

Appendix H.6 - Level of Service Analysis

A level of service (LOS) analysis was performed for the Kennedy Interchange and Ohio River bridge crossings using the 2010 Highway Capacity Manual¹ (HCM) and related 2010 Highway Capacity Software (HCS). The summaries of LOS results are shown here in Tables H.6-1 and H.6-2. The actual HCS reports have been included at the end of the section. The LOS results were reported in Chapters 2 and 3 of the FSEIS within Figure 2.2-7 and Table 3.3-4 respectively, as well as Table A.5-4 in Appendix A.5. Table 3.3-4 and Table A.5-4 present the worst-case bridge crossing LOS out of northbound in the AM peak hour, southbound in the AM peak hour, northbound in the PM peak hour, and southbound in the PM peak hour for each bridge under each alternative. These worst-case values are presented in Table H.6-2 in bold.

As part of the Louisville – Southern Indiana Ohio River Bridges (LSIORB) Project a Time-of-Day (TOD) travel demand model was developed (see Appendix H.2 and Appendix H.3 for more information). The TOD model produced the freeway segment volumes used in the HCS analysis (see Appendix H.1 for more details of the traffic volume forecasts). Several key assumptions were made regarding freeway operations as inputs to the HCS.

Peak-Hour Factor (PHF)

Within the HCS analysis, PHF is used to convert an average hourly traffic volume to a peak 15-minute flow rate. The 15-minute flow rate is used as the basis for most procedures of the HCS, including freeway analysis. Segment-specific 15-minute count data was not available to calculate PHFs. The HCM (page 11-13) points out that freeway PHFs typically range from 0.85 to 0.98. For this analysis a PHF of 0.92 was used. As part of the LSIORB Project, intersection turning movement volumes were collected at ramp terminals and other intersections adjacent to the Kennedy Interchange. Although not completely correlated to the freeway segments, these turning movement volumes were collected in 15-minute intervals and indicate that a PHF of 0.92 is reflective of local traffic conditions.

Free-Flow Speed (FFS)

Conducting an LOS analysis of freeway segments requires a value of FFS. The HCM directs that the FFS can be determined from field measurement or estimated based on physical roadway characteristics. In the absence of actual field-measured speeds, an initial approach taken to estimate the FFS based on physical characteristics indicated values through the Kennedy Interchange ranging from 67 to 69 miles per hour (mph). Notwithstanding the flexibility provided in estimating the FFS based on physical roadway characteristics, the HCM freeway analysis methodologies best reflect operations within more standardized interstate corridors. Given the complex nature of the Kennedy

¹ Transportation Research Board of the National Academies, *HCM2010 Highway Capacity Manual*, Washington, D.C., 2010.

Interchange it was reasoned that these estimates likely exceeded realistic FFS expectations.

Under a separate context, a FFS study was conducted in support of statewide travel demand modeling efforts in Indiana². For the speed study, the surveyed locations were all located in Southern Indiana. Many of the locations were along interstate roadways including I-64. The conclusions of the study identified a free-flow speed of 60 mph for a typical urban 2-lane interstate with a posted speed of 55 mph. For 4-, 6- and 8-lane facilities, a free-flow speed of 64 mph was identified. As required for a statewide travel demand model, these estimates represented conditions along a typical interstate segment. Again, given the complex nature of the Kennedy Interchange it seemed that 64 mph was also likely higher than the expected FFS.

Given the aforementioned reasoning and the 55 mph speed limit in the Kennedy Interchange, an assumed FFS of 60 mph was used for the LOS analysis throughout the Kennedy Interchange and Ohio River bridge crossings. The exceptions to using the 60 mph FFS assumption included:

- I-265 East End Bridge - Given the relatively isolated nature of the I-265 East End Bridge, the HCS analysis was conducted using a FFS of 65 mph.
- Clark Memorial Bridge – The Clark Memorial Bridge was analyzed with HCS using the multilane lane highway methodology, which best reflects the configuration of the bridge and the approaches to it. The analysis was conducted using a 45 mph FFS based on the following.
- The Clark Memorial Bridge and the approaches to it total over one mile of uninterrupted roadway. Given the functional characteristics of the bridge and its approaches the segment was analyzed using the HCS multilane highway methodology. For the multilane highway methodology, the calculations internally force the analysis to use the closest of four speed-flow curves: 45 mph, 50 mph, 55mph, or 60 mph. The 45 mph FFS was used as it is closest to the posted speed limit of 35 mph on the Clark Memorial Bridge.
- I-71 Southbound between I-65 Off and I-64 On - The southbound segment of I-71 between the exit to I-65 northbound and the entrance from I-64 eastbound was analyzed using a FFS of 55 mph. The decision was made based on the presence of a 35 mph posted advisory speed limit for this segment of the interchange.

Heavy Vehicle Percentages

The percentage of heavy vehicles in the traffic stream for each freeway segment was estimated by the TOD model for the 2030 No-Action, the 2030 FEIS Selected, 2030 Modified Selected, 2030 East End and 2030 Downtown bridge-scenarios. For the 2010 analysis, heavy vehicle percentages were available for the Ohio River bridge crossings and Kennedy interchange from vehicle classification ground counts.

² Appendix V – Model Development and Validation Technical Report 3.3.3, I-69 Evansville to Indianapolis Tier 1 Environmental Impact Statement.

Table H.6-1**Kennedy Interchange 2010 and 2030 No-Action Level of Service (LOS) Summary**

	2010		2030	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Mainline				
I-65 Northbound				
Between Muhammad Ali Blvd. On to I-64/I-71 Off *	B	E	B	F
Between I-64/I-71 Off to I-64/I-71 On	B	D	B	E
Between I-64/I-71 On to Court Ave. Off (Kennedy Bridge)	B	D	C	E
I-65 Southbound				
Between Market Off to I-64 Off (Kennedy Bridge)	D	C	F	D
Between I-64 Off to I-64/I-71 On	C	C	F	D
Between I-64/I-71 On to Jefferson St. Off *	E	B	F	F
I-64 Eastbound				
West of I-65 Off	C	D	D	E
Between River Rd. On to I-71NB Off	C	E	D	F
Between I-65 On to Story Ave. Off *	C	C	D	D
Between Story Ave. Off to Mellwood Ave. On	C	D	D	E
I-64 Westbound				
Between Mellwood Ave. Off to Story Ave. On	D	C	F	E
Between Story Ave. On to I-65 Off *	C	B	E	D
Between I-71SB On to I-65 On	D	C	F	E
Between I-65 On to 3 rd St. Off *	C	B	E	D
West of 3 rd St. Off	B	C	D	D
I-71 Northbound				
Between I-64WB Off to I-65SB On	A	C	B	C
Between I-65SB On to I-64EB Off *	D	F	F	F
Between I-64EB On to Zorn Ave. Off	C	E	D	F
I-71 Southbound				
Between Zorn Ave. On to I-64WB Off	E	C	F	E
Between I-64WB Off to I-64WB On	C	B	C	C
Between I-64WB On to I-65NB Off *	F	D	F	F
Between I-65NB Off to I-64EB On	D	A	D	B

* Analyzed as a weaving segment.

Table H.6-2

2030 Ohio River Bridge Crossings Level of Service (LOS) Summary

River Crossing	Alternative				
	No-Action	FEIS Selected	Modified Selected	East End Only	Downtown Only
I-64 Sherman Minton Bridge					
A.M. Peak Westbound	B	B	C	B	B
A.M. Peak Eastbound	F	D	E	D	D
P.M. Peak Westbound	F	E	E	E	E
P.M. Peak Eastbound	C	C	D	C	D
US-31 Clark Memorial Bridge					
A.M. Peak Northbound	A	A	B	A	A
A.M. Peak Southbound	C	C	C	C	C
P.M. Peak Northbound	C	C	D*	C	C
P.M. Peak Southbound	B	B	C	B	B
I-65 John F. Kennedy Memorial Bridge					
A.M. Peak Northbound	C	A	A	B	B
A.M. Peak Southbound	F	D	C	F	D
P.M. Peak Northbound	E	C	C	E	D
P.M. Peak Southbound	D	B	B	D	C
I-265 East End Bridge					
A.M. Peak Northbound		C	D	D	
A.M. Peak Southbound		B	B	B	
P.M. Peak Northbound		B	B	B	
P.M. Peak Southbound		D	D	D	

Bold LOS - Indicates the lowest level of service by direction and time period which was reported in Chapter 3 Table 3.3-4 and Table A.5-4 in Appendix A.5.

* Under the Modified Selected Alternative the Clark Memorial Bridge is LOS D. LOS is based on density in passenger cars per mile per lane (pcpmpl). The upper boundary for density for LOS C is 26 pcpmpl. For the multilane highway analysis the calculated density was 26.7 pcpmpl. This is equivalent to about 60 vehicles out of the P.M. peak northbound 2,200 vehicles forecasted.

The HCS reports have been assembled together in nine groups:

1. 2010 A.M. peak hour Kennedy Interchange including the Kennedy Bridge (LOS reported in Figure 2.2-7).
2. 2010 P.M. peak hour Kennedy Interchange including the Kennedy Bridge (LOS reported in Figure 2.2-7).
3. 2030 No-Action A.M. peak hour Kennedy Interchange including the Kennedy Bridge (LOS reported in Figure 2.2-7).

4. 2030 No-Action P.M. peak hour Kennedy Interchange including the Kennedy Bridge (LOS reported in Figure 2.2-7).
5. 2030 No-Action A.M. and P.M. peak hours for the Sherman Minton Bridge and Clark Memorial Bridge (LOS reported in Table 3.3-4).
6. 2030 FEIS Selected A.M. and P.M. peak hours for the Sherman Minton Bridge, Clark Memorial Bridge, Kennedy Bridge and East End Bridge (LOS reported in Table 3.3-4).
7. 2030 Modified Selected A.M. and P.M. peak hours for the Sherman Minton Bridge, Clark Memorial Bridge, Kennedy Bridge and East End Bridge (LOS reported in Table 3.3-4).
8. 2030 East End A.M. and P.M. peak hours for the Sherman Minton Bridge, Clark Memorial Bridge, Kennedy Bridge and East End Bridge (LOS reported in Table A.5-4).
9. 2030 Downtown A.M. and P.M. peak hours for the Sherman Minton Bridge, Clark Memorial Bridge and Kennedy Bridge (LOS reported in Table A.5-4).

Note: For the multilane highway analysis of the Clark Memorial Bridge, Direction 1 is northbound and Direction 2 is southbound.

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-65 Northbound</i>		
Agency or Company	Parsons		From/To <i>Between I-64 Off and I-64 On</i>		
Date Performed	11/7/11		Jurisdiction <i>11-4.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	17	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.922		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	826	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	13.8	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	Adams		Highway/Direction of Travel <i>I-65 Northbound</i>		
Agency or Company	Parsons		From/To <i>Between I-64 On and Court Off</i>		
Date Performed	11/7/11		Jurisdiction <i>11-5.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3250	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.952	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	4		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	927	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	15.4	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	Adams		Highway/Direction of Travel I-65 Southbound		
Agency or Company	Parsons		From/To Btw Market St Off and I-64 Off		
Date Performed	11/7/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2010		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	16	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.926	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	3		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	1761	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	59.5	mph	S		
D = v _p / S	29.6	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	Adams		Highway/Direction of Travel <i>I-65 Southbound</i>		
Agency or Company	Parsons		From/To <i>Between I-64 Off and I-64 On</i>		
Date Performed	11/7/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2450	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	21	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.905		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1471	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	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	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>West of Kennedy Interchange</i>		
Date Performed	11/7/11		Jurisdiction <i>21-1.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3350	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.966		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	3				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	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}) 1256 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 60.0 mph			x f _p)		
D = v _p / S 20.9 pc/mi/ln			S		
LOS C			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>Between I-65 Off and River On</i>		
Date Performed	11/7/11		Jurisdiction <i>21-2.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2150	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
			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}) 1215			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 60.0			x f _p)		
D = v _p / S 20.3			S		
LOS C			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
speed			f _p - Page 11-18		
DDHV - Directional design hour volume			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>Between River On and I-71 Off</i>		
Date Performed	11/7/11		Jurisdiction <i>21-3.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2250	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.962	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	1272	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	60.0	mph	S		
D = v _p / S	21.2	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	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>Btw Story Off & Mellwood On</i>		
Date Performed	11/30/11		Jurisdiction <i>21-6.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] <i>0.966</i>		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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}) <i>1462</i>			Design LOS		
x f _p)		pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p)		
D = v _p / S	24.4	pc/mi/ln	S		
LOS	C		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel <i>I-64 Westbound</i>		
Agency or Company	Parsons		From/To <i>Btw Mellwood Off and Story On</i>		
Date Performed	11/30/11		Jurisdiction <i>22-1.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3250	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] <i>0.980</i>		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-64 Westbound</i>		
Agency or Company	Parsons		From/To <i>Between I-71 On and I-65 On</i>		
Date Performed	11/7/11		Jurisdiction <i>22-4.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0 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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-64 Westbound</i>		
Agency or Company	Parsons		From/To <i>West of Third Street</i>		
Date Performed	11/7/11		Jurisdiction <i>22-6.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS) ☐ Des.(N) ☐ Planning Data					
Flow Inputs					
Volume, V	2750	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
1021	pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	60.0	mph	S		
D = v _p / S	17.0	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		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-71 Northbound</i>		
Agency or Company	Parsons		From/To <i>Btw I-64WB Off and I-65SB On</i>		
Date Performed	11/7/11		Jurisdiction <i>31-1.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1150	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	ff _{LW}		mph
			ff _{LC}		mph
			TRD Adjustment		mph
			FFS	60.0	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		
v _p	641	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	S		
D = v _p / S	10.7	pc/mi/ln	D = v _p / S		
LOS	A		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	ff _{LW} - Exhibit 11-8	
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13	ff _{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	Adams		Highway/Direction of Travel <i>I-71 Northbound</i>		
Agency or Company	Parsons		From/To <i>Btw I64EB On & Zorn Off</i>		
Date Performed	11/7/11		Jurisdiction <i>31-4.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
			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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
speed			f _p - Page 11-18		
DDHV - Directional design hour volume			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-71 Southbound</i>		
Agency or Company	Parsons		From/To <i>Btw Zorn On & I64WB Off</i>		
Date Performed	11/7/11		Jurisdiction <i>32-1.1</i>		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
2107 pc/h/ln			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S 55.3 mph			S mph		
D = v _p / S			D = v _p / S		
38.1 pc/mi/ln			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		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-71 Southbound		
Agency or Company	Parsons		From/To Btw I-64WB Off and I-64WB On		
Date Performed	11/7/11		Jurisdiction 32-2.1		
Analysis Time Period	AM Peak Hour		Analysis Year 2010		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2350	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	3	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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})			v _p = (V or DDHV) / (PHF x N x f _{HV})		
	1296	pc/h/ln			pc/h/ln
S	60.0	mph	S		mph
D = v _p / S	21.6	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	Adams		Highway/Direction of Travel I-71 Southbound		
Agency or Company	Parsons		From/To Btw I65NB Off & I64EB On		
Date Performed	11/7/11		Jurisdiction 32-4.1		
Analysis Time Period	AM Peak Hour		Analysis Year 2010		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	55.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		mph
			FFS		55.0
					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		
S	55.0	mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S	27.2	pc/mi/ln	S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-65 Northbound 11-3.1			
Agency/Company	Parsons				Weaving Segment Location	Btw Ali On & I64/I71 Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	AM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	One-Sided				Segment type	Freeway			
Weaving number of lanes, N	4				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	2100ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1100	0.92	20	0	1.5	1.2	0.909	1.00	1315
V_{RF}	1400	0.92	6	0	1.5	1.2	0.971	1.00	1567
V_{FR}	300	0.92	9	0	1.5	1.2	0.957	1.00	341
V_{RR}	400	0.92	20	0	1.5	1.2	0.909	1.00	1315
V_{NW}	1754							V =	3662
V_W	1908								
VR	0.521								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	3 lc				Minimum weaving lane changes, LC_{MIN}	682 lc/h			
Interchange density, ID	2.50 int/mi				Weaving lane changes, LC_W	1403 lc/h			
Minimum RF lane changes, LC_{RF}	2 lc/pc				Non-weaving lane changes, LC_{NW}	729 lc/h			
Minimum FR lane changes, LC_{FR}	0 lc/pc				Total lane changes, LC_{ALL}	2132 lc/h			
Minimum RR lane changes, LC_{RR}	lc/pc				Non-weaving vehicle index, I_{NW}	0.229			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	3662 pc/h				Weaving intensity factor, W	0.229			
Weaving segment capacity, c_w	6107 veh/h				Weaving segment speed, S	54.3 mph			
Weaving segment v/c ratio	0.545				Average weaving speed, S_W	58.1 mph			
Weaving segment density, D	16.9 pc/mi/ln				Average non-weaving speed, S_{NW}	50.7 mph			
Level of Service, LOS	B				Maximum weaving length, L_{MAX}	6507 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-65 Southbound 12-6.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I64/I71 On & Jefferson Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	AM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	One-Sided				Segment type	Freeway			
Weaving number of lanes, N	4				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	2175ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1620	0.92	30	0	1.5	1.2	0.870	1.00	2025
V_{RF}	830	0.92	2	0	1.5	1.2	0.990	1.00	911
V_{FR}	2180	0.92	2	0	1.5	1.2	0.990	1.00	2393
V_{RR}	1120	0.92	30	0	1.5	1.2	0.870	1.00	2025
V_{NW}	3273							V =	6577
V_W	3304								
VR	0.502								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	3 lc				Minimum weaving lane changes, LC_{MIN}	1822 lc/h			
Interchange density, ID	2.70 int/mi				Weaving lane changes, LC_W	2592 lc/h			
Minimum RF lane changes, LC_{RF}	0 lc/pc				Non-weaving lane changes, LC_{NW}	2361 lc/h			
Minimum FR lane changes, LC_{FR}	2 lc/pc				Total lane changes, LC_{ALL}	4953 lc/h			
Minimum RR lane changes, LC_{RR}	lc/pc				Non-weaving vehicle index, I_{NW}	0.433			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	6577 pc/h				Weaving intensity factor, W	0.433			
Weaving segment capacity, c_w	6058 veh/h				Weaving segment speed, S	46.3 mph			
Weaving segment v/c ratio	0.944				Average weaving speed, S_W	57.0 mph			
Weaving segment density, D	35.5 pc/mi/ln				Average non-weaving speed, S_{NW}	39.0 mph			
Level of Service, LOS	E				Maximum weaving length, L_{MAX}	6288 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst		Adams			Freeway/Dir of Travel		I-64 Eastbound 21-5.1		
Agency/Company		Parsons			Weaving Segment Location		Btw I-65 On & Story Off		
Date Performed		10/28/2011			Analysis Year		2010		
Analysis Time Period		AM Peak Hour							
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration		Two-Sided			Segment type		Freeway		
Weaving number of lanes, N		3			Freeway minimum speed, S_{MIN}		50		
Weaving segment length, L_S		1425ft			Freeway maximum capacity, C_{IFL}		2300		
Freeway free-flow speed, FFS		60 mph			Terrain type		Level		
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1210	0.92	6	0	1.5	1.2	0.971	1.00	1355
V_{RF}	190	0.92	2	0	1.5	1.2	0.990	1.00	209
V_{FR}	1390	0.92	7	0	1.5	1.2	0.966	1.00	1564
V_{RR}	210	0.92	6	0	1.5	1.2	0.971	1.00	1355
V_{NW}	3128							V =	3359
V_W	231								
VR	0.069								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}		0 lc			Minimum weaving lane changes, LC_{MIN}		462 lc/h		
Interchange density, ID		2.00 int/mi			Weaving lane changes, LC_W		746 lc/h		
Minimum RF lane changes, LC_{RF}		1c/pc			Non-weaving lane changes, LC_{NW}		839 lc/h		
Minimum FR lane changes, LC_{FR}		1c/pc			Total lane changes, LC_{ALL}		1585 lc/h		
Minimum RR lane changes, LC_{RR}		2 lc/pc			Non-weaving vehicle index, I_{NW}		0.246		
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v		3359 pc/h			Weaving intensity factor, W		0.246		
Weaving segment capacity, c_w		5598 veh/h			Weaving segment speed, S		51.7 mph		
Weaving segment v/c ratio		0.583			Average weaving speed, S_W		58.0 mph		
Weaving segment density, D		21.7 pc/mi/ln			Average non-weaving speed, S_{NW}		51.3 mph		
Level of Service, LOS		C			Maximum weaving length, L_{MAX}		6371 ft		
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst		Adams			Freeway/Dir of Travel		I-64 Westbound 22-2.1		
Agency/Company		Parsons			Weaving Segment Location		Btw Story On & I-65 Off		
Date Performed		10/28/2011			Analysis Year		2010		
Analysis Time Period		AM Peak Hour							
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration		Two-Sided			Segment type		Freeway		
Weaving number of lanes, N		3			Freeway minimum speed, S_{MIN}		50		
Weaving segment length, L_S		1600ft			Freeway maximum capacity, C_{IFL}		2300		
Freeway free-flow speed, FFS		60 mph			Terrain type		Level		
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1850	0.92	3	0	1.5	1.2	0.985	1.00	2041
V_{RF}	1400	0.92	5	0	1.5	1.2	0.976	1.00	1560
V_{FR}	300	0.92	3	0	1.5	1.2	0.985	1.00	331
V_{RR}	200	0.92	3	0	1.5	1.2	0.985	1.00	2041
V_{NW}	3932							V =	4160
V_W	228								
VR	0.055								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}		0 lc			Minimum weaving lane changes, LC_{MIN}		456 lc/h		
Interchange density, ID		1.80 int/mi			Weaving lane changes, LC_W		744 lc/h		
Minimum RF lane changes, LC_{RF}		1c/pc			Non-weaving lane changes, LC_{NW}		1099 lc/h		
Minimum FR lane changes, LC_{FR}		1c/pc			Total lane changes, LC_{ALL}		1843 lc/h		
Minimum RR lane changes, LC_{RR}		2 lc/pc			Non-weaving vehicle index, I_{NW}		0.253		
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v		4160 pc/h			Weaving intensity factor, W		0.253		
Weaving segment capacity, c_w		5749 veh/h			Weaving segment speed, S		50.4 mph		
Weaving segment v/c ratio		0.713			Average weaving speed, S_W		58.0 mph		
Weaving segment density, D		27.5 pc/mi/ln			Average non-weaving speed, S_{NW}		50.1 mph		
Level of Service, LOS		C			Maximum weaving length, L_{MAX}		6239 ft		
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst		Adams			Freeway/Dir of Travel		I-64 Westbound 22-5.1		
Agency/Company		Parsons			Weaving Segment Location		Btw I-65 On & 3rd Off		
Date Performed		10/28/2011			Analysis Year		2010		
Analysis Time Period		AM Peak Hour							
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration				Two-Sided		Segment type		Freeway	
Weaving number of lanes, N				4		Freeway minimum speed, S_{MIN}		50	
Weaving segment length, L_S				1425ft		Freeway maximum capacity, C_{IFL}		2300	
Freeway free-flow speed, FFS				60 mph		Terrain type		Level	
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2200	0.92	5	0	1.5	1.2	0.976	1.00	2451
V_{RF}	1400	0.92	1	0	1.5	1.2	0.995	1.00	1529
V_{FR}	550	0.92	6	0	1.5	1.2	0.971	1.00	616
V_{RR}	350	0.92	5	0	1.5	1.2	0.976	1.00	2451
V_{NW}	4596							V =	4978
V_W	382								
VR	0.077								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}				0 lc		Minimum weaving lane changes, LC_{MIN}		382 lc/h	
Interchange density, ID				1.80 int/mi		Weaving lane changes, LC_W		859 lc/h	
Minimum RF lane changes, LC_{RF}				1c/pc		Non-weaving lane changes, LC_{NW}		949 lc/h	
Minimum FR lane changes, LC_{FR}				1c/pc		Total lane changes, LC_{ALL}		1808 lc/h	
Minimum RR lane changes, LC_{RR}				1 lc/pc		Non-weaving vehicle index, I_{NW}		0.273	
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v				4978 pc/h		Weaving intensity factor, W		0.273	
Weaving segment capacity, c_w				7477 veh/h		Weaving segment speed, S		51.7 mph	
Weaving segment v/c ratio				0.650		Average weaving speed, S_W		57.9 mph	
Weaving segment density, D				24.1 pc/mi/ln		Average non-weaving speed, S_{NW}		51.3 mph	
Level of Service, LOS				C		Maximum weaving length, L_{MAX}		6447 ft	
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-71 Northbound 31-2.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I65SB On & I64EB Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	AM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	Two-Sided				Segment type	Freeway			
Weaving number of lanes, N	2				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_S	2220ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	530	0.92	4	0	1.5	1.2	0.980	1.00	588
V_{RF}	620	0.92	6	0	1.5	1.2	0.971	1.00	694
V_{FR}	820	0.92	9	0	1.5	1.2	0.957	1.00	931
V_{RR}	980	0.92	4	0	1.5	1.2	0.980	1.00	588
V_{NW}	2213							V =	3316
V_W	1103								
VR	0.333								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	0 lc				Minimum weaving lane changes, LC_{MIN}	1103 lc/h			
Interchange density, ID	2.30 int/mi				Weaving lane changes, LC_W	1281 lc/h			
Minimum RF lane changes, LC_{RF}	lc/pc				Non-weaving lane changes, LC_{NW}	1274 lc/h			
Minimum FR lane changes, LC_{FR}	lc/pc				Total lane changes, LC_{ALL}	2555 lc/h			
Minimum RR lane changes, LC_{RR}	1 lc/pc				Non-weaving vehicle index, I_{NW}	0.253			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	3316 pc/h				Weaving intensity factor, W	0.253			
Weaving segment capacity, c_w	3482 veh/h				Weaving segment speed, S	47.9 mph			
Weaving segment v/c ratio	0.934				Average weaving speed, S_W	58.0 mph			
Weaving segment density, D	34.6 pc/mi/ln				Average non-weaving speed, S_{NW}	44.1 mph			
Level of Service, LOS	D				Maximum weaving length, L_{MAX}	9069 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-71 Southbound 32-3.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I64WB On & I65NB Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	AM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	Two-Sided				Segment type	Freeway			
Weaving number of lanes, N	2				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	1480ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1610	0.92	2	0	1.5	1.2	0.990	1.00	1768
V_{RF}	740	0.92	6	0	1.5	1.2	0.971	1.00	828
V_{FR}	1090	0.92	6	0	1.5	1.2	0.971	1.00	1220
V_{RR}	510	0.92	2	0	1.5	1.2	0.990	1.00	1768
V_{NW}	3816							V =	4390
V_W	574								
VR	0.131								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	0 lc				Minimum weaving lane changes, LC_{MIN}	lc/h			
Interchange density, ID	2.20 int/mi				Weaving lane changes, LC_W	lc/h			
Minimum RF lane changes, LC_{RF}	lc/pc				Non-weaving lane changes, LC_{NW}	lc/h			
Minimum FR lane changes, LC_{FR}	lc/pc				Total lane changes, LC_{ALL}	lc/h			
Minimum RR lane changes, LC_{RR}	1 lc/pc				Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	4390 pc/h				Weaving intensity factor, W				
Weaving segment capacity, c_w	3723 veh/h				Weaving segment speed, S	mph			
Weaving segment v/c ratio	1.167				Average weaving speed, S_W	mph			
Weaving segment density, D	pc/mi/ln				Average non-weaving speed, S_{NW}	mph			
Level of Service, LOS	F				Maximum weaving length, L_{MAX}	6973 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-65 Northbound</i>		
Agency or Company	Parsons		From/To <i>Between I-64 Off and I-64 On</i>		
Date Performed	11/7/11		Jurisdiction <i>11-4.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] <i>0.901</i>		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	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		
	1810	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	59.2	mph	S		
D = v _p / S	30.6	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	Adams		Highway/Direction of Travel <i>I-65 Northbound</i>		
Agency or Company	Parsons		From/To <i>Between I-64 On and Court Off</i>		
Date Performed	11/7/11		Jurisdiction <i>11-5.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5350	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	16	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.926		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	4		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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)			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	60.0	mph	S		mph
D = v _p / S	26.2	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	Adams		Highway/Direction of Travel I-65 Southbound		
Agency or Company	Parsons		From/To Btw Market St Off and I-64 Off		
Date Performed	11/7/11		Jurisdiction 12-4.1		
Analysis Time Period	PM Peak Hour		Analysis Year 2010		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	25	
Peak-Hr Prop. of AADT, K			%RVs, P _R	2	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade %	Length	mi
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.5	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.881	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	3		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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)			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	60.0	mph	S	mph	
D = v _p / S	23.3	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	Adams		Highway/Direction of Travel <i>I-65 Southbound</i>		
Agency or Company	Parsons		From/To <i>Between I-64 Off and I-64 On</i>		
Date Performed	11/7/11		Jurisdiction <i>12-5.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	25	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.889		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0		
			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		
1101 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			D = v _p / S		
18.4 pc/mi/ln			pc/mi/ln		
LOS C			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	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>West of Kennedy Interchange</i>		
Date Performed	11/7/11		Jurisdiction <i>21-1.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
			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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-64 Eastbound	
Agency or Company	Parsons		From/To	Between I-65 Off and River On	
Date Performed	11/7/11		Jurisdiction	21-2.1	
Analysis Time Period	PM Peak Hour		Analysis Year	2010	
Project Description Ohio River Bridges					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2950	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	1659	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	27.7	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	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>Between River On and I-71 Off</i>		
Date Performed	11/7/11		Jurisdiction <i>21-3.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	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		
	2117	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	38.4	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	Adams		Highway/Direction of Travel <i>I-64 Eastbound</i>		
Agency or Company	Parsons		From/To <i>East of Story Avenue</i>		
Date Performed	11/7/11		Jurisdiction <i>21-6.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
1894	pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	58.4	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		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-64 Westbound</i>		
Agency or Company	Parsons		From/To <i>East of Story Avenue</i>		
Date Performed	11/7/11		Jurisdiction <i>22-1.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2250	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	<i>Level</i>	
DDHV = AADT x K x D		veh/h	Grade %	Length	<i>mi</i>
			Up/Down %		
Calculate Flow Adjustments					
f _p	1.00		E _R	1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.952	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	1284	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	60.0	mph	S		
D = v _p / S	21.4	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	Adams		Highway/Direction of Travel	I-64 Westbound	
Agency or Company	Parsons		From/To	Between I-71 On and I-65 On	
Date Performed	11/7/11		Jurisdiction	22-4.1	
Analysis Time Period	PM Peak Hour		Analysis Year	2010	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.962	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	FFS	60.0 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		
	1526	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	25.4	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	Adams		Highway/Direction of Travel I-64 Westbound		
Agency or Company	Parsons		From/To West of Third Street		
Date Performed	11/7/11		Jurisdiction 22-6.1		
Analysis Time Period	PM Peak Hour		Analysis Year 2010		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.971	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0	mph
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1232	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	60.0	mph	S		
D = v _p / S	20.5	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	Adams		Highway/Direction of Travel I-71 Northbound		
Agency or Company	Parsons		From/To Btw I-64WB Off and I-65SB On		
Date Performed	11/7/11		Jurisdiction 31-1.1		
Analysis Time Period	PM Peak Hour		Analysis Year 2010		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	2		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
	1275	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	21.3	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	Adams		Highway/Direction of Travel <i>I-71 Northbound</i>		
Agency or Company	Parsons		From/To <i>Btw I64EB On & Zorn Off</i>		
Date Performed	11/7/11		Jurisdiction <i>31-4.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3750	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
			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		
x f _p)	2089		v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	55.7		x f _p)		
D = v _p / S	37.5		S		
LOS	E		D = v _p / S		
			pc/mi/ln		
			mph		
			pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-71 Southbound</i>		
Agency or Company	Parsons		From/To <i>Btw Zorn On & I64WB Off</i>		
Date Performed	11/7/11		Jurisdiction <i>32-1.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
1399	pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	60.0	mph	S		
D = v _p / S	23.3	pc/mi/ln	mph		
LOS	C		D = v _p / S		
			pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-71 Southbound	
Agency or Company	Parsons		From/To	Btw I-64WB Off and I-64WB On	
Date Performed	11/7/11		Jurisdiction	32-2.1	
Analysis Time Period	PM Peak Hour		Analysis Year	2010	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1450	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	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		
v _p	808	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p)		
D = v _p / S	13.5	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel <i>I-71 Southbound</i>		
Agency or Company	Parsons		From/To <i>Btw I65NB Off & I64EB On</i>		
Date Performed	11/7/11		Jurisdiction <i>32-4.1</i>		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2010</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	55.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	55.0	
				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		
S	55.0		v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	pc/h/ln	
D = v _p / S	8.1		S	mph	
LOS	A		D = v _p / S	pc/mi/ln	
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-65 Northbound 11-3.1			
Agency/Company	Parsons				Weaving Segment Location	Btw Ali On & I64/I71 Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	PM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	One-Sided				Segment type	Freeway			
Weaving number of lanes, N	4				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	2100ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1900	0.92	33	0	1.5	1.2	0.858	1.00	2406
V_{RF}	2000	0.92	3	0	1.5	1.2	0.985	1.00	2207
V_{FR}	1100	0.92	3	0	1.5	1.2	0.985	1.00	1214
V_{RR}	1200	0.92	33	0	1.5	1.2	0.858	1.00	2406
V_{NW}	3730							V =	7151
V_W	3421								
VR	0.478								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	3 lc				Minimum weaving lane changes, LC_{MIN}	2428 lc/h			
Interchange density, ID	2.50 int/mi				Weaving lane changes, LC_W	3149 lc/h			
Minimum RF lane changes, LC_{RF}	2 lc/pc				Non-weaving lane changes, LC_{NW}	2521 lc/h			
Minimum FR lane changes, LC_{FR}	0 lc/pc				Total lane changes, LC_{ALL}	5670 lc/h			
Minimum RR lane changes, LC_{RR}	lc/pc				Non-weaving vehicle index, I_{NW}	0.495			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	7151 pc/h				Weaving intensity factor, W	0.495			
Weaving segment capacity, c_w	6280 veh/h				Weaving segment speed, S	42.0 mph			
Weaving segment v/c ratio	0.977				Average weaving speed, S_W	56.7 mph			
Weaving segment density, D	42.6 pc/mi/ln				Average non-weaving speed, S_{NW}	33.9 mph			
Level of Service, LOS	E				Maximum weaving length, L_{MAX}	6009 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-65 Southbound 12-6.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I64/I71 On & Jefferson Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	PM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	One-Sided				Segment type	Freeway			
Weaving number of lanes, N	4				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	2175ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1550	0.92	32	0	1.5	1.2	0.862	1.00	1954
V_{RF}	250	0.92	4	0	1.5	1.2	0.980	1.00	277
V_{FR}	1200	0.92	4	0	1.5	1.2	0.980	1.00	1330
V_{RR}	200	0.92	32	0	1.5	1.2	0.862	1.00	1954
V_{NW}	2176							V =	3783
V_W	1607								
VR	0.425								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	3 lc				Minimum weaving lane changes, LC_{MIN}	554 lc/h			
Interchange density, ID	2.70 int/mi				Weaving lane changes, LC_W	1324 lc/h			
Minimum RF lane changes, LC_{RF}	0 lc/pc				Non-weaving lane changes, LC_{NW}	857 lc/h			
Minimum FR lane changes, LC_{FR}	2 lc/pc				Total lane changes, LC_{ALL}	2181 lc/h			
Minimum RR lane changes, LC_{RR}	lc/pc				Non-weaving vehicle index, I_{NW}	0.226			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	3783 pc/h				Weaving intensity factor, W	0.226			
Weaving segment capacity, c_w	7083 veh/h				Weaving segment speed, S	54.1 mph			
Weaving segment v/c ratio	0.460				Average weaving speed, S_W	58.2 mph			
Weaving segment density, D	17.5 pc/mi/ln				Average non-weaving speed, S_{NW}	51.5 mph			
Level of Service, LOS	B				Maximum weaving length, L_{MAX}	5395 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-64 Eastbound 21-5.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I-65 On & Story Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	PM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	Two-Sided				Segment type	Freeway			
Weaving number of lanes, N	3				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	1425ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1860	0.92	5	0	1.5	1.2	0.976	1.00	2072
V_{RF}	190	0.92	1	0	1.5	1.2	0.995	1.00	208
V_{FR}	1540	0.92	6	0	1.5	1.2	0.971	1.00	1724
V_{RR}	160	0.92	5	0	1.5	1.2	0.976	1.00	2072
V_{NW}	4004							V =	4179
V_W	175								
VR	0.042								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	0 lc				Minimum weaving lane changes, LC_{MIN}	350 lc/h			
Interchange density, ID	2.00 int/mi				Weaving lane changes, LC_W	634 lc/h			
Minimum RF lane changes, LC_{RF}	lc/pc				Non-weaving lane changes, LC_{NW}	1019 lc/h			
Minimum FR lane changes, LC_{FR}	lc/pc				Total lane changes, LC_{ALL}	1653 lc/h			
Minimum RR lane changes, LC_{RR}	2 lc/pc				Non-weaving vehicle index, I_{NW}	0.254			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	4179 pc/h				Weaving intensity factor, W	0.254			
Weaving segment capacity, c_w	5681 veh/h				Weaving segment speed, S	51.1 mph			
Weaving segment v/c ratio	0.718				Average weaving speed, S_W	58.0 mph			
Weaving segment density, D	27.3 pc/mi/ln				Average non-weaving speed, S_{NW}	50.8 mph			
Level of Service, LOS	C				Maximum weaving length, L_{MAX}	6117 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-64 Westbound 22-2.1			
Agency/Company	Parsons				Weaving Segment Location	Btw Story On & I-65 Off			
Dale Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	PM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	Two-Sided				Segment type	Freeway			
Weaving number of lanes, N	3				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	1600ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1375	0.92	7	0	1.5	1.2	0.966	1.00	1547
V_{RF}	875	0.92	15	0	1.5	1.2	0.930	1.00	1022
V_{FR}	275	0.92	1	0	1.5	1.2	0.995	1.00	300
V_{RR}	175	0.92	7	0	1.5	1.2	0.966	1.00	1547
V_{NW}	2869							V =	3063
V_W	194								
VR	0.063								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	0 lc				Minimum weaving lane changes, LC_{MIN}	388 lc/h			
Interchange density, ID	1.80 int/mi				Weaving lane changes, LC_W	676 lc/h			
Minimum RF lane changes, LC_{RF}	lc/pc				Non-weaving lane changes, LC_{NW}	880 lc/h			
Minimum FR lane changes, LC_{FR}	lc/pc				Total lane changes, LC_{ALL}	1556 lc/h			
Minimum RR lane changes, LC_{RR}	2 lc/pc				Non-weaving vehicle index, I_{NW}	0.221			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	3063 pc/h				Weaving intensity factor, W	0.221			
Weaving segment capacity, c_w	5620 veh/h				Weaving segment speed, S	52.6 mph			
Weaving segment v/c ratio	0.527				Average weaving speed, S_W	58.2 mph			
Weaving segment density, D	19.4 pc/mi/ln				Average non-weaving speed, S_{NW}	52.3 mph			
Level of Service, LOS	B				Maximum weaving length, L_{MAX}	6319 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-64 Westbound 22-5.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I-65 On & 3rd Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	PM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	Two-Sided				Segment type	Freeway			
Weaving number of lanes, N	4				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_s	1425ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2340	0.92	8	0	1.5	1.2	0.962	1.00	2645
V_{RF}	360	0.92	3	0	1.5	1.2	0.985	1.00	397
V_{FR}	960	0.92	3	0	1.5	1.2	0.985	1.00	1059
V_{RR}	140	0.92	8	0	1.5	1.2	0.962	1.00	2645
V_{NW}	4101							V =	4255
V_W	154								
VR	0.036								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	0 lc				Minimum weaving lane changes, LC_{MIN}	154 lc/h			
Interchange density, ID	1.80 int/mi				Weaving lane changes, LC_W	631 lc/h			
Minimum RF lane changes, LC_{RF}	lc/pc				Non-weaving lane changes, LC_{NW}	847 lc/h			
Minimum FR lane changes, LC_{FR}	lc/pc				Total lane changes, LC_{ALL}	1478 lc/h			
Minimum RR lane changes, LC_{RR}	1 lc/pc				Non-weaving vehicle index, I_{NW}	0.233			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	4255 pc/h				Weaving intensity factor, W	0.233			
Weaving segment capacity, c_w	7481 veh/h				Weaving segment speed, S	53.9 mph			
Weaving segment v/c ratio	0.547				Average weaving speed, S_W	58.1 mph			
Weaving segment density, D	19.7 pc/mi/ln				Average non-weaving speed, S_{NW}	53.8 mph			
Level of Service, LOS	B				Maximum weaving length, L_{MAX}	6063 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst		Adams			Freeway/Dir of Travel		I-71 Northbound 31-2.1		
Agency/Company		Parsons			Weaving Segment Location		Btw I65SB On & I64EB Off		
Date Performed		10/28/2011			Analysis Year		2010		
Analysis Time Period		PM Peak Hour							
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration				Two-Sided		Segment type		Freeway	
Weaving number of lanes, N				2		Freeway minimum speed, S_{MIN}		50	
Weaving segment length, L_S				2220ft		Freeway maximum capacity, C_{IFL}		2300	
Freeway free-flow speed, FFS				60 mph		Terrain type		Level	
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1240	0.92	3	0	1.5	1.2	0.985	1.00	1368
V_{RF}	1060	0.92	6	0	1.5	1.2	0.971	1.00	1187
V_{FR}	760	0.92	5	0	1.5	1.2	0.976	1.00	847
V_{RR}	640	0.92	3	0	1.5	1.2	0.985	1.00	1368
V_{NW}	3402							V =	4125
V_W	723								
VR	0.175								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}				0 lc		Minimum weaving lane changes, LC_{MIN}		lc/h	
Interchange density, ID				2.30 int/mi		Weaving lane changes, LC_W		lc/h	
Minimum RF lane changes, LC_{RF}				lc/pc		Non-weaving lane changes, LC_{NW}		lc/h	
Minimum FR lane changes, LC_{FR}				lc/pc		Total lane changes, LC_{ALL}		lc/h	
Minimum RR lane changes, LC_{RR}				1 lc/pc		Non-weaving vehicle index, I_{NW}			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v				4125 pc/h		Weaving intensity factor, W			
Weaving segment capacity, c_w				3748 veh/h		Weaving segment speed, S		mph	
Weaving segment v/c ratio				1.084		Average weaving speed, S_W		mph	
Weaving segment density, D				pc/mi/ln		Average non-weaving speed, S_{NW}		mph	
Level of Service, LOS				F		Maximum weaving length, L_{MAX}		7417 ft	
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridges Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst	Adams				Freeway/Dir of Travel	I-71 Southbound 32-3.1			
Agency/Company	Parsons				Weaving Segment Location	Btw I64WB On & I65NB Off			
Date Performed	10/28/2011				Analysis Year	2010			
Analysis Time Period	PM Peak Hour								
Project Description <i>Ohio River Bridges Project</i>									
Inputs									
Weaving configuration	Two-Sided				Segment type	Freeway			
Weaving number of lanes, N	2				Freeway minimum speed, S_{MIN}	50			
Weaving segment length, L_S	1480ft				Freeway maximum capacity, C_{IFL}	2300			
Freeway free-flow speed, FFS	60 mph				Terrain type	Level			
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	460	0.92	6	0	1.5	1.2	0.971	1.00	515
V_{RF}	990	0.92	7	0	1.5	1.2	0.966	1.00	1114
V_{FR}	340	0.92	6	0	1.5	1.2	0.971	1.00	381
V_{RR}	710	0.92	6	0	1.5	1.2	0.971	1.00	515
V_{NW}	2010							V =	2836
V_W	826								
VR	0.291								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}	0 lc				Minimum weaving lane changes, LC_{MIN}	826 lc/h			
Interchange density, ID	2.20 int/mi				Weaving lane changes, LC_W	962 lc/h			
Minimum RF lane changes, LC_{RF}	1c/pc				Non-weaving lane changes, LC_{NW}	831 lc/h			
Minimum FR lane changes, LC_{FR}	1c/pc				Total lane changes, LC_{ALL}	1793 lc/h			
Minimum RR lane changes, LC_{RR}	1 lc/pc				Non-weaving vehicle index, I_{NW}	0.263			
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v	2836 pc/h				Weaving intensity factor, W	0.263			
Weaving segment capacity, c_w	3406 veh/h				Weaving segment speed, S	49.9 mph			
Weaving segment v/c ratio	0.808				Average weaving speed, S_W	57.9 mph			
Weaving segment density, D	28.4 pc/mi/ln				Average non-weaving speed, S_{NW}	47.2 mph			
Level of Service, LOS	D				Maximum weaving length, L_{MAX}	8622 ft			
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-65 NB Mainline		
Agency or Company	KTA		From/To Btw I-64/71 Off and I-64/71 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	1600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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}) 900 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
S 60.0 mph			x f _p)		
D = v _p / S 15.0 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	Tony Lewis		Highway/Direction of Travel	I-65 NB Mainline	
Agency or Company	KTA		From/To	North of I-64/71 On	
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year	2030 No Build	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.952	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}		mph
Rt-Side Lat. Clearance		ft	f _{LC}		mph
Number of Lanes, N	4		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	60.0	mph
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1113	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	60.0	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	Tony Lewis		Highway/Direction of Travel I-65 SB Mainline		
Agency or Company	KTA		From/To North of I-64/71 Off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	7700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	11	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.948		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2943	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	27.2	mph	S		
D = v _p / S	108.0	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	Tony Lewis		Highway/Direction of Travel	I-65 SB Mainline	
Agency or Company	KTA		From/To	Btw I-64/71 Off and I-64/71 On	
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year	2030 No Build	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	11	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.948	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	2		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	2351	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	49.8	mph	S		
D = v _p / S	47.2	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	Tony Lewis		Highway/Direction of Travel I-64 EB Mainline		
Agency or Company	KTA		From/To West of I-65 Off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridge Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	4600		veh/h	Peak-Hour Factor, PHF	0.92
AADT			veh/day	%Trucks and Buses, P _T	8
Peak-Hr Prop. of AADT, K				%RVs, P _R	0
Peak-Hr Direction Prop, D				General Terrain:	Level
DDHV = AADT x K x D			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)] 0.962	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width			ft		
Rt-Side Lat. Clearance			ft		
Number of Lanes, N	3			f _{LW}	mph
Total Ramp Density, TRD			ramps/mi	f _{LC}	mph
FFS (measured)	60.0		mph	TRD Adjustment	mph
Base free-flow Speed, BFFS			mph	FFS	60.0 mph
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1733		pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})	
S	59.7		mph	x f _p)	
D = v _p / S	29.0		pc/mi/ln	S	
LOS	D			D = v _p / S	
				Required Number of Lanes, N	
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel	I-64 EB Mainline	
Agency or Company	KTA		From/To	Btw River Rd. On and I-71 off	
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year	2030 No Build	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	2		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0	mph
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1800	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	59.3	mph	S		
D = v _p / S	30.4	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	Tony Lewis		Highway/Direction of Travel I-64 EB Mainline		
Agency or Company	KTA		From/To Btw Story Off and Mell. On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.952		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} 1997 x f _p) pc/h/ln			Design LOS		
S 57.1 mph			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p) pc/h/ln		
D = v _p / S 35.0 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		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-64 WB Mainline		
Agency or Company	KTA		From/To Btw Mell. Off and Story On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 2317 pc/h/ln			Design LOS		
S 50.7 mph			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
D = v _p / S 45.7 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		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-64 WB Mainline		
Agency or Company	KTA		From/To Btw I-71 On and I-65 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0 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		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S			x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
speed			f _p - Page 11-18		
DDHV - Directional design hour volume			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-64 WB Mainline		
Agency or Company	KTA		From/To West of 3rd Off		
Date Performed	12/12/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u> $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV})$ v_p 1612 pc/h/ln S 60.0 mph $D = v_p / S$ 26.9 pc/mi/ln LOS D			<u>Design (N)</u> Design LOS $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV})$ v_p pc/h/ln S mph $D = v_p / S$ pc/mi/ln Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service speed DDHV - Directional design hour volume			S - Speed D - Density FFS - Free-flow speed BFFS - Base free-flow speed E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11-13 f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2, 11-3 f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-71 NB Mainline		
Agency or Company	KTA		From/To Btw 1-64 WB Off and I-65 SB On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	1200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0 mph	
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	665	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	11.1	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	Tony Lewis		Highway/Direction of Travel I-71 NB Mainline		
Agency or Company	KTA		From/To North of I-64 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	2800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft	f _{LW}		mph
Rt-Side Lat. Clearance		ft	f _{LC}		mph
Number of Lanes, N	2		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	60.0	mph
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1575	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	60.0	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	Tony Lewis		Highway/Direction of Travel I-71 SB Mainline		
Agency or Company	KTA		From/To North of I-64 Off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4500		veh/h	Peak-Hour Factor, PHF	0.92
AADT			veh/day	%Trucks and Buses, P _T	5
Peak-Hr Prop. of AADT, K				%RVs, P _R	0
Peak-Hr Direction Prop, D				General Terrain:	Level
DDHV = AADT x K x D			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					
Rt-Side Lat. Clearance					
Number of Lanes, N	2				
Total Ramp Density, TRD					
FFS (measured)	60.0				
Base free-flow Speed, BFFS					
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		
2507 pc/h/ln			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 45.1 mph			pc/h/ln		
D = v _p / S			S mph		
55.6 pc/mi/ln			D = v _p / S		
LOS F			pc/mi/ln		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			S - Speed		
V - Hourly volume			D - Density		
v _p - Flow rate			FFS - Free-flow speed		
LOS - Level of service			BFFS - Base free-flow speed		
DDHV - Directional design hour volume					
			E _R - Exhibits 11-10, 11-12		
			f _{LW} - Exhibit 11-8		
			E _T - Exhibits 11-10, 11-11, 11-13		
			f _{LC} - Exhibit 11-9		
			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-71 SB Mainline		
Agency or Company	KTA		From/To Btw I-64 Off and I-64 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
			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		
1504	pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	60.0	mph	S		
D = v _p / S	25.1	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		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-71 SB Mainline		
Agency or Company	KTA		From/To Btw I-65 NB Off and I-64 EB On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	AM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	2		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	55.0	mph	FFS	55.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	1838	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	55.0	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					

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Tony Lewis Agency/Company KTA Date Performed 10/26/2011 Analysis Time Period AM					Freeway/Dir of Travel I-65 NB Weaving Segment Location Btw Ali On and I-64/71 Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration One-Sided Weaving number of lanes, N 4 Weaving segment length, L_S 2300ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S_{MIN} 50 Freeway maximum capacity, C_{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1587	0.92	10	0	1.5	1.2	0.952	1.00	1811
V_{RF}	914	0.92	3	0	1.5	1.2	0.985	1.00	1008
V_{FR}	565	0.92	6	0	1.5	1.2	0.971	1.00	633
V_{RR}	335	0.92	10	0	1.5	1.2	0.952	1.00	1811
V_{NW}	2179							V =	3820
V_W	1641								
VR	0.430								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 2 lc					Minimum weaving lane changes, LC_{MIN} 1266 lc/h				
Interchange density, ID 2.50 int/mi					Weaving lane changes, LC_W 2026 lc/h				
Minimum RF lane changes, LC_{RF} 2 lc/pc					Non-weaving lane changes, LC_{NW} 925 lc/h				
Minimum FR lane changes, LC_{FR} 0 lc/pc					Total lane changes, LC_{ALL} 2951 lc/h				
Minimum RR lane changes, LC_{RR} 1c/pc					Non-weaving vehicle index, I_{NW} 0.275				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 3820 pc/h					Weaving intensity factor, W 0.275				
Weaving segment capacity, c_w 5321 veh/h					Weaving segment speed, S 50.6 mph				
Weaving segment v/c ratio 0.684					Average weaving speed, S_W 57.8 mph				
Weaving segment density, D 18.9 pc/mi/ln					Average non-weaving speed, S_{NW} 46.3 mph				
Level of Service, LOS B					Maximum weaving length, L_{MAX} 7015 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Agency/Company KTA Date Performed 10/26/2011 Analysis Time Period AM					Freeway/Dir of Travel I-65 SB Weaving Segment Location Btw I-64/7 On and Jefferso Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration One-Sided Weaving number of lanes, N 4 Weaving segment length, L_s 2200ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S_{MIN} 50 Freeway maximum capacity, C_{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2080	0.92	5	0	1.5	1.2	0.976	1.00	2317
V_{RF}	2020	0.92	3	0	1.5	1.2	0.985	1.00	2229
V_{FR}	2476	0.92	2	0	1.5	1.2	0.990	1.00	2718
V_{RR}	1623	0.92	5	0	1.5	1.2	0.976	1.00	2317
V_{NW}	4090							V =	9037
V_W	4947								
VR	0.547								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 2 lc					Minimum weaving lane changes, LC_{MIN} lc/h				
Interchange density, ID 2.70 int/mi					Weaving lane changes, LC_W lc/h				
Minimum RF lane changes, LC_{RF} 0 lc/pc					Non-weaving lane changes, LC_{NW} lc/h				
Minimum FR lane changes, LC_{FR} 2 lc/pc					Total lane changes, LC_{ALL} lc/h				
Minimum RR lane changes, LC_{RR} lc/pc					Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 9037 pc/h					Weaving intensity factor, W				
Weaving segment capacity, c_w 4277 veh/h					Weaving segment speed, S mph				
Weaving segment v/c ratio 2.061					Average weaving speed, S_W mph				
Weaving segment density, D pc/mi/ln					Average non-weaving speed, S_{NW} mph				
Level of Service, LOS F					Maximum weaving length, L_{MAX} 8386 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel : I-64 EB				
Agency/Company KTA					Weaving Segment Location Btw I-71 On and Story Off				
Date Performed 12/13/2011					Analysis Year 2030 No Build				
Analysis Time Period AM									
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration Two-Sided					Segment type Freeway				
Weaving number of lanes, N 3					Freeway minimum speed, S_{MIN} 50				
Weaving segment length, L_s 1475ft					Freeway maximum capacity, C_{IFL} 2300				
Freeway free-flow speed, FFS 60 mph					Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1555	0.92	7	0	1.5	1.2	0.966	1.00	1749
V_{RF}	245	0.92	5	0	1.5	1.2	0.976	1.00	273
V_{FR}	1595	0.92	8	0	1.5	1.2	0.962	1.00	1803
V_{RR}	505	0.92	7	0	1.5	1.2	0.966	1.00	1749
V_{NW}	3825							V =	4382
V_W	557								
VR	0.127								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} 1114 lc/h				
Interchange density, ID 2.00 int/mi					Weaving lane changes, LC_W 1404 lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} 1010 lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} 2414 lc/h				
Minimum RR lane changes, LC_{RR} 2 lc/pc					Non-weaving vehicle index, I_{NW} 0.333				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 4382 pc/h					Weaving intensity factor, W 0.333				
Weaving segment capacity, c_w 5455 veh/h					Weaving segment speed, S 46.2 mph				
Weaving segment v/c ratio 0.776					Average weaving speed, S_w 57.5 mph				
Weaving segment density, D 31.6 pc/mi/ln					Average non-weaving speed, S_{NW} 45.0 mph				
Level of Service, LOS D					Maximum weaving length, L_{MAX} 6937 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Agency/Company KTA Date Performed 10/26/2011 Analysis Time Period AM					Freeway/Dir of Travel I-64 WB Weaving Segment Location Btw Story On and I-65 Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration Two-Sided Weaving number of lanes, N 3 Weaving segment length, L_s 1600ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S_{MIN} 50 Freeway maximum capacity, C_{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2526	0.92	3	0	1.5	1.2	0.985	1.00	2787
V_{RF}	1573	0.92	5	0	1.5	1.2	0.976	1.00	1753
V_{FR}	296	0.92	0	0	1.5	1.2	1.000	1.00	322
V_{RR}	304	0.92	3	0	1.5	1.2	0.985	1.00	2787
V_{NW}	4862							V =	5196
V_W	334								
VR	0.064								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} 668 lc/h				
Interchange density, ID 1.80 int/mi					Weaving lane changes, LC_W 956 lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} 1520 lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} 2476 lc/h				
Minimum RR lane changes, LC_{RR} 2 lc/pc					Non-weaving vehicle index, I_{NW} 0.319				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 5196 pc/h					Weaving intensity factor, W 0.319				
Weaving segment capacity, c_w 5728 veh/h					Weaving segment speed, S 47.4 mph				
Weaving segment v/c ratio 0.894					Average weaving speed, S_W 57.6 mph				
Weaving segment density, D 36.5 pc/mi/ln					Average non-weaving speed, S_{NW} 46.9 mph				
Level of Service, LOS E					Maximum weaving length, L_{MAX} 6328 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel				
Agency/Company KTA					I-64 WB				
Date Performed 12/13/2011					Weaving Segment Location Btw I-65 On and 3rd Off				
Analysis Time Period AM					Analysis Year 2030 No Build				
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration Two-Sided					Segment type Freeway				
Weaving number of lanes, N 4					Freeway minimum speed, S_{MIN} 50				
Weaving segment length, L_s 1466ft					Freeway maximum capacity, C_{IFL} 2300				
Freeway free-flow speed, FFS 60 mph					Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2720	0.92	4	0	1.5	1.2	0.980	1.00	3016
V_{RF}	1125	0.92	0	0	1.5	1.2	1.000	1.00	1223
V_{FR}	1580	0.92	3	0	1.5	1.2	0.985	1.00	1743
V_{RR}	675	0.92	4	0	1.5	1.2	0.980	1.00	3016
V_{NW}	5982							V =	6723
V_W	741								
VR	0.110								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} 741 lc/h				
Interchange density, ID 1.80 int/mi					Weaving lane changes, LC_W 1227 lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} 2013 lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} 3240 lc/h				
Minimum RR lane changes, LC_{RR} 1 lc/pc					Non-weaving vehicle index, I_{NW} 0.423				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 6723 pc/h					Weaving intensity factor, W 0.423				
Weaving segment capacity, c_w 7427 veh/h					Weaving segment speed, S 47.6 mph				
Weaving segment v/c ratio 0.887					Average weaving speed, S_W 57.0 mph				
Weaving segment density, D 35.3 pc/mi/ln					Average non-weaving speed, S_{NW} 46.6 mph				
Level of Service, LOS E					Maximum weaving length, L_{MAX} 6771 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel				
Agency/Company KTA					I-71 NB				
Date Performed 10/26/2011					Weaving Segment Location Btw I-65 SB On and I-64 Off				
Analysis Time Period AM					Analysis Year 2030 No Build				
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration Two-Sided					Segment type Freeway				
Weaving number of lanes, N 2					Freeway minimum speed, S_{MIN} 50				
Weaving segment length, L_s 2200ft					Freeway maximum capacity, C_{IFL} 2300				
Freeway free-flow speed, FFS 60 mph					Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	354	0.92	5	0	1.5	1.2	0.976	1.00	394
V_{RF}	846	0.92	5	0	1.5	1.2	0.976	1.00	943
V_{FR}	1960	0.92	2	0	1.5	1.2	0.990	1.00	2152
V_{RR}	441	0.92	5	0	1.5	1.2	0.976	1.00	394
V_{NW}	3489							V =	3973
V_W	484								
VR	0.122								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} lc/h				
Interchange density, ID 2.30 int/mi					Weaving lane changes, LC_W lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} lc/h				
Minimum RR lane changes, LC_{RR} 1 lc/pc					Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 3973 pc/h					Weaving intensity factor, W				
Weaving segment capacity, c_w 3789 veh/h					Weaving segment speed, S mph				
Weaving segment v/c ratio 1.023					Average weaving speed, S_W mph				
Weaving segment density, D pc/mi/ln					Average non-weaving speed, S_{NW} mph				
Level of Service, LOS F					Maximum weaving length, L_{MAX} 6885 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel				
Agency/Company KTA					I-71 SB				
Date Performed 10/26/2011					Weaving Segment Location Btw I-64 On and I-65 NB Off				
Analysis Time Period AM					Analysis Year 2030 No Build				
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration Two-Sided					Segment type Freeway				
Weaving number of lanes, N 2					Freeway minimum speed, S_{MIN} 50				
Weaving segment length, L_S 1500ft					Freeway maximum capacity, C_{IFL} 2300				
Freeway free-flow speed, FFS 60 mph					Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2032	0.92	1	0	1.5	1.2	0.995	1.00	2220
V_{RF}	668	0.92	4	0	1.5	1.2	0.980	1.00	741
V_{FR}	910	0.92	1	0	1.5	1.2	0.995	1.00	994
V_{RR}	1290	0.92	1	0	1.5	1.2	0.995	1.00	2220
V_{NW}	3955							V =	5406
V_W	1451								
VR	0.268								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} lc/h				
Interchange density, ID 2.20 int/mi					Weaving lane changes, LC_W lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} lc/h				
Minimum RR lane changes, LC_{RR} 1 lc/pc					Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 5406 pc/h					Weaving intensity factor, W				
Weaving segment capacity, c_w 3530 veh/h					Weaving segment speed, S mph				
Weaving segment v/c ratio 1.524					Average weaving speed, S_W mph				
Weaving segment density, D pc/mi/ln					Average non-weaving speed, S_{NW} mph				
Level of Service, LOS F					Maximum weaving length, L_{MAX} 8379 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-65 NB Mainline		
Agency or Company	KTA		From/To Btw I-64/71 Off and I-64/71 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	20	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.909		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}		mph
Rt-Side Lat. Clearance		ft	f _{LC}		mph
Number of Lanes, N	2		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	60.0	mph
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	2272	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	51.8	mph	x f _p)		
D = v _p / S	43.9	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	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	Tony Lewis		Highway/Direction of Travel I-65 NB Mainline		
Agency or Company	KTA		From/To North of I-64/71 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	7500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	15	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.930		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	4				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
E			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-65 SB Mainline		
Agency or Company	KTA		From/To North of I-64/71 Off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	21	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.905		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 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		
x f _p)	1922 pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	58.1 mph		x f _p)		
D = v _p / S	33.1 pc/mi/ln		S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-65 SB Mainline		
Agency or Company	KTA		From/To Btw I-64/71 Off and I-64/71 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2600		veh/h	Peak-Hour Factor, PHF	0.92
AADT			veh/day	%Trucks and Buses, P _T	25
Peak-Hr Prop. of AADT, K				%RVs, P _R	0
Peak-Hr Direction Prop, D				General Terrain:	Level
DDHV = AADT x K x D			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)] 0.889	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0		
			mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
1590 pc/h/ln			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S			x f _p)		
60.0 mph			S		
D = v _p / S			D = v _p / S		
26.5 pc/mi/ln			pc/mi/ln		
LOS			Required Number of Lanes, N		
D					
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		
FFS - Free-flow speed			f _p - Page 11-18		
BFFS - Base free-flow speed			TRD - Page 11-11		
DDHV - Directional design hour volume			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-64 EB Mainline		
Agency or Company	KTA		From/To West of I-65 Off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridge Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 2110			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 55.3			x f _p)		
D = v _p / S 38.2			S		
LOS E			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-64 EB Mainline		
Agency or Company	KTA		From/To Btw River Rd. On and I-71 off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}		mph
Rt-Side Lat. Clearance		ft	f _{LC}		mph
Number of Lanes, N	2		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	60.0	mph
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
	2463	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	46.5	mph	S		
D = v _p / S	53.0	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	Tony Lewis		Highway/Direction of Travel I-64 EB Mainline		
Agency or Company	KTA		From/To Btw Story Off and Mell. On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	3800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.957		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-64 WB Mainline		
Agency or Company	KTA		From/To Btw Mell. Off and Story On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.952	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	2		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
v _p	2168	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	54.1	mph	S		
D = v _p / S	40.0	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	Tony Lewis		Highway/Direction of Travel	I-64 WB Mainline	
Agency or Company	KTA		From/To	Btw I-71 On and I-65 On	
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year	2030 No Build	
Project Description Ohio River Bridges Project					
☒ Oper. (LOS)		☒ Des. (N)		☐ Planning Data	
Flow Inputs					
Volume, V	4000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	% Trucks and Buses, P_T	9	
Peak-Hr Prop. of AADT, K			% RVs, P_R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T-1) + P_R(E_R-1)]$	0.957	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f_{LW}	mph	
Rt-Side Lat. Clearance		ft	f_{LC}	mph	
Number of Lanes, N	2		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0	
FFS (measured)	60.0	mph		mph	
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
<u>Operational (LOS)</u>			<u>Design (N)</u>		
$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	2272	pc/h/ln	Design LOS		
S	51.8	mph	$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$	pc/h/ln	
$D = v_p / S$	43.9	pc/mi/ln	S	mph	
LOS	E		$D = v_p / S$	pc/mi/ln	
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E_R - Exhibits 11-10, 11-12	f_{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	Tony Lewis		Highway/Direction of Travel	I-64 WB Mainline	
Agency or Company	KTA		From/To	West of 3rd Off	
Date Performed	12/12/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year	2030 No Build	
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.957	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	3		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0 mph	
Base free-flow Speed, BFFS		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		
x f _p)	1855	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	58.8	mph	x f _p)		
D = v _p / S	31.5	pc/mi/ln	S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Tony Lewis		Highway/Direction of Travel I-71 NB Mainline		
Agency or Company	KTA		From/To Btw 1-64 WB Off and I-65 SB On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	2				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	mph
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1504	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p)		
D = v _p / S	25.1	pc/mi/ln	S		
LOS	C		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-71 NB Mainline		
Agency or Company	KTA		From/To North of I-64 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
			mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S	43.2	mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S	59.3	pc/mi/ln	S		
LOS	F		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-71 SB Mainline		
Agency or Company	KTA		From/To North of I-64 Off		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	2		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
v _p	2081	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	55.8	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	Tony Lewis		Highway/Direction of Travel I-71 SB Mainline		
Agency or Company	KTA		From/To Btw I-64 Off and I-64 On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 1170			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 60.0			x f _p)		
D = v _p / S 19.5			S		
LOS C			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
speed			f _p - Page 11-18		
DDHV - Directional design hour volume			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Tony Lewis		Highway/Direction of Travel I-71 SB Mainline		
Agency or Company	KTA		From/To Btw I-65 NB Off and I-64 EB On		
Date Performed	9/15/2011		Jurisdiction		
Analysis Time Period	PM		Analysis Year 2030 No Build		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft	f _{LW}		mph
Rt-Side Lat. Clearance		ft	f _{LC}		mph
Number of Lanes, N	2		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	55.0	mph
FFS (measured)	55.0	mph			
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	942	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	55.0	mph	S		
D = v _p / S	17.1	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					

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Tony Lewis Agency/Company KTA Date Performed 10/26/2011 Analysis Time Period PM					Freeway/Dir of Travel I-65 NB Weaving Segment Location Btw Ali On and I-64/71 Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration One-Sided Weaving number of lanes, N 4 Weaving segment length, L_s 2300ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S_{MIN} 50 Freeway maximum capacity, C_{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3603	0.92	6	0	1.5	1.2	0.971	1.00	4034
V_{RF}	997	0.92	2	0	1.5	1.2	0.990	1.00	1095
V_{FR}	2018	0.92	3	0	1.5	1.2	0.985	1.00	2226
V_{RR}	1082	0.92	6	0	1.5	1.2	0.971	1.00	4034
V_{NW}	5216							V =	8537
V_W	3321								
VR	0.389								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 2 lc					Minimum weaving lane changes, LC_{MIN} lc/h				
Interchange density, ID 2.50 int/mi					Weaving lane changes, LC_W lc/h				
Minimum RF lane changes, LC_{RF} 2 lc/pc					Non-weaving lane changes, LC_{NW} lc/h				
Minimum FR lane changes, LC_{FR} 0 lc/pc					Total lane changes, LC_{ALL} lc/h				
Minimum RR lane changes, LC_{RR} lc/pc					Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 8537 pc/h					Weaving intensity factor, W				
Weaving segment capacity, c_w 5990 veh/h					Weaving segment speed, S mph				
Weaving segment v/c ratio 1.384					Average weaving speed, S_W mph				
Weaving segment density, D pc/mi/ln					Average non-weaving speed, S_{NW} mph				
Level of Service, LOS F					Maximum weaving length, L_{MAX} 6558 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel				
Agency/Company KTA					I-65 SB				
Date Performed 10/26/2011					Weaving Segment Location				
Analysis Time Period PM					Btw I-64/7 On and Jefferso Off				
					Analysis Year				
					2030 No Build				
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration					Segment type				
Weaving number of lanes, N					Freeway				
Weaving segment length, L_s					Freeway minimum speed, S_{MIN}				
Freeway free-flow speed, FFS					Freeway maximum capacity, C_{IFL}				
					Terrain type				
					Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1500	0.92	10	0	1.5	1.2	0.952	1.00	1712
V_{RF}	1100	0.92	5	0	1.5	1.2	0.976	1.00	1226
V_{FR}	1401	0.92	3	0	1.5	1.2	0.985	1.00	1546
V_{RR}	1099	0.92	10	0	1.5	1.2	0.952	1.00	1712
V_{NW}	2919							V =	5691
V_W	2772								
VR	0.487								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL}					Minimum weaving lane changes, LC_{MIN}				
Interchange density, ID					Weaving lane changes, LC_W				
Minimum RF lane changes, LC_{RF}					Non-weaving lane changes, LC_{NW}				
Minimum FR lane changes, LC_{FR}					Total lane changes, LC_{ALL}				
Minimum RR lane changes, LC_{RR}					Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v					Weaving intensity factor, W				
Weaving segment capacity, c_w					Weaving segment speed, S				
Weaving segment v/c ratio					Average weaving speed, S_W				
Weaving segment density, D					Average non-weaving speed, S_{NW}				
Level of Service, LOS					Maximum weaving length, L_{MAX}				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Agency/Company KTA Date Performed 12/13/2011 Analysis Time Period PM					Freeway/Dir of Travel I-64 EB Weaving Segment Location Btw I-71 On and Story Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration Two-Sided Weaving number of lanes, N 3 Weaving segment length, L _s 1475ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S _{MIN} 50 Freeway maximum capacity, C _{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E _T	E _R	f _{HV}	f _p	v (pc/h)
V _{FF}	2215	0.92	5	0	1.5	1.2	0.976	1.00	2468
V _{RF}	185	0.92	5	0	1.5	1.2	0.976	1.00	206
V _{FR}	1615	0.92	5	0	1.5	1.2	0.976	1.00	1799
V _{RR}	285	0.92	5	0	1.5	1.2	0.976	1.00	2468
V _{NW}	4473							V =	4800
V _W	327								
VR	0.068								
Configuration Characteristics									
Minimum maneuver lanes, N _{WL} 0 lc					Minimum weaving lane changes, LC _{MIN} 654 lc/h				
Interchange density, ID 2.00 int/mi					Weaving lane changes, LC _W 944 lc/h				
Minimum RF lane changes, LC _{RF} lc/pc					Non-weaving lane changes, LC _{NW} 1189 lc/h				
Minimum FR lane changes, LC _{FR} lc/pc					Total lane changes, LC _{ALL} 2133 lc/h				
Minimum RR lane changes, LC _{RR} 2 lc/pc					Non-weaving vehicle index, I _{NW} 0.302				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 4800 pc/h					Weaving intensity factor, W 0.302				
Weaving segment capacity, c _w 5637 veh/h					Weaving segment speed, S 48.2 mph				
Weaving segment v/c ratio 0.831					Average weaving speed, S _w 57.7 mph				
Weaving segment density, D 33.2 pc/mi/ln					Average non-weaving speed, S _{NW} 47.6 mph				
Level of Service, LOS D					Maximum weaving length, L _{MAX} 6365 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel				
Agency/Company KTA					I-64 WB				
Date Performed 10/26/2011					Weaving Segment Location				
Analysis Time Period PM					2030 No Build				
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration Two-Sided					Segment type Freeway				
Weaving number of lanes, N 3					Freeway minimum speed, S_{MIN} 50				
Weaving segment length, L_S 1600ft					Freeway maximum capacity, C_{IFL} 2300				
Freeway free-flow speed, FFS 60 mph					Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2383	0.92	4	0	1.5	1.2	0.980	1.00	2642
V_{RF}	1417	0.92	4	0	1.5	1.2	0.980	1.00	1571
V_{FR}	177	0.92	1	0	1.5	1.2	0.995	1.00	193
V_{RR}	323	0.92	4	0	1.5	1.2	0.980	1.00	2642
V_{NW}	4406							V =	4759
V_W	353								
VR	0.074								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} 706 lc/h				
Interchange density, ID 1.80 int/mi					Weaving lane changes, LC_W 994 lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} 1197 lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} 2191 lc/h				
Minimum RR lane changes, LC_{RR} 2 lc/pc					Non-weaving vehicle index, I_{NW} 0.290				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 4759 pc/h					Weaving intensity factor, W 0.290				
Weaving segment capacity, c_w 5679 veh/h					Weaving segment speed, S 47.9 mph				
Weaving segment v/c ratio 0.822					Average weaving speed, S_W 57.8 mph				
Weaving segment density, D 33.1 pc/mi/ln					Average non-weaving speed, S_{NW} 47.3 mph				
Level of Service, LOS D					Maximum weaving length, L_{MAX} 6423 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Agency/Company KTA Date Performed 12/13/2011 Analysis Time Period PM					Freeway/Dir of Travel I-64 WB Weaving Segment Location Btw I-65 On and 3rd Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration Two-Sided Weaving number of lanes, N 4 Weaving segment length, L _s 1466ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S _{MIN} 50 Freeway maximum capacity, C _{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E _T	E _R	f _{HV}	f _p	v (pc/h)
V _{FF}	3615	0.92	3	0	1.5	1.2	0.985	1.00	3988
V _{RF}	410	0.92	1	0	1.5	1.2	0.995	1.00	448
V _{FR}	1285	0.92	4	0	1.5	1.2	0.980	1.00	1425
V _{RR}	290	0.92	3	0	1.5	1.2	0.985	1.00	3988
V _{NW}	5861							V =	6181
V _W	320								
VR	0.052								
Configuration Characteristics									
Minimum maneuver lanes, N _{WL} 0 lc					Minimum weaving lane changes, LC _{MIN} 320 lc/h				
Interchange density, ID 1.80 int/mi					Weaving lane changes, LC _W 806 lc/h				
Minimum RF lane changes, LC _{RF} lc/pc					Non-weaving lane changes, LC _{NW} 1901 lc/h				
Minimum FR lane changes, LC _{FR} lc/pc					Total lane changes, LC _{ALL} 2707 lc/h				
Minimum RR lane changes, LC _{RR} 1 lc/pc					Non-weaving vehicle index, I _{NW} 0.367				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 6181 pc/h					Weaving intensity factor, W 0.367				
Weaving segment capacity, c _w 7633 veh/h					Weaving segment speed, S 50.6 mph				
Weaving segment v/c ratio 0.798					Average weaving speed, S _w 57.3 mph				
Weaving segment density, D 30.5 pc/mi/ln					Average non-weaving speed, S _{NW} 50.3 mph				
Level of Service, LOS D					Maximum weaving length, L _{MAX} 6210 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst Agency/Company KTA Date Performed 10/26/2011 Analysis Time Period PM					Freeway/Dir of Travel I-71 NB Weaving Segment Location Btw I-65 SB On and I-64 Off Analysis Year 2030 No Build				
Project Description <i>Ohio River Bridge Project</i>									
Inputs									
Weaving configuration Two-Sided Weaving number of lanes, N 2 Weaving segment length, L _s 2200ft Freeway free-flow speed, FFS 60 mph					Segment type Freeway Freeway minimum speed, S _{MIN} 50 Freeway maximum capacity, C _{IFL} 2300 Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E _T	E _R	f _{HV}	f _p	v (pc/h)
V _{FF}	1518	0.92	3	0	1.5	1.2	0.985	1.00	1675
V _{RF}	1182	0.92	5	0	1.5	1.2	0.976	1.00	1317
V _{FR}	1488	0.92	1	0	1.5	1.2	0.995	1.00	1625
V _{RR}	313	0.92	3	0	1.5	1.2	0.985	1.00	1675
V _{NW}	4617							V =	4961
V _W	344								
VR	0.069								
Configuration Characteristics									
Minimum maneuver lanes, N _{WL} 0 lc					Minimum weaving lane changes, LC _{MIN} lc/h				
Interchange density, ID 2.30 int/mi					Weaving lane changes, LC _W lc/h				
Minimum RF lane changes, LC _{RF} lc/pc					Non-weaving lane changes, LC _{NW} lc/h				
Minimum FR lane changes, LC _{FR} lc/pc					Total lane changes, LC _{ALL} lc/h				
Minimum RR lane changes, LC _{RR} 1 lc/pc					Non-weaving vehicle index, I _{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 4961 pc/h					Weaving intensity factor, W				
Weaving segment capacity, c _w 3901 veh/h					Weaving segment speed, S mph				
Weaving segment v/c ratio 1.253					Average weaving speed, S _W mph				
Weaving segment density, D pc/mi/ln					Average non-weaving speed, S _{NW} mph				
Level of Service, LOS F					Maximum weaving length, L _{MAX} 6377 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

Ohio River Bridge Project

FREEWAY WEAVING WORKSHEET									
General Information					Site Information				
Analyst					Freeway/Dir of Travel				
Agency/Company KTA					I-71 SB				
Date Performed 10/26/2011					Weaving Segment Location Btw I-64 On and I-65 NB Off				
Analysis Time Period PM					Analysis Year 2030 No Build				
Project Description Ohio River Bridge Project									
Inputs									
Weaving configuration Two-Sided					Segment type Freeway				
Weaving number of lanes, N 2					Freeway minimum speed, S_{MIN} 50				
Weaving segment length, L_s 1500ft					Freeway maximum capacity, C_{IFL} 2300				
Freeway free-flow speed, FFS 60 mph					Terrain type Level				
Conversions to pc/h Under Base Conditions									
	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1356	0.92	2	0	1.5	1.2	0.990	1.00	1489
V_{RF}	745	0.92	3	0	1.5	1.2	0.985	1.00	822
V_{FR}	364	0.92	1	0	1.5	1.2	0.995	1.00	398
V_{RR}	1536	0.92	2	0	1.5	1.2	0.990	1.00	1489
V_{NW}	2709							V =	4412
V_W	1703								
VR	0.386								
Configuration Characteristics									
Minimum maneuver lanes, N_{WL} 0 lc					Minimum weaving lane changes, LC_{MIN} lc/h				
Interchange density, ID 2.20 int/mi					Weaving lane changes, LC_W lc/h				
Minimum RF lane changes, LC_{RF} lc/pc					Non-weaving lane changes, LC_{NW} lc/h				
Minimum FR lane changes, LC_{FR} lc/pc					Total lane changes, LC_{ALL} lc/h				
Minimum RR lane changes, LC_{RR} 1 lc/pc					Non-weaving vehicle index, I_{NW}				
Weaving Segment Speed, Density, Level of Service, and Capacity									
Weaving segment flow rate, v 4412 pc/h					Weaving intensity factor, W				
Weaving segment capacity, c_w 3319 veh/h					Weaving segment speed, S mph				
Weaving segment v/c ratio 1.316					Average weaving speed, S_W mph				
Weaving segment density, D pc/mi/ln					Average non-weaving speed, S_{NW} mph				
Level of Service, LOS F					Maximum weaving length, L_{MAX} 9657 ft				
Notes									
a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".									
b. For volumes that exceed the weaving segment capacity, the level of service is "F".									

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-64 Northbound	
Agency or Company	Parsons		From/To	Sherman Minton Bridge NB	
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year	2030	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	15	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.930	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0	
FFS (measured)	60.0	mph		mph	
Base free-flow Speed, BFFS		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		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S			x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Southbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	6700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
x f _p)	2525	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	44.5	mph	x f _p)		
D = v _p / S	56.8	pc/mi/ln	S		
LOS	F		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-64 Northbound	
Agency or Company	Parsons		From/To	Sherman Minton Bridge NB	
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year	2030	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	6700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.952	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0	
FFS (measured)	60.0	mph		mph	
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	2549	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	43.6	mph	x f _p)		
D = v _p / S	58.4	pc/mi/ln	S		
LOS	F		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel <i>I-64 Southbound</i>		
Agency or Company	Parsons		From/To <i>Sherman Minton Bridge SB</i>		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2030</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	13	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.939		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	3				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1466	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p)		
D = v _p / S	24.4	pc/mi/ln	S		
LOS	C		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Persons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 No-Action
Analysis Time Period	AM Peak	Analysis Year	
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper (LOS)		☐ Des. (N) ☐ Plan. (vp)	
Flow Inputs			
Volume, V (veh/h)	720	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P_R	0
Peak-Hour Direction Prop. D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (m)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{wv} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{LC} (mi/h)	
Access Points, A (A/mi)	0	f_A (mi/h)	
Median Type, M		f_M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	393	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	8.7	Max Service Flow Rate (pc/h/ln)	
LOS	A	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	391.3
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	1.92
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
☒ General Information		☐ Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 No-Action
Analysis Time Period	AM Peak	Analysis Year	
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N)	
☐ Plan (vp)			
Flow Inputs			
Volume, V (veh/h)	1680	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{wv}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{wv} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{lc} (mi/h)	
Access Points, A (A/mi)	0	f_a (mi/h)	
Median Type, M		f_m (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations			
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	917	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	20.4	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	917.0
Effective width, W_E (Eq. 15-39) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	1.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.35
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information Analyst: J Sherman Agency or Company: Parsons Date Performed: 12/30/2011 Analysis Time Period: PM Peak Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)		Site Information Highway/Direction to Travel: US 31 Clark Bridge From/To: Bridge Jurisdiction: 2030 No-Action Analysis Year: 2030 No-Action	
☒ Oper. (LOS) ☐ Des. (N) ☐ Plan. (vp)			
Flow Inputs Volume, V (veh/h): 1980 AADT (veh/h): 1980 Peak-Hour Factor, PHF: 0.92 %Trucks and Buses, P _T : 1 %RVs, P _R : 0 Level: Level General Terrain: Level Grade: 0.00 Length (mi): 0.00 Up/Down %: 0.00 Number of Lanes: 2 Driver Type Adjustment: 1.00			
Calculate Flow Adjustments f _p : 1.00 E _R : 1.2 E _T : 1.5 f _w : 0.995			
Speed Inputs Lane Width, LW (ft): 12.0 Total Lateral Clearance, LC (ft): 12.0 Access Points, A (A/mi): 0 Median Type, M: 45.0 FFS (measured): 45.0 Base Free-Flow Speed, BFFS: 45.0			
Calc Speed Adj and FFS f _w (mi/h): f _{LC} (mi/h): f _A (mi/h): f _M (mi/h): FFS (mi/h): 45.0			
Operations Operational (LOS): Flow Rate, V _p (pc/h): 1081 Speed, S (mi/h): 45.0 D (pc/mi/h): 24.0 LOS: C			
Design Design (N): Required Number of Lanes, N: Flow Rate, v _p (pc/h): Max Service Flow Rate (pc/h): Design LOS:			
Bicycle Level of Service			

Directional demand flow rate in outside lane, V _{OL} (Eq. 15-24) veh/h	1076.1
Effective width, W _e (Eq. 15-29) ft	24.00
Effective speed factor, S _f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.44
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 No-Action
Analysis Time Period	PM Peak	Analysis Year	
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper (LOS)		☐ Des. (N) ☐ Plan. (vp)	
Flow Inputs			
Volume, V (veh/h)	1320	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		% Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/h)		% RVs, P_R	0
Peak-Hour Direction Prop. D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{vw} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{LC} (mi/h)	
Access Points, A (A/mi)	0	f_A (mi/h)	
Median Type, M		f_M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations			
Design			
Operational (LOS)		Design (N)	
Flow Rate, V_p (pc/h/ln)	720	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/h)	16.0	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	717.4
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.23
Bicycle level of service (Exhibit 15-4)	B

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Northbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	13	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.939		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1003	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p)		
D = v _p / S	16.7	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Southbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	3		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
v _p	1987	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	57.3	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	Adams		Highway/Direction of Travel I-64 Northbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☒ Planning Data	
Flow Inputs					
Volume, V	6000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.962	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	3		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		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		
v _p	2261	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	52.1	mph	S		
D = v _p / S	43.4	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	Adams		Highway/Direction of Travel I-64 Southbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	11	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.948		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 1529			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 60.0			x f _p)		
D = v _p / S 25.5			S		
LOS C			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 FEIS
Analysis Time Period	AM Peak	Analysis Year	
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N)	
☐ Plan. (yp)			
Flow Inputs			
Volume, V (veh/h)	600	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (m)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{wv}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	Calc Speed Adj and FFS	
Total Lateral Clearance, LC (ft)	12.0	f_{wv} (mi/h)	
Access Points, A (A/mi)	0	f_{lc} (mi/h)	
Median Type, M		f_a (mi/h)	
FFS (measured)	45.0	f_m (mi/h)	
Base Free-Flow Speed, BFFS		FFS (mi/h)	45.0
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	327	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	7.3	Max Service Flow Rate (pc/h/ln)	
LOS	A	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	1261
Effective width, W_e (Eq. 15-28) ft	24.00
Effective speed factor, S_e (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	1.83
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 FEIS
Analysis Time Period	AM Peak	Analysis Year	
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper (LOS)		☐ Des. (N)	
☐ Plan. (vp)			
Flow Inputs			
Volume, V (veh/h)	2000	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		% Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		% RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain: Level	
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{AV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{LW} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{LC} (mi/h)	
Access Points, A (A/mi)	0	f_A (mi/h)	
Median Type, M		f_M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations		Design	
Operational LOS		Design (N)	
Flow Rate, v_p (pc/h/ln)	1092	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	24.3	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	1097.0
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_e (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.44
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 FEIS
Analysis Time Period	PM Peak	Analysis Year	
Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N)	
☐ Plan. (vp)			
Flow Inputs			
Volume, V (veh/h)	2100	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P _T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P _R	0
Peak-Hour Direction Prop, D		General Terrain: Level	
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f _{LW} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f _{LC} (mi/h)	
Access Points, A (A/mi)	0	f _A (mi/h)	
Median Type, M		f _M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v _p (pc/h/ln)	1147	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v _p (pc/h)	
D (pc/mi/h)	25.5	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V _{OL} (Eq. 15-24) veh/h	1147.3
Effective width, W _e (Eq. 15-29) ft	24.00
Effective speed factor, S _e (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.47
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 FEIS
Analysis Time Period	PM Peak	Analysis Year	
Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N) ☐ Plan. (vp)	
Flow Inputs			
Volume, V (veh/h)	1400	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		% Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		% RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	Calc Speed Adj and FFS	
Total Lateral Clearance, LC (ft)	12.0	f_{LW} (mi/h)	
Access Points, A (A/mi)	0	f_{LC} (mi/h)	
Median Type, M		f_A (mi/h)	
FFS (measured)	45.0	f_M (mi/h)	
Base Free-Flow Speed, BFFS		FFS (mi/h)	45.0
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	764	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	17.0	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	760 p
Effective width, W_e (Eq. 15-29) ft	21.00
Effective speed factor, S_f (Eq. 15-30)	1.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.26
Bicycle level of service (Exhibit 15-4)	B

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Northbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.952		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	6				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 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		
	571	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	9.5	pc/mi/ln	D = v _p / S		
LOS	A		Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Southbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	8300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.962	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	6		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1564	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	60.0	mph	S		
D = v _p / S	26.1	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	Adams		Highway/Direction of Travel <i>I-65 Northbound</i>		
Agency or Company	Parsons		From/To <i>Kennedy Bridge</i>		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2030 FEIS</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	8100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	12	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.943		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	6				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0	
				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		
v _p	1555	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p		
D = v _p / S	25.9	pc/mi/ln	S		
LOS	C		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-65 Southbound	
Agency or Company	Parsons		From/To	Kennedy Bridge	
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year	2030 FEIS	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	19	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.913	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	6		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
v _p	893	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			x f _p)		
S	60.0	mph	S		
D = v _p / S	14.9	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	Adams		Highway/Direction of Travel I-265 Northbound		
Agency or Company	Parsons		From/To East End Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	5	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	65.0	
				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		
v _p	1560	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	64.6	mph	x f _p		
D = v _p / S	24.1	pc/mi/ln	S		
LOS	C		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-265 Southbound		
Agency or Company	Parsons		From/To East End Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.962	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	65.0 mph	
FFS (measured)	65.0	mph			
Base free-flow Speed, BFFS		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		
v _p	716	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	65.0	mph	S		
D = v _p / S	11.0	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	Adams		Highway/Direction of Travel I-265 Northbound		
Agency or Company	Parsons		From/To East End Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.957	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}	mph	
Number of Lanes, N	3		f _{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	65.0	mph	FFS	65.0 mph	
Base free-flow Speed, BFFS		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		
	833	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	65.0	mph	x f _p)		
D = v _p / S	12.8	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel I-265 Southbound		
Agency or Company	Parsons		From/To East End Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 FEIS		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.971	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}		mph
Rt-Side Lat. Clearance		ft	f _{LC}		mph
Number of Lanes, N	3		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	65.0	mph
FFS (measured)	65.0	mph			
Base free-flow Speed, BFFS		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		
v _p	1679	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	63.9	mph	x f _p		
D = v _p / S	26.3	pc/mi/ln	S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	JJS		Highway/Direction of Travel WB I-64		
Agency or Company	Parsons		From/To Sherman Minton Bridge		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year 2030 Mod Pref with Tolls		
Project Description Ohio River Bridges					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	13	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.939		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 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		
1235	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	20.6 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		
V - Hourly volume	D - Density		E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate	FFS - Free-flow speed		f _{LW} - Exhibit 11-8		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel SB I-64		
Agency or Company	Parsons		From/To Sherman Minton Bridge		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year 2030 Mod Pref with Tolls		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel WB I-64		
Agency or Company	Parsons		From/To Sherman Minton Bridge		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year 2030 Mod Pref with Tolls		
Project Description Ohio River Bridges					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	6100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 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		
v _p	2299	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	51.1	mph	x f _p)		
D = v _p / S	45.0	pc/mi/ln	S		
LOS	E		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel SB I-64		
Agency or Company	Parsons		From/To Sherman Minton Bridge		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year 2030 Mod Pref with Tolls		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	11	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.948		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 1835 pc/h/ln			Design LOS		
S 59.0 mph			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
D = v _p / S 31.1 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		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parrsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 Mod Prof
Analysis Time Period	AM Peak	Analysis Year	
Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS) ☐ Des. (N) ☐ Plan. (vp)			
Flow Inputs			
Volume, V (veh/h)	1100	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		% Trucks and Buses, P _T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P _R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f _{LV} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f _{LC} (mi/h)	
Access Points, A (A/mi)	0	f _A (mi/h)	
Median Type, M		f _M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations			
Design			
Design (N)			
Operational (LOS)			
Flow Rate, v _p (pc/hln)	600	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v _p (pc/h)	
D (pc/mi/h)	13.3	Max Service Flow Rate (pc/hln)	
LOS	B	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h	397.8
Effective width, W _e (Eq. 15-29) ft	24.00
Effective speed factor, S _f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.14
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
☐ X			
General Information			
Analyst	J Sherman	Site Information	
Agency or Company	Parsons	Highway/Direction to Travel	US 31 Clark Bridge
Date Performed	12/30/2011	Front/To	Bridge
Analysis Time Period	AM Peak	Jurisdiction	2030 Mod Pref
Project Description	Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)		
☒ Oper. (LOS)		☐ Des. (N)	
Flow Inputs			
Volume, V (veh/h)	2100	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P _T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P _R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{iw}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f _w (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f _{LC} (mi/h)	
Access Points, A (A/mi)	0	f _A (mi/h)	
Median Type, M		f _M (mi/h)	
FFS (measured)	45.0	f _M (mi/h)	
Base Free-Flow Speed, BFFS		FFS (mi/h)	45.0
Operations			
Design			
Operational (LOS)		Design (N)	
Flow Rate, v _p (pc/h/ln)	1147	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v _p (pc/h)	
D (pc/mi/ln)	25.5	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V _{OL} (Eq. 15-24) veh/h	1141.3
Effective width, W _e (Eq. 15-29) ft	24.00
Effective speed factor, S _f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.47
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information Analyst: J Sherman Agency or Company: Parsons Date Performed: 12/30/2011 Analysis Time Period: PM Peak Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)		Site Information Highway/Direction to Travel: US 31 Clark Bridge From/To: Bridge Jurisdiction: 2030 Mod Pref Analysis Year:	
☒ Oper. (LOS)		☐ Des. (N)	
Flow Inputs			
Volume, V (veh/h)	2200	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		% Trucks and Buses, P _T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P _R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{lv}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f _{lv} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f _{lc} (mi/h)	
Access Points, A (A/mi)	0	f _a (mi/h)	
Median Type, M		f _{lt} (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations			
Operational (LOS)		Design (N)	
Flow Rate, v _p (pc/h/ln)	1201	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v _p (pc/h)	
D (pc/mi/ln)	26.7	Max Service Flow Rate (pc/h/ln)	
LOS	D	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, v _o (Eq. 15-24) veh/h	1191.7
Effective width, W _e (Eq. 15-29) ft	24.00
Effective speed factor, S _f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.49
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 Mod Pref
Analysis Time Period	PM Peak	Analysis Year	
Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N) ☐ Plan. (vp)	
Flow Inputs			
Volume, V (veh/h)	1600	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		%Trucks and Buses, P _T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P _R	0
Peak-Hour Direction Prop, D		General Terrain: Level	
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _w	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f _w (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f _{LC} (mi/h)	
Access Points, A (A/mi)	0	f _A (mi/h)	
Median Type, M		f _M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v _p (pc/h/ln)	873	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v _p (pc/h)	
D (pc/mi/ln)	19.4	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, v _o (Eq. 15-24) veh/h	859.6
Effective width, W _e (Eq. 15-23) ft	24.00
Effective speed factor, S _f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.33
Bicycle level of service (Exhibit 15-4)	B

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel <i>NB I-65</i>		
Agency or Company	Parsons		From/To <i>Kennedy Bridge</i>		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year <i>2030 Mod Pref with Tolls</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	15	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.930		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	6				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel <i>SB I-65</i>		
Agency or Company	Parsons		From/To <i>Kennedy Bridge</i>		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year <i>2030 Mod Pref with Tolls</i>		
Project Description <i>Ohio River Bridges</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	7700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	6				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
f _{LW}			mph		
f _{LC}			mph		
TRD Adjustment			mph		
FFS			60.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
1451 pc/h/ln			Required Number of Lanes, N		
60.0 mph			pc/h/ln		
24.2 pc/mi/ln			mph		
C			pc/mi/ln		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
S - Speed			TRD - Page 11-11		
D - Density			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel NB I-65		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year 2030 Mod Pref with Tolls		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	7900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	12	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.943		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	6				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0 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		
1517	pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
S	60.0 mph		pc/h/ln		
D = v _p / S	25.3 pc/mi/ln		S		
LOS	C		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel SB I-65		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year 2030 Mod Pref with Tolls		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	23	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.897		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	6		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	60.0	mph	FFS	60.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
	727	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	60.0	mph	x f _p)		
D = v _p / S	12.1	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	JJS		Highway/Direction of Travel <i>WB I-265</i>		
Agency or Company	Parsons		From/To <i>East End Bridge</i>		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year <i>2030 Mod Preferred with Tolls</i>		
Project Description <i>Ohio river Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 65.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1847 pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	62.2 mph		x f _p)		
D = v _p / S	29.7 pc/mi/ln		S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel <i>EB I-265</i>		
Agency or Company	Parsons		From/To <i>East End Bridge</i>		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	AM Peak		Analysis Year <i>2030 Mod Pref with Tolls</i>		
Project Description					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	1700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	4	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			65.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
942	pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	65.0	mph	x f _p)		
D = v _p / S	14.5	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel <i>WB I-265</i>		
Agency or Company	Parsons		From/To <i>East End Bridge</i>		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year <i>2030 Mod Pref with Tolls</i>		
Project Description <i>Ohio river Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2000	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 65.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	JJS		Highway/Direction of Travel <i>EB I-265</i>		
Agency or Company	Parsons		From/To <i>East End Bridge</i>		
Date Performed	7/7/2011		Jurisdiction		
Analysis Time Period	PM Peak		Analysis Year <i>2030 Mod Pref with Tolls</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3600	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	7	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	2				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	65.0 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}) 2025			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 59.5 mph			x f _p)		
D = v _p / S 34.1			S mph		
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		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Northbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	14	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.935		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV}) 930 pc/h/ln			Design LOS		
S 60.0 mph			v _p = (V or DDHV) / (PHF x N x f _{HV}) pc/h/ln		
D = v _p / S 15.5 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		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-64 Southbound	
Agency or Company	Parsons		From/To	Sherman Minton Bridge SB	
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year	2030 East End	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.971	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
	1941	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
x f _p)			pc/h/ln		
S	57.9	mph	S		
D = v _p / S	33.5	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	Adams		Highway/Direction of Travel <i>I-64 Northbound</i>		
Agency or Company	Parsons		From/To <i>Sherman Minton Bridge NB</i>		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2030 East End</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☒ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5800	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	2186	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	53.8	mph	x f _p)		
D = v _p / S	40.7	pc/mi/ln	S		
LOS	E		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Southbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☒ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	3900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P_T	11	
Peak-Hr Prop. of AADT, K			%RVs, P_R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
			Up/Down %		
Calculate Flow Adjustments					
f_p	1.00		E_R	1.2	
E_T	1.5		$f_{HV} = 1/[1+P_T(E_T-1)+P_R(E_R-1)]$	0.948	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}	mph	
Number of Lanes, N	3		f_{LC}	mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment	mph	
FFS (measured)	60.0	mph	FFS	60.0 mph	
Base free-flow Speed, BFFS		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	1491	pc/h/ln	v_p	pc/h/ln	
S	60.0	mph	S	mph	
$D = v_p / S$	24.9	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					

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information Analyst: Adams Agency or Company: Parsons Date Performed: 12/30/2011 Analysis Time Period: AM Peak Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)		Site Information Highway/Direction to Travel: US 31 Clark Bridge From/To: Bridge Jurisdiction: 2030 East End Analysis Year: 2030	
☒ Oper. (LOS) ☐ Des. (N) ☐ Plan. (vp)			
Flow Inputs Volume, V (veh/h): 720 Peak-Hour Factor, PHF: 0.92 AADT(veh/h): %Trucks and Buses, P _T : 1 Peak-Hour Prop of AADT (veh/h): %RVs, P _R : 0 Peak-Hour Direction Prop, D: General Terrain: Level DDHV (veh/h): Grade Length (mi): 0.00 Driver Type Adjustment: 1.00 Up/Down %: 0.00 Number of Lanes: 2			
Calculate Flow Adjustments f _p : 1.00 E _R : 1.2 E _T : 1.5 f _{adj} : 0.995			
Speed Inputs Lane Width, LW (ft): 12.0 Total Lateral Clearance, LC (ft): 12.0 Access Points, A (A/mi): 0 Median Type, M: FFS (measured): 45.0 Base Free-Flow Speed, BFFS:			
Calc Speed Adj and FFS f _{lv} (mi/h): f _{lc} (mi/h): f _h (mi/h): f _h (mi/h): FFS (mi/h): 45.0			
Operations Operational (LOS): Flow Rate, v _p (pc/hln): 393 Speed, S (mi/h): 45.0 D (pc/hln): 8.7 LOS: A			
Design Design (N): Required Number of Lanes, N: Flow Rate, v _p (pc/h): Max Service Flow Rate (pc/hln): Design LOS:			
Bicycle Level of Service			

Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h	391.3
Effective width, W _e (Eq. 15-29) ft	21.00
Effective speed factor, S _p (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	1.92
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)	
General Information Site Information	
Analyst Adams Parsons	Highway/Direction to Travel US 31 Clark Bridge Bridge
Agency or Company Data Performed 12/30/2011 AM Peak	Jurisdiction 2030 East End
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)	
☒ Oper.(LOS) ☐ Des. (N) ☐ Plan.(vp)	
Flow Inputs Volume, V (veh/h) 1680 Peak-Hour Factor, PHF 0.92 AADT(veh/h) 1 %Trucks and Buses, P_T 0 Peak-Hour Prop of AADT (veh/d) %RVs, P_R 0 Peak-Hour Direction Prop. D General Terrain: Level DDHV (veh/h) Length (mi) 0.00 Driver Type Adjustment Up/Down % 0.00 Number of Lanes 2	
Calculate Flow Adjustments f_b 1.00 E_R 1.5 E_R 1.2 f_{tw} 0.995	
Speed Inputs Lane Width, LW (ft) 12.0 Total Lateral Clearance, LC (ft) 12.0 Access Points, A (A/mi) 0 Median Type, M FFS (measured) 45.0 Base Free-Flow Speed, BFFS f_{LW} (mi/h) f_{LC} (mi/h) f_A (mi/h) f_M (mi/h) FFS (mi/h) 45.0	
Operations Operational (LOS) Flow Rate, v_p (pc/h/ln) 917 Speed, S (mi/h) 45.0 D (pc/mi/ln) 20.4 LOS C Design (N) Required Number of Lanes, N Flow Rate, v_p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS	
Bicycle Level of Service	

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	913.0
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	1.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.73
Bicycle level of service (Exhibit 15-4)	B

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MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information		Site Information	
Analyst	Adams	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	From/To	Bridge
Date Performed	12/30/2011	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2030 East End
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N)	
☐ Plan (vp)			
Flow Inputs			
Volume, V (veh/h)	1850	Peak-Hour Factor, PHF	0.92
AAOT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AAOT (veh/h)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain: Level	
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{LW} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{LC} (mi/h)	
Access Points, A (A/mi)	0	f_A (mi/h)	
Median Type, M		f_M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Base Free-Flow Speed, BFFS			
Operations			
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1015	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	22.6	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1010.9
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	1.44
Bicycle level of service score, BLOS (Eq. 15-31)	2.41
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)																																							
<table border="1"> <thead> <tr> <th colspan="2">General Information</th> <th colspan="2">Site Information</th> </tr> </thead> <tbody> <tr> <td>Analyst</td> <td>Adams</td> <td>Highway/Direction to Travel</td> <td>US 31 Clark Bridge</td> </tr> <tr> <td>Agency or Company</td> <td>Parsons</td> <td>From/To</td> <td>Bridge</td> </tr> <tr> <td>Date Performed</td> <td>12/30/2011</td> <td>Jurisdiction</td> <td></td> </tr> <tr> <td>Analysis Time Period</td> <td>PM Peak</td> <td>Analysis Year</td> <td>2030 East End</td> </tr> <tr> <td colspan="4">Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)</td> </tr> <tr> <td colspan="2">Oper (LOS)</td> <td colspan="2">Des. (N)</td> </tr> <tr> <td colspan="2">Plan (LOS)</td> <td colspan="2">Plan (vp)</td> </tr> </tbody> </table>				General Information		Site Information		Analyst	Adams	Highway/Direction to Travel	US 31 Clark Bridge	Agency or Company	Parsons	From/To	Bridge	Date Performed	12/30/2011	Jurisdiction		Analysis Time Period	PM Peak	Analysis Year	2030 East End	Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)				Oper (LOS)		Des. (N)		Plan (LOS)		Plan (vp)					
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Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	671.9
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	1.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.30
Bicycle level of service (Exhibit 15-4)	B

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BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Northbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.952		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	4				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 mph	
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel <i>I-65 Southbound</i>		
Agency or Company	Parsons		From/To <i>Kennedy Bridge</i>		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year <i>2030 East End</i>		
Project Description <i>Ohio River Bridges Project</i>					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	7100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.957		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Northbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	7900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	12	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.943		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	4				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
			f _{LC} - Exhibit 11-9		
			TRD - Page 11-11		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Southbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	20	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.909		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS 60.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S	59.8	mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S	28.7	pc/mi/ln	S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-265 Northbound		
Agency or Company	Parsons		From/To East End Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4500	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			65.0 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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
speed			f _p - Page 11-18		
DDHV - Directional design hour volume			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-265 Southbound		
Agency or Company	Parsons		From/To East End Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.957		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			65.0 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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			E _T - Exhibits 11-10, 11-11, 11-13		
v _p - Flow rate			f _p - Page 11-18		
LOS - Level of service			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		
DDHV - Directional design hour volume			f _{LW} - Exhibit 11-8		
S - Speed			f _{LC} - Exhibit 11-9		
D - Density			TRD - Page 11-11		
FFS - Free-flow speed					
BFFS - Base free-flow speed					

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-265 Northbound		
Agency or Company	Parsons		From/To East End Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2400	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.957		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			65.0 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		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-265 Southbound		
Agency or Company	Parsons		From/To East End Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 East End		
Project Description Ohio River Bridges Project					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	6	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.971		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		LW LC TRD Adjustment FFS mph mph mph mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	65.0 mph				
Base free-flow Speed, BFFS	mph		FFS 65.0 mph		
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1754 pc/h/ln		v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	63.2 mph		x f _p)		
D = v _p / S	27.7 pc/mi/ln		S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Northbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 Downtown		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	2300	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	15	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.930	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
v _p	896	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p		
D = v _p / S	14.9	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel I-64 Southbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge SB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 Downtown		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	3				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph			
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)			Design LOS		
S			v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)		
D = v _p / S			S		
LOS			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-64 Northbound		
Agency or Company	Parsons		From/To Sherman Minton Bridge NB		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 Downtown		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	5900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	9	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)]	0.957	
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft	f _{LW}	mph	
Rt-Side Lat. Clearance		ft	f _{LC}	mph	
Number of Lanes, N	3		TRD Adjustment	mph	
Total Ramp Density, TRD		ramps/mi	FFS	60.0 mph	
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		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		
x f _p)	2234	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	52.7	mph	x f _p)		
D = v _p / S	42.4	pc/mi/ln	S		
LOS	E		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12	f _{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	Adams		Highway/Direction of Travel <i>I-64 Southbound</i>		
Agency or Company	Parsons		From/To <i>Sherman Minton Bridge SB</i>		
Date Performed	5/16/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year <i>2030 Downtown</i>		
Project Description <i>Ohio River Bridges Project</i>					
☐ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4200	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	12	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.943		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft		f_{LW} mph f_{LC} mph TRD Adjustment mph FFS 60.0 mph		
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	3				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph				
LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v _p = (V or DDHV) / (PHF x N x f _{HV})			Design LOS		
x f _p)	1613		v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0		x f _p)		
D = v _p / S	26.9		S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information Analyst: J Sherman Agency or Company: Parsons Date Performed: 12/30/2011 Analysis Time Period: AM Peak Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)		Site Information Highway/Direction to Travel: US 31 Clark Bridge From/To: Bridge Jurisdiction: 2030 Downtown Analysis Year:	
☒ Oper. (LOS)		☐ Des. (N)	
Flow Inputs			
Volume, V (veh/h)	760	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		% Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/h)		% RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain: Level	
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{LW} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{LC} (mi/h)	
Access Points, A (A/mi)	0	f_A (mi/h)	
Median Type, M		f_M (mi/h)	
FFS (measured)	45.0	FFS (mi/h)	45.0
Operations			
Operational (LOS) Flow Rate, v_p (pc/h/ln) Speed, S (mi/h) D (pc/mi/ln) LOS		Design (N) Required Number of Lanes, N Flow Rate, v_p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS	
Operational (LOS) Flow Rate, v_p (pc/h/ln) Speed, S (mi/h) D (pc/mi/ln) LOS		Design (N) Required Number of Lanes, N Flow Rate, v_p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	423.9
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	1.97
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	Front/To	Bridge
Date Performed	12/30/2011	Jurisdiction	2030 Downtown
Analysis Time Period	AM Peak	Analysis Year	
Project Description Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N)	
☐ Plan. (vp)			
Flow Inputs			
Volume, V (veh/h)	1820	Peak-Hour Factor, PHF	0.92
AAOT (veh/h)		% Trucks and Buses, P_T	1
Peak-Hour Prop of AAOT (veh/h)		% RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_b	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	Calc Speed Adj and FFS	
Total Lateral Clearance, LC (ft)	12.0	f_{LV} (mi/h)	
Access Points, A (A/mi)	0	f_{LC} (mi/h)	
Median Type, M		f_s (mi/h)	
FFS (measured)	45.0	f_{d4} (mi/h)	
Base Free-Flow Speed, BFFS		FFS (mi/h)	45.0
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	994	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/h)	22.1	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	999.1
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	1.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.39
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 1)			
General Information		Site Information	
Analyst	J Sherman	Highway/Direction to Travel	US 31 Clark Bridge
Agency or Company	Parsons	Front/To	Bridge
Date Performed	12/30/2011	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2030 Downtown
Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)			
☒ Oper. (LOS)		☐ Des. (N)	
☐ Plan. (vp)			
Flow Inputs			
Volume, V (veh/h)	1620	Peak-Hour Factor, PHF	0.92
AADT (veh/h)		% Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		% RVs, P_R	0
Peak-Hour Direction Prop. D		General Terrain	Level
DDHV (veh/h)		Grade	0.00
Driver Type Adjustment	1.00	Length (mi)	0.00
		Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_T	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	Calc Speed Adj and FFS	
Total Lateral Clearance, LC (ft)	12.0	f_{wv} (mi/h)	
Access Points, A (A/mi)	0	f_{LC} (mi/h)	
Median Type, M		f_A (mi/h)	
FFS (measured)	45.0	f_H (mi/h)	
Base Free-Flow Speed, BFFS		FFS (mi/h)	45.0
Operations			
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	884	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	19.6	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	850.4
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	3.84
Bicycle level of service score, BLOS (Eq. 15-31)	2.34
Bicycle level of service (Exhibit 15-4)	B

MULTILANE HIGHWAYS WORKSHEET(Direction 2)			
General Information Analyst: J Sherman Agency or Company: Parsons Date Performed: 12/30/2011 Analysis Time Period: PM Peak Project Description: Ohio River Bridges Project (Direction 1=NB, Direction 2=SB)		Site Information Highway/Direction to Travel: US 31 Clark Bridge From/To: Bridge Jurisdiction: 2030 Downtown Analysis Year:	
☒ Oper. (LOS)		☐ Das. (N)	
Flow Inputs			
Volume, V (veh/h)	1080	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/h)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain: Level	
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2
Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995
Speed Inputs			
Lane Width, LW (ft)	12.0	f_{wv} (mi/h)	
Total Lateral Clearance, LC (ft)	12.0	f_{LC} (mi/h)	
Access Points, A (A/mi)	0	f_A (mi/h)	
Median Type, M		f_M (mi/h)	
FFS (measured)	45.0	f_{44} (mi/h)	
Base Free-Flow Speed, BFFS		FFS (mi/h)	45.0
Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h)	589	Required Number of Lanes, N	
Speed, S (mi/h)	45.0	Flow Rate, v_p (pc/h)	
D (pc/mi/h)	13.1	Max Service Flow Rate (pc/h/mi)	
LOS	B	Design LOS	
Bicycle Level of Service			

Directional demand flow rate in outside lane, V_{OL} (Eq. 15-24) veh/h	387.0
Effective width, W_e (Eq. 15-29) ft	24.00
Effective speed factor, S_f (Eq. 15-30)	3.64
Bicycle level of service score, BLOS (Eq. 15-31)	2.13
Bicycle level of service (Exhibit 15-4)	B

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Northbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 Downtown		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	4900	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	8	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.962		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	6				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0		
			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		
x f _p)	923	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	60.0	mph	x f _p)		
D = v _p / S	15.4	pc/mi/ln	S		
LOS	B		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Southbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	AM Peak Hour		Analysis Year 2030 Downtown		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	8700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	10	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain: Level		
DDHV = AADT x K x D		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)] 0.952		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	6				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0		
			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		
x f _p)	1655	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	59.9	mph	x f _p)		
D = v _p / S	27.6	pc/mi/ln	S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel	I-65 Northbound	
Agency or Company	Parsons		From/To	Kennedy Bridge	
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year	2030 Downtown	
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	9100	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	12	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.943		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft			
Number of Lanes, N	6				
Total Ramp Density, TRD		ramps/mi			
FFS (measured)	60.0	mph			
Base free-flow Speed, BFFS		mph	f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment		
			FFS		
			60.0		
			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		
x f _p)	1747	pc/h/ln	v _p = (V or DDHV) / (PHF x N x f _{HV})		
S	59.6	mph	x f _p)		
D = v _p / S	29.3	pc/mi/ln	S		
LOS	D		D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes	S - Speed		E _R - Exhibits 11-10, 11-12		
V - Hourly volume	D - Density		f _{LW} - Exhibit 11-8		
v _p - Flow rate	FFS - Free-flow speed		E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service	BFFS - Base free-flow speed		f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		

BASIC FREEWAY SEGMENTS WORKSHEET					
General Information			Site Information		
Analyst	Adams		Highway/Direction of Travel I-65 Southbound		
Agency or Company	Parsons		From/To Kennedy Bridge		
Date Performed	5/11/11		Jurisdiction		
Analysis Time Period	PM Peak Hour		Analysis Year 2030 Downtown		
Project Description Ohio River Bridges Project					
☒ Oper.(LOS)		☐ Des.(N)		☐ Planning Data	
Flow Inputs					
Volume, V	6700	veh/h	Peak-Hour Factor, PHF	0.92	
AADT		veh/day	%Trucks and Buses, P _T	16	
Peak-Hr Prop. of AADT, K			%RVs, P _R	0	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		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)] 0.926		
Speed Inputs			Calc Speed Adj and FFS		
Lane Width	ft				
Rt-Side Lat. Clearance	ft				
Number of Lanes, N	6				
Total Ramp Density, TRD	ramps/mi				
FFS (measured)	60.0 mph				
Base free-flow Speed, BFFS	mph		f _{LW}	mph	
			f _{LC}	mph	
			TRD Adjustment	mph	
			FFS	60.0 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}) 1311 pc/h/ln			Design LOS		
x f _p)			v _p = (V or DDHV) / (PHF x N x f _{HV})		
S 60.0 mph			x f _p)		
D = v _p / S 21.9 pc/mi/ln			S		
LOS C			D = v _p / S		
			Required Number of Lanes, N		
Glossary			Factor Location		
N - Number of lanes			E _R - Exhibits 11-10, 11-12		
V - Hourly volume			f _{LW} - Exhibit 11-8		
v _p - Flow rate			E _T - Exhibits 11-10, 11-11, 11-13		
LOS - Level of service			f _{LC} - Exhibit 11-9		
DDHV - Directional design hour volume			f _p - Page 11-18		
			TRD - Page 11-11		
			LOS, S, FFS, v _p - Exhibits 11-2, 11-3		