2	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2789	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	40.7	mph	S		
D = v _p / S	68.5	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 NB	
Agency or Company	Chen Ryan Associates		From/To	6th Avenue to Washington St	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6507	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	159486	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	6507	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	3		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.40	ramps/mi	TRD Adjustment	6.7	mph
FFS (measured)		mph	FFS	68.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2317	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	55.5	mph	S		
D = v _p / S	41.7	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 NB		
Agency or Company	Chen Ryan Associates		From/To Mesa Col Dr/Murray Ridge Rd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6411	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	114485	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	70		General Terrain:	Level	
DDHV = AADT x K x D	6411	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.45	ramps/mi	TRD Adjustment	6.8	mph
FFS (measured)		mph	FFS	68.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 1397 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
S 69.5 mph			x f _p)		
D = v _p / S 20.1 pc/mi/ln			S mph		
LOS C			D = v _p / S pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 NB		
Agency or Company	Chen Ryan Associates		From/To Murray Ridge Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3941	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	87577	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.06		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	3941	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.07	ramps/mi	TRD Adjustment	5.9	mph
FFS (measured)		mph	FFS	69.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	859	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	70.0	mph	S		
D = v _p / S	12.3	pc/mi/ln	D = v _p / S		
LOS	B		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel <i>I-805 NB</i>		
Agency or Company	Chen Ryan Associates		From/To <i>I-8 Interchange to Adams Ave</i>		
Date Performed	2018		Jurisdiction <i>City of San Diego</i>		
Analysis Time Period	PM		Analysis Year <i>2050</i>		
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3888	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	86394	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.06		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	3888	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.10	ramps/mi	TRD Adjustment	6.0	mph
FFS (measured)		mph	FFS	69.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1059	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	70.0	mph	S		
D = v _p / S	15.1	pc/mi/ln	D = v _p / S		
LOS	B		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 NB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3448	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	76632	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.06		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	3448	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.29	ramps/mi	TRD Adjustment	6.5	mph
FFS (measured)		mph	FFS	68.9	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 939 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
S 70.0 mph			x f _p)		
D = v _p / S 13.4 pc/mi/ln			S mph		
LOS B			D = v _p / S pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To Aero Drive to Friars Road		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8086	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	168452	veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	60		General Terrain:	Level	
DDHV = AADT x K x D	8086	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.79	ramps/mi	TRD Adjustment	7.6	mph
FFS (measured)		mph	FFS	67.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2181	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	58.8	mph	S		
D = v _p / S	37.1	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To Friars Road to I-8 Interchange		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	11157	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	273454	veh/day	%Trucks and Buses, P_T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	11157	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	5		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2372	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	54.1	mph	S		
$D = v_p / S$	43.9	pc/mi/ln	$D = v_p / S$		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel <i>I-15 NB</i>		
Agency or Company	Chen Ryan Associates		From/To <i>I-8 Interchange to Adams Ave</i>		
Date Performed	2018		Jurisdiction <i>City of San Diego</i>		
Analysis Time Period	PM		Analysis Year <i>2050</i>		
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9318	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	228387	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	<i>Level</i>	
DDHV = AADT x K x D	9318	veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.53	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2477	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	51.1	mph	S		
D = v _p / S	48.5	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 NB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8881	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	217666	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	8881	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.59	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
2360		pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S		54.4 mph	x f _p)		
D = v _p / S		43.4 pc/mi/ln	S		
LOS		E	D = v _p / S		
			pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Sunset Cliffs to Sports Arena		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	2314	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	59018	veh/day	%Trucks and Buses, P_T	1	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	56		General Terrain:	Level	
DDHV = AADT x K x D	2314	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.995	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.49	ramps/mi	TRD Adjustment	4.5	mph
FFS (measured)		mph	FFS	70.9	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p)$		
S	70.0	mph	S	mph	
$D = v_p / S$	17.5	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	B		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Sports Arena Boulevard to I-5		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3671	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	95355	veh/day	%Trucks and Buses, P_T	1	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	55		General Terrain:	Level	
DDHV = AADT x K x D	3671	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.995	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	3		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.96	ramps/mi	TRD Adjustment	5.7	mph
FFS (measured)		mph	FFS	69.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1295	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	69.9	mph	S		
$D = v_p / S$	18.5	pc/mi/ln	$D = v_p / S$		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To I-5 Interchange to Morena Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	5373	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	134671	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	5373	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.64	ramps/mi	TRD Adjustment	4.9	mph
FFS (measured)		mph	FFS	70.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1435	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	69.4	mph	S		
$D = v_p / S$	20.7	pc/mi/ln	$D = v_p / S$		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Morena Boulevard to Taylor St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6970	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	174680	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	6970	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	5		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.51	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1489	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	69.0	mph	S		
$D = v_p / S$	21.6	pc/mi/ln	$D = v_p / S$		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Taylor Street to Hotel Circle		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6193	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	155213	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	6193	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.67	ramps/mi	TRD Adjustment	7.3	mph
FFS (measured)		mph	FFS	68.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1654	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	67.6	mph	S		
D = v _p / S	24.5	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Hotel Circle to SR-163		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6697	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	167843	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	6697	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.93	ramps/mi	TRD Adjustment	7.9	mph
FFS (measured)		mph	FFS	67.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1431	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	65.0	mph	S		
D = v _p / S	22.0	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To SR-163 to Mission Center Road		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	5789	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	145100	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	5789	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	4		f_{LC}	0.0	mph
Total Ramp Density, TRD	3.03	ramps/mi	TRD Adjustment	8.2	mph
FFS (measured)		mph	FFS	67.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	1546	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	64.7	mph	S		
$D = v_p / S$	23.9	pc/mi/ln	$D = v_p / S$		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Mission Cntr Rd to Q Way/TX St		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7497	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	187895	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7497	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.985		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.06	ramps/mi	TRD Adjustment	8.2	mph
FFS (measured)		mph	FFS	67.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2002	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	59.9	mph	S		
D = v _p / S	33.4	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To Qualcomm Way/Texas St to I-805		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	5322	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	133380	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	5322	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	4		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.09	ramps/mi	TRD Adjustment	8.3	mph
FFS (measured)		mph	FFS	67.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
1422		pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		pc/h/ln
x f _p)			x f _p)		
S		65.0 mph	S		mph
D = v _p / S		21.9 pc/mi/ln	D = v _p / S		pc/mi/ln
LOS		C	Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes		S - Speed	E _R - Exhibits 11-10, 11-12		f _{LW} - Exhibit 11-8
V - Hourly volume		D - Density	E _T - Exhibits 11-10, 11-11, 11-13		f _{LC} - Exhibit 11-9
v _p - Flow rate		FFS - Free-flow speed	f _p - Page 11-18		TRD - Page 11-11
LOS - Level of service		BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To I-805 to I-15		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7762	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	194532	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	7762	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.62	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	1659	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	67.6	mph	S		
D = v _p / S	24.6	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-8 WB		
Agency or Company	Chen Ryan Associates		From/To I-15 to Fairmount Avenue		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6484	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	157009	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	59		General Terrain:	Level	
DDHV = AADT x K x D	6484	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.41	ramps/mi	TRD Adjustment	6.7	mph
FFS (measured)		mph	FFS	68.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1392	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	69.6	mph	S		
D = v _p / S	20.0	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 SB		
Agency or Company	Chen Ryan Associates		From/To Seaworld Dr/Tecolote Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9169	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	242554	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	9169	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.37	ramps/mi	TRD Adjustment	6.6	mph
FFS (measured)		mph	FFS	68.8	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1959	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	63.3	mph	S		
D = v _p / S	30.9	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-5 SB		
Agency or Company	Chen Ryan Associates		From/To I-8 to Old Town Avenue		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9243	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	244532	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.07		%RVs, P _R	0	
Peak-Hr Direction Prop, D	54		General Terrain:	Level	
DDHV = AADT x K x D	9243	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.980		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.84	ramps/mi	TRD Adjustment	7.7	mph
FFS (measured)		mph	FFS	67.7	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1985	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	62.9	mph	S		
D = v _p / S	31.6	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	Genesee Avenue to Friars Road	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	9710	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	212935	veh/day	%Trucks and Buses, P_T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	57		General Terrain:	Level	
DDHV = AADT x K x D	9710	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	4		TRD Adjustment	7.4	mph
Total Ramp Density, TRD	2.69	ramps/mi	FFS	68.0	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2606	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		pc/h/ln
S	47.1	mph	S		mph
$D = v_p / S$	55.4	pc/mi/ln	$D = v_p / S$		pc/mi/ln
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	Friars Road to I-8 Interchange	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7098	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	173978	veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7098	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.980	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f _{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f _{LC}	0.0	mph
Number of Lanes, N	5		TRD Adjustment	7.1	mph
Total Ramp Density, TRD	2.56	ramps/mi	FFS	68.3	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1524	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	68.8	mph	S		
D = v _p / S	22.2	pc/mi/ln	D = v _p / S		
LOS	C		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	I-8 Interchange to 6th Avenue	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7554	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	185137	veh/day	%Trucks and Buses, P_T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	7554	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}	0.0	mph
Rt-Side Lat. Clearance	6.0	ft	f_{LC}	0.0	mph
Number of Lanes, N	4		TRD Adjustment	6.5	mph
Total Ramp Density, TRD	2.29	ramps/mi	FFS	68.9	mph
FFS (measured)		mph			
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2018	pc/h/ln	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	62.2	mph	S		
$D = v_p / S$	32.4	pc/mi/ln	$D = v_p / S$		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel	SR-163 SB	
Agency or Company	Chen Ryan Associates		From/To	6th Avenue to Washington St	
Date Performed	2018		Jurisdiction	City of San Diego	
Analysis Time Period	PM		Analysis Year	2050	
Project Description <i>Proposed</i>					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6277	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	153846	veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	6277	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	2		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.06	ramps/mi	TRD Adjustment	5.9	mph
FFS (measured)		mph	FFS	69.5	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3353	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	16.2	mph	S		
D = v _p / S	206.6	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To Mesa Col Dr/Murray Ridge Rd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	14917	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	266369	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	70		General Terrain:	Level	
DDHV = AADT x K x D	14917	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.45	ramps/mi	TRD Adjustment	6.8	mph
FFS (measured)		mph	FFS	68.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3250	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	21.3	mph	S		
D = v _p / S	152.9	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To Murray Ridge Rd to I-8		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	15433	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257215	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	15433	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.21	ramps/mi	TRD Adjustment	6.3	mph
FFS (measured)		mph	FFS	69.1	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	3363	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	15.7	mph	S		
D = v _p / S	213.8	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To I-8 Interchange to Adams Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	15224	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	253739	veh/day	%Trucks and Buses, P_T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P_R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	15224	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	6		f_{LC}	0.0	mph
Total Ramp Density, TRD	2.25	ramps/mi	TRD Adjustment	6.4	mph
FFS (measured)		mph	FFS	69.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$			$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$		
S	41.6	mph	S	mph	
$D = v_p / S$	66.4	pc/mi/ln	$D = v_p / S$	pc/mi/ln	
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9	
v_p - Flow rate	FFS - Free-flow speed		f_p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v_p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-805 SB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	13504	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	225070	veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	75		General Terrain:	Level	
DDHV = AADT x K x D	13504	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.966	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.44	ramps/mi	TRD Adjustment	6.8	mph
FFS (measured)		mph	FFS	68.6	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2942	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	34.8	mph	S		
D = v _p / S	84.5	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To Aero Drive to Friars Road		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	12374	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257793	veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	60		General Terrain:	Level	
DDHV = AADT x K x D	12374	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.52	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	2670	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	44.9	mph	S		
D = v _p / S	59.4	pc/mi/ln	D = v _p / S		
LOS	F		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To Friars Road to I-8 Interchange		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	10520	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	257834	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	10520	veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	3.14	ramps/mi	TRD Adjustment	8.4	mph
FFS (measured)		mph	FFS	67.0	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2237	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	55.1	mph	S		
D = v _p / S	40.6	pc/mi/ln	D = v _p / S		
LOS	E		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To I-8 Interchange to Adams Ave		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8786	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	215341	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	8786	veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.990		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.53	ramps/mi	TRD Adjustment	7.0	mph
FFS (measured)		mph	FFS	68.4	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 1868 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 64.8 mph			x f _p)		
D = v _p / S 28.8 pc/mi/ln			S		
LOS D			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
S - Speed			f _{LW} - Exhibit 11-8		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
D - Density			f _{LC} - Exhibit 11-9		
v _p - Flow rate			f _p - Page 11-18		
FFS - Free-flow speed			TRD - Page 11-11		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
BFFS - Base free-flow speed					
DDHV - Directional design hour volume					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Chen Ryan Associates		Highway/Direction of Travel I-15 SB		
Agency or Company	Chen Ryan Associates		From/To Adams Avenue to El Cajon Blvd		
Date Performed	2018		Jurisdiction City of San Diego		
Analysis Time Period	PM		Analysis Year 2050		
Project Description Proposed					
☒ Oper.(LOS)		☐ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	8374	veh/h	Peak-Hour Factor, PHF	0.95	
AADT	205233	veh/day	%Trucks and Buses, P _T	2	
Peak-Hr Prop. of AADT, K	0.08		%RVs, P _R	0	
Peak-Hr Direction Prop, D	51		General Terrain:	Level	
DDHV = AADT x K x D	8374	veh/h	Grade % Length	mi	
Up/Down %					
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.990	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f _{LW}	0.0	mph
Number of Lanes, N	5		f _{LC}	0.0	mph
Total Ramp Density, TRD	2.59	ramps/mi	TRD Adjustment	7.2	mph
FFS (measured)		mph	FFS	68.2	mph
Base free-flow Speed, BFFS	75.4	mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1781	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	66.1	mph	S		
D = v _p / S	27.0	pc/mi/ln	D = v _p / S		
LOS	D		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9	
v _p - Flow rate	FFS - Free-flow speed		f _p - Page 11-18	TRD - Page 11-11	
LOS - Level of service	BFFS - Base free-flow speed		LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume					