





# Delay and Queue Calc. Spreadsheet for Bottleneck Work Zones - Quick Version

Note: Use this "Quick Version" when the capacity of the WZ does not vary from hour to hour, hourly volumes can be estimated from the AADT and TPG info., and the facility in question is not an existing bottleneck.

Project: I-80 Reconstruction (Phase II) - Int 303 to 304 EB Segment (Highway)  
 Analyst: JRE  
 Date: 10/7/2015

One Way Work Zone Capacity (veh/hr) 1550 vph Assumes 1 lane WZ Capacity  
 One Way AADT (veh/day) 29093 vpd 2025 Vol

Percent of Peak Period (>1000 vph) Traffic Diverted (%) 0 %  
 Number of Lanes for Queued Vehicles (lanes) 2  
 Percent Trucks (Daily) 8 %  
 Traffic Pattern Group (Number 1 to 10) 1  
 Inbound = 1, Outbound = 2, Neutral = 3 3  
 Number of vehicles in Queue per Lane Mile (veh) 216 vpm

TPG Index	
1=Urban Interstate	
2=Rural Interstate	
3=Urban Other Principal Arterials	
4=Rural Other Principal Arterials	
5=Urban Minor Arterials, Collectors, Local Roads	
6=North Rural Minor Arterials	
7=Central Rural Minor Arterials	
8=North Rural Collectors and Local Roads	
9=Central Rural Collectors and Local Roads	
10=Special Recreational	

**20-Minute Delay Results**  
 Number of Episodes of 20-Minute Delay 2  
 Longest Sustained Episode of 20-Minute Delay 8.50 hours  
 Total Hours per Day with Delays > 20-min 9.35 hours  
 Significant Project Based on 20-Minute Delay Threshold? Yes

**Maximum Delay (min)** 95 min

**Total Daily Delay (vehicle-hours)** 16,809 vehicle-hours

Portion of  
Hour with  
Delay > 20 min

Time Beginning	Estimated Volume	Reduced Volume	Queue (Veh)	Queue (miles)	Delay for Last Arrival of Hour (min)	Restrict Work to Avoid 20 minute delay
0:00	346	346	0	0.0	0	
1:00	250	250	0	0.0	0	
2:00	226	226	0	0.0	0	
3:00	238	238	0	0.0	0	
4:00	323	323	0	0.0	0	
5:00	658	658	0	0.0	0	
6:00	1416	1416	0	0.0	0	
7:00	1935	1935	385	0.9	15	
8:00	1718	1718	553	1.3	21	
9:00	1493	1493	496	1.1	19	
10:00	1472	1472	418	1.0	16	
11:00	1529	1529	397	0.9	15	
12:00	1576	1576	423	1.0	16	
13:00	1599	1599	472	1.1	18	
14:00	1756	1756	678	1.6	26	
15:00	2036	2036	1164	2.7	45	
16:00	2194	2194	1808	4.2	70	X
17:00	2131	2131	2390	5.5	93	X
18:00	1626	1626	2466	5.7	95	
19:00	1264	1264	2180	5.0	84	
20:00	1072	1072	1702	3.9	66	
21:00	942	942	1094	2.5	42	
22:00	740	740	284	0.7	11	
23:00	553	553	0	0.0	0	
	29093	29093				

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Hourly Percentages from Table 350 of Traffic Data Report		Portion of Hour with Delay > 20 min
1.19%		0.00
0.86%		0.00
0.78%		0.00
0.82%		0.00
1.11%		0.00
2.26%		0.00
4.87%		0.00
6.65%		0.00
5.91%		0.22
5.13%		0.64
5.06%		0.00
5.25%		0.00
5.42%		0.00
5.50%		0.00
6.04%		0.78
7.00%		1.00
7.54%		1.00
7.33%		1.00
5.59%		1.00
4.34%		1.00
3.68%		1.00
3.24%		1.00
2.54%		0.71
1.90%		0.00

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 Analyst: JRE  
 Date: 10/7/2015

One Way Work Zone Capacity (veh/hr) 1550 vph  
 One Way AADT (veh/day) 30950 vpd Assumes 1 lane WZ Capacity  
 2025 Vol

Percent of Peak Period (>1000 vph) Traffic Diverted (%) 0 %  
 Number of Lanes for Queued Vehicles(lanes) 2  
 Percent Trucks (Daily) 8 %  
 Traffic Pattern Group (Number 1 to 10) 1  
 Inbound = 1, Outbound = 2, Neutral =3 3  
 Number of vehicles in Queue per Lane Mile (veh) 216 vpm

TPG Index	
1=Urban Interstate	
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10=Special Recreational	

**20-Minute Delay Results**  
 Number of Episodes of 20-Minute Delay 1  
 Longest Sustained Episode of 20-Minute Delay 15.97 hours  
 Total Hours per Day with Delays > 20-min 15.97 hours  
 Significant Project Based on 20-Minute Delay Threshold? Yes

**Maximum Delay (min)** 148 min

**Total Daily Delay (vehicle-hours)** 31,907 vehicle-hours

Portion of  
Hour with  
Delay>20 min

Time Beginning	Estimated Volume	Reduced Volume	Queue (Veh)	Queue (miles)	Delay for Last Arrival of Hour (min)	Restrict Work to Avoid 20 minute delay
0:00	388	368	0	0.0	0	
1:00	265	265	0	0.0	0	
2:00	240	240	0	0.0	0	
3:00	253	253	0	0.0	0	
4:00	343	343	0	0.0	0	
5:00	700	700	0	0.0	0	
6:00	1507	1507	0	0.0	0	
7:00	2058	2058	508	1.2	20	
8:00	1828	1828	786	1.8	30	
9:00	1589	1589	824	1.9	32	
10:00	1566	1566	841	1.9	33	
11:00	1626	1626	917	2.1	35	
12:00	1676	1676	1043	2.4	40	
13:00	1702	1702	1195	2.8	46	
14:00	1868	1868	1513	3.5	59	
15:00	2166	2166	2129	4.9	82	X
16:00	2334	2334	2913	6.7	113	X
17:00	2268	2268	3631	8.4	141	X
18:00	1730	1730	3811	8.8	148	
19:00	1345	1345	3605	8.3	140	
20:00	1140	1140	3196	7.4	124	
21:00	1002	1002	2648	6.1	103	
22:00	787	787	1885	4.4	73	
23:00	588	588	924	2.1	36	
	30950	30950				

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Hourly Percentages from Table 350 of Traffic Data Report		Portion of Hour with Delay>20 min
1.19%		0.00
0.86%		0.00
0.78%		0.00
0.82%		0.00
1.11%		0.00
2.26%		0.00
4.87%		0.00
6.65%		0.00
5.91%		0.97
5.13%		1.00
5.06%		1.00
5.25%		1.00
5.42%		1.00
5.50%		1.00
6.04%		1.00
7.00%		1.00
7.54%		1.00
7.33%		1.00
5.59%		1.00
4.34%		1.00
3.68%		1.00
3.24%		1.00
2.54%		1.00
1.90%		1.00

**I-80 RECONSTRUCTION**

HIGHEST VOL SEGMENTS (USE AADT FOR WZ ANALYSIS)

			AADT (2013)		AADT (2025)	AADT (2045)
Eastbound I-80 (between Int 303 - Int 304)	EB	FS	22940	0.02	29093	43231
Westbound I-80 (between Int 303 - Int 304)	WB	FS	24404	0.02	30950	45990
Eastbound I-80 (between Int 306 - Int 307)	EB	FS	34766	0.02	44092	65518
Westbound I-80 (between Int 306 - Int 307)	WB	FS	35689	0.02	45262	67257