

# **Appendix 0**

*In House Interchange  
Delay Spreadsheet*

### CUSTOM OPERATIONS SPREADSHEET FOR I-71/I-271 RAMP DIVERSIONS

Table 1: UNIT COST					
Vehicle	Unit Cost (per hour) <sup>a</sup>	% of Diversion ADT		Average (per veh-hr)	
		To I-271 NB	To I-71 NB	To I-271 NB	To I-71 NB
Cars	\$23.12	94%	95%	\$25.61	\$25.20
Trucks	\$64.68	6%	5%		

<sup>a</sup> Source: 2023 TTI Urban Mobility Report

Table 2: TRAVEL TIME DISTRIBUTIONS				
Path	Travel Times Along SR Corridor (min) <sup>a</sup>			Off-Peak Factor <sup>b</sup>
	7:00-9:00 AM	4:00-6:00 PM	Off-Peak	
To I-271 NB, from north of SR 3 on I-71 SB	5.00	5.50	5.34	
To I-271 NB, from west of I-71 on SR 3 NB	4.90	5.90	5.57	
Grand Average (to I-271 NB)	4.95	5.70	5.45	1.95
To I-71 NB, from east of SR 94 on I-271 SB	4.50	4.50	4.28	
To I-71 NB, from south of I-271 on SR 94 NB	4.50	4.50	4.85	
Grand Average (to I-71 NB)	4.50	4.50	4.56	1.97

<sup>a</sup> Source: 2022 StreetLight data

<sup>b</sup> For operation cost calculations; used to extrapolate peak hour data to off-peak hours - (AM + PM)÷(Off-peak)

Table 3: TOTAL COST BENEFIT FROM RAMP DIVERSIONS													
	Year	Time of Day	Daily Volume (veh)	Individual Travel Times (min)			Combined Travel Times Benefit for All Vehicles (hr)			Unit Cost (per veh-hr)	Annual Cost Benefits		20-Year Design Life Cost Benefit
				No-Build <sup>a</sup>	Build	Difference	Daily	Annual	Annual Sum		By Year	Average	
To I-271 NB	2030	AM Peak	220	10.92	5.71	5.21	19.1	4966.9		\$25.61	\$609,200	\$670,100	\$13,402,000
		PM Peak	100	8.95	5.71	3.24	5.4	1404.0	23784				
		Off-Peak	900	10.18	5.71	4.47	67.0	17413.6					
	2050	AM Peak	230	11.80	5.71	6.09	23.3	6069.7		\$25.61	\$731,000		
		PM Peak	100	9.73	5.71	4.02	6.7	1742.0	28541				
		Off-Peak	900	11.03	5.71	5.32	79.7	20728.8					
To I-71 NB	2030	AM Peak	80	11.53	5.21	6.32	8.4	2190.9		\$25.20	\$465,300	\$575,250	\$11,505,000
		PM Peak	90	10.67	5.21	5.46	8.2	2129.4	18466				
		Off-Peak	540	11.26	5.21	6.05	54.4	14146.0					
	2050	AM Peak	80	15.59	5.21	10.38	13.8	3598.4		\$25.20	\$685,200		
		PM Peak	90	11.33	5.21	6.12	9.2	2386.8	27194				
		Off-Peak	580	13.65	5.21	8.44	81.6	21208.3					
<b>Grand Total</b>												<b>\$24,907,000</b>	

<sup>a</sup> Off peak volumes = (ADT) - (AM Pk + PM Pk)

<sup>b</sup> The off-peak hour travel time under no-build conditions is calculated by dividing the AM & PM peak hour total by the factor in Table 2

**CUSTOM OPERATIONS SPREADSHEET FOR SR 3/SR 94 CORRIDOR**

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Vehicle	Unit Cost (per hour) <sup>a</sup>	% of ADT (estimated)	Average (per veh-hr)
Cars	\$23.12	98%	\$23.95
Trucks	\$64.68	2%	

<sup>a</sup>Source: 2023 TTI Urban Mobility Report

Int.	Year	Time of Day	Daily Volume (veh) <sup>a</sup>				Average Delays (s) <sup>b</sup>				Combined Delay Costs for All Vehicles (hr, Combined Build)			Combined Delay Benefit for All Vehicles (hr, Combined Build)		Combined Delay Costs for All Vehicles (hr, Alt 3)			Combined Delay Benefit for All Vehicles (hr, Alt 3)		Combined Delay Costs for All Vehicles (hr, Alt 4)			Combined Delay Benefit for All Vehicles (hr, Alt 4)	
			No-Build	Build	Build-Alt 3	Build-Alt 4	No-Build	Build	Build-Alt 3	Build-Alt 4	No-Build	Build	Difference	Annual	Annual Sum	No-Build	Build Alt 3	Difference	Annual	Annual Sum	No-Build	Build Alt 4	Difference	Annual	Annual Sum
#50	2030	AM Peak	2340	2290	2290	2340	17.2	17.7	17.6	17.4	11.2	11.3	-0.1	-21		11.2	11.2	0.0	-4		11.2	11.3	-0.1	-34	
		PM Peak	2660	2630	2630	2660	32.5	32.6	32.5	32.5	24.0	23.8	0.2	51	105	24.0	23.7	0.3	70	265	24.0	24.0	0.0	0	-161
		Off-Peak	17550	17300	17300	17550	24.9	25.2	25.1	25.0	121.1	120.9	0.3	74		121.1	120.4	0.8	199		121.1	121.6	-0.5	-127	
	2050	AM Peak	2460	2410	2410	2460	17.6	17.8	17.8	17.6	12.0	11.9	0.1	29		12.0	11.9	0.1	29		12.0	12.0	0.0	0	
		PM Peak	2800	2770	2770	2800	35.9	36.0	35.9	36.0	27.9	27.7	0.2	58	370	27.9	27.6	0.3	78	456	27.9	28.0	-0.1	-20	-88
		Off-Peak	18710	18460	18460	18710	26.8	26.9	26.9	26.8	139.0	137.9	1.1	283		139.0	137.7	1.3	350		139.0	139.3	-0.3	-68	
#40	2030	AM Peak	2000	1700	1770	1920	62.1	68.9	69.5	59.6	34.5	32.5	2.0	511		34.5	34.2	0.3	86		34.5	31.8	2.7	705	
		PM Peak	1850	1660	1750	1760	21.1	18.2	20.7	17.2	10.8	8.4	2.5	637	3804	10.8	10.1	0.8	203	510	10.8	8.4	2.4	633	6492
		Off-Peak	13300	11860	12200	12550	41.6	43.6	45.1	38.4	153.7	143.5	10.2	2656		153.7	152.8	0.8	221		153.7	133.9	19.8	5154	
	2050	AM Peak	2110	1800	1880	2030	74.6	78.6	82.1	71.4	43.7	39.3	4.4	1150		43.7	42.9	0.8	221		43.7	40.3	3.5	900	
		PM Peak	1970	1780	1870	1880	25.2	21.0	25.4	21.0	13.8	10.4	3.4	886	7461	13.8	13.2	0.6	155	-48	13.8	11.0	2.8	734	7335
		Off-Peak	14090	12610	13190	13510	49.9	49.8	53.8	46.2	195.3	174.4	20.9	5425		195.3	196.9	-1.6	-424		195.3	173.4	21.9	5700	
#30	2030	AM Peak	1090	790	860	1010	5.6	4.8	4.9	5.0	1.7	1.1	0.6	167		1.7	1.2	0.5	137		1.7	1.4	0.3	76	
		PM Peak	1350	1160	1250	1260	6.7	3.4	2.3	5.7	2.5	1.1	1.4	368	2182	2.5	0.8	1.7	446	2331	2.5	2.0	0.5	135	895
		Off-Peak	8240	6800	7350	7700	6.2	4.1	3.6	5.4	14.1	7.7	6.3	1646		14.1	7.4	6.7	1749		14.1	11.4	2.6	685	
	2050	AM Peak	1150	840	920	1070	7.3	5.6	5.9	6.2	2.3	1.3	1.0	267		2.3	1.5	0.8	214		2.3	1.8	0.5	127	
		PM Peak	1450	1260	1350	1360	10.1	6.9	8.4	7.7	4.1	2.4	1.7	430	2930	4.1	3.2	0.9	239	1908	4.1	2.9	1.2	301	1838
		Off-Peak	8850	7370	7950	8270	8.7	6.3	7.2	7.0	21.4	12.8	8.6	2234		21.4	15.8	5.6	1455		21.4	16.0	5.4	1410	
#10	2030	AM Peak	1360	1060	1130	1280	91.8	13.9	15.9	71.3	34.7	4.1	30.6	7953		34.7	5.0	29.7	7719		34.7	25.4	9.3	2426	
		PM Peak	1720	1530	1570	1580	55.9	16.4	24.9	37.6	26.7	7.0	19.7	5132	56970	26.7	10.9	15.8	4121	51603	26.7	16.5	10.2	2653	20989
		Off-Peak	9980	8540	9140	9490	73.9	15.2	20.4	54.5	204.7	35.9	168.8	43885		204.7	51.8	152.9	39763		204.7	143.5	61.2	15910	
	2050	AM Peak	1450	1140	1220	1370	90.0	15.3	20.2	75.0	36.3	4.8	31.4	8165		36.3	6.8	29.4	7645		36.3	28.5	7.7	2004	
		PM Peak	1760	1570	1660	1670	55.4	19.9	30.7	37.9	27.1	8.7	18.4	4786	57412	27.1	14.2	12.9	3361	49175	27.1	17.6	9.5	2471	19397
		Off-Peak	10700	9220	9800	10120	72.7	17.6	25.5	56.5	216.1	45.1	171.0	44461		216.1	69.3	146.8	38168		216.1	158.7	57.4	14922	
#250	2030	AM Peak	1620	1320	1390	1540	10.3	5.6	5.5	10.3	4.6	2.1	2.6	671		4.6	2.1	2.5	653		4.6	4.4	0.2	60	
		PM Peak	2000	1810	1900	1910	37.6	14.3	23.2	22.2	20.9	7.2	13.7	3562	17158	20.9	12.2	8.6	2248	11977	20.9	11.8	9.1	2369	9602
		Off-Peak	11760	10320	10870	11220	24.0	10.0	14.4	16.3	78.2	28.5	49.7	12925		78.2	43.3	34.9	9076		78.2	50.6	27.6	7174	
	2050	AM Peak	1740	1430	1510	1660	17.2	7.1	7.4	17.0	8.3	2.8	5.5	1428		8.3	3.1	5.2	1354		8.3	7.8	0.5	123	
		PM Peak	2160	1970	2060	2070	216.3	40.8	88.9	70.0	129.8	22.3	107.5	27938	117580	129.8	50.9	78.9	20516	88318	129.8	40.3	89.5	23278	92833
		Off-Peak	12780	11300	11880	12200	116.8	24.0	48.2	43.5	414.5	75.2	339.3	88214		414.5	158.9	255.6	66448		414.5	147.4	267.0	69432	
#240	2030	AM Peak	1680	1420	1450	1640	58.9	20.2	23.0	83.0	27.5	8.0	19.5	5075		27.5	9.3	18.2	4738		27.5	37.8	-10.3	-2684	
		PM Peak	2120	1980	2020	2080	157.4	199.4	135.0	305.5	92.7	109.7	-17.0	-4415	8181	92.7	75.8	16.9	4405	39673	92.7	176.5	-83.8	-21793	-96430
		Off-Peak	12090	10960	11200	11860	108.2	109.8	79.0	194.3	363.2	334.3	28.9	7520		363.2	245.8	117.4	30531		363.2	639.9	-276.7	-71953	
	2050	AM Peak	1810	1540	1580	1770	79.1	32.1	35.1	120.2	39.8	13.7	26.0	6770		39.8	15.4	24.4	6335		39.8	59.1	-19.3	-5025	
		PM Peak	2290	2150	2190	2250	217.6	355.8	200.7	387.9	138.4	212.5	-74.1	-19259	-39293	138.4	122.1	16.3	4245	46898	138.4	242.4	-104.0	-27045	-126953
		Off-Peak	13030	11880	12130	12780	148.4	194.0	117.9	254.1	536.9	640.0	-103.1	-26804		536.9	397.3	139.7	36319		536.9	901.9	-364.9	-94883	
#230	2030	AM Peak	1490	1270	1260	1490	315.9	21.3	21.3	297.9	130.7	7.5	123.2	32041		130.7	7.5	123.3	32056		130.7	123.3	7.4	1937	
		PM Peak	1290	1190	1190	1290	11.7	5.5	5.5	11.7	4.2	1.8	2.4	617	130746	4.2	1.8	2.4	617	130752	4.2	4.2	0.0	0	7755
		Off-Peak	8950	8050	8060	8950	163.8	13.4	13.4	154.8	407.2	30.0	377.3	98088		407.2	30.0	377.2	98078		407.2	384.9	22.4	5818	
	2050	AM Peak	1590	1360	1360	1590	12.0	58.6	58.6	16.2	5.3	22.1	-16.8	-4378		5.3	22.1	-16.8	-4378		5.3	7.2	-1.9	-482	
		PM Peak	1400	1300	1300	1400	26.8	10.9	9.9	26.1	10.4	3.9	6.5	1686	-11064	10.4	3.6	6.8	1780	-10657	10.4	10.2	0.3	71	-1624
		Off-Peak	9590	8690	8690	9590	19.4	34.8	34.3	21.2	51.7	83.9	-32.2	-8373		51.7	82.7	-31.0	-8059		51.7	56.3	-4.7	-1212	

<sup>a</sup> Off peak volumes = (ADT) - (AM Pk + PM Pk)

<sup>b</sup> Off-peak hour delays = (AM Pk + PM Pk) ÷ 2

**CUSTOM OPERATIONS SPREADSHEET: SR 3/SR 94 CORRIDOR**

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Table 7: SR 3/SR 94 CORRIDOR - OPERATIONS COST TOTALS														
Int.	Year	Annual Delay Benefit (hr, Combined Ramps)	Annual Delay Benefit (hr, Alt 3)	Annual Delay Benefit (hr, Alt 4)	Average (per veh-hr)	Annual Cost Benefits (Combined)		20-Year Design Life Cost Benefit (Combined)	Annual Cost Benefits (Alt 3)		20-Year Design Life Cost Benefit (Alt 3)	Annual Cost Benefits (Alt 4)		20-Year Design Life Cost Benefit (Alt 4)
						By Year	Average		By Year	Average		By Year	Average	
#50	2030	105	265	-161	\$23.95	\$2,500	\$5,700	\$114,000	\$6,400	\$8,650	\$173,000	-\$3,800	-\$2,950	-\$59,000
	2050	370	456	-88		\$8,900			\$10,900			-\$2,100		
#40	2030	3804	510	6492	\$23.95	\$91,100	\$134,900	\$2,698,000	\$12,200	\$5,500	\$110,000	\$155,500	\$165,600	\$3,312,000
	2050	7461	-48	7335		\$178,700			-\$1,200			\$175,700		
#30	2030	2182	2331	895	\$23.95	\$52,300	\$61,250	\$1,225,000	\$55,800	\$50,750	\$1,015,000	\$21,400	\$32,700	\$654,000
	2050	2930	1908	1838		\$70,200			\$45,700			\$44,000		
#10	2030	56970	51603	20989	\$23.95	\$1,364,500	\$1,369,800	\$27,396,000	\$1,236,000	\$1,206,900	\$24,138,000	\$502,700	\$483,650	\$9,673,000
	2050	57412	49175	19397		\$1,375,100			\$1,177,800			\$464,600		
#250	2030	17158	11977	9602	\$23.95	\$411,000	\$1,613,600	\$32,272,000	\$286,900	\$1,201,100	\$24,022,000	\$230,000	\$1,226,750	\$24,535,000
	2050	117580	88318	92833		\$2,816,200			\$2,115,300			\$2,223,500		
#240	2030	8181	39673	-96430	\$23.95	\$195,900	-\$372,600	-\$7,452,000	\$950,200	\$1,036,750	\$20,735,000	-\$2,309,600	-\$2,675,150	-\$53,503,000
	2050	-39293	46898	-126953		-\$941,100			\$1,123,300			-\$3,040,700		
#230	2030	130746	130752	7755	\$23.95	\$3,131,500	\$1,433,250	\$28,665,000	\$3,131,700	\$1,438,250	\$28,765,000	\$185,700	\$73,400	\$1,468,000
	2050	-11064	-10657	-1624		-\$265,000			-\$255,200			-\$38,900		
<b>Grand Total (Combined)</b>						<b>\$84,918,000</b>		<b>Grand Total (Alt 3)</b>		<b>\$98,958,000</b>		<b>Grand Total (Alt 4)</b>		<b>-\$13,920,000</b>