

# final report

November 27, 2024

## Traffic Impact Study

6422 Billtown Road (KY 1819)  
Louisville, KY

Prepared for

Louisville Metro Planning Commission  
Kentucky Transportation Cabinet



Table of Contents

INTRODUCTION ..... 2

    Figure 1. Site Map..... 2

EXISTING CONDITIONS ..... 2

    Figure 2. Existing Peak Hour Volumes ..... 4

FUTURE CONDITIONS ..... 5

    Figure 3. 2027 Peak Hour No Build Volumes..... 6

TRIP GENERATION ..... 7

    Table 1. Peak Hour Trips Generated by Site ..... 7

    Figure 4. Trip Distribution Percentages ..... 8

    Figure 5. Peak Hour Trips Generated by Site..... 9

    Figure 6. 2027 Build Peak Hour Volumes ..... 10

ANALYSIS ..... 11

    Table 2. Peak Hour Level of Service..... 11

    Figure 7. 2037 No Build Peak Hour Volumes..... 13

    Figure 8. 2037 Build Peak Hour Volumes ..... 14

    Table 3. 2037 Peak Hour Level of Service..... 15

CONCLUSIONS ..... 16

APPENDIX ..... 17

## INTRODUCTION

The development plan for 6422 Billtown Road (KY 1819) in Louisville, KY shows a mix of uses - a gas/convenience store, a restaurant with a drive-through, a coffee shop, and an apartment community. **Figure 1** displays a map of the site. Access to the site will be from the extension of Gellhaus Lane into the site (this is also Veterans Drive), an entrance-on Billtown Road opposite Weather Vane Drive, and to the frontage road (KY 6329). The purpose of this study is to examine the traffic impacts of the development upon the adjacent highway system. For this study, the impact area was defined to be the intersections of Billtown Road with Beckingham Boulevard, Weather Vane Drive, Gellhaus Lane, and both ramp junctions of I 265.

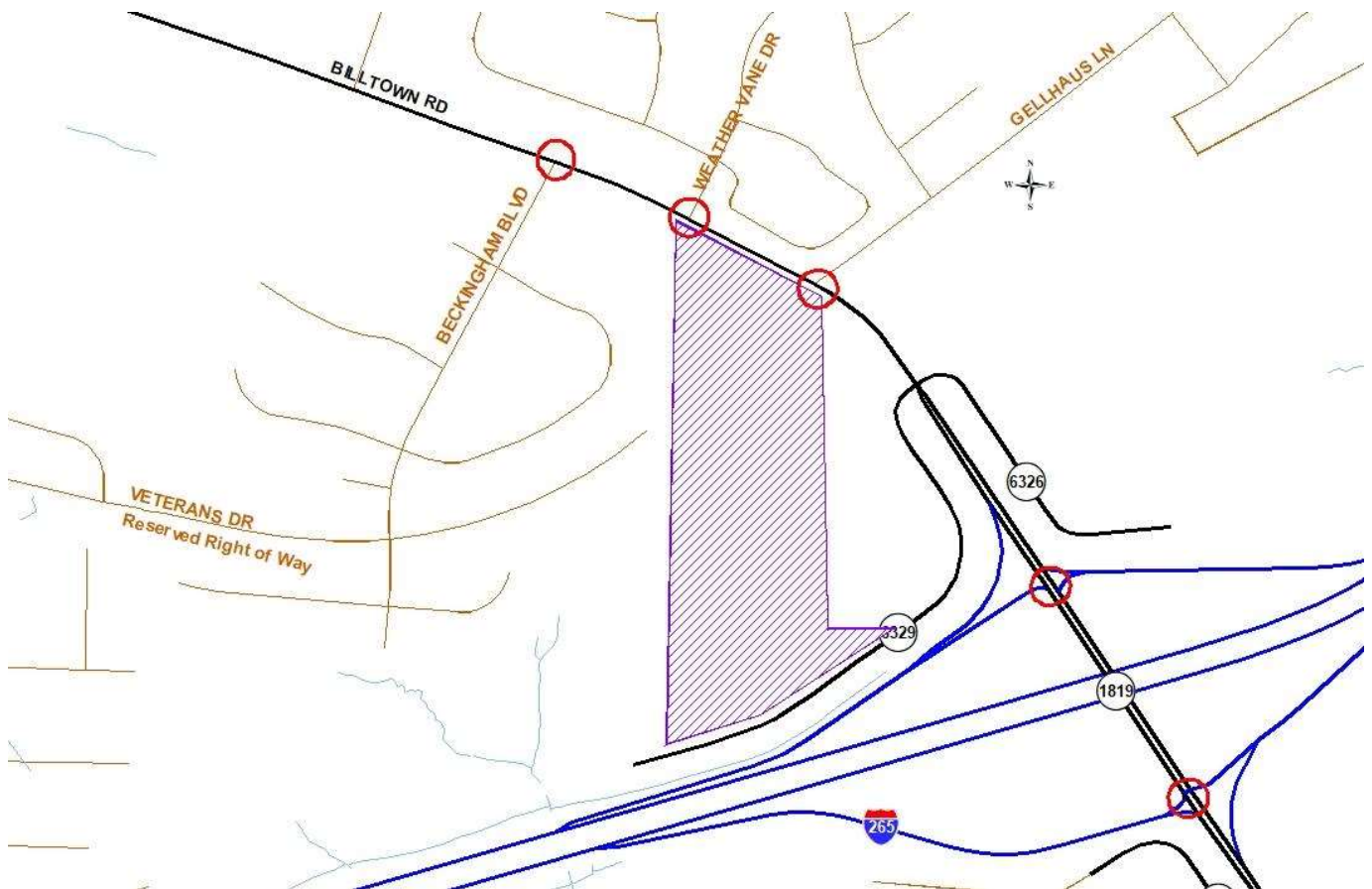


Figure 1. Site Map

## EXISTING CONDITIONS

Billtown Road, KY 1819, is maintained by the Kentucky Transportation Cabinet (KYTC) with an estimated 2024 ADT of 12,100 vehicles per day between Lovers Lane and I 265, as estimated from the 2023 count at KYTC station 325. The road is a two-lane highway with eleven-foot lanes and a one-foot paved shoulder. The speed limit is 45 mph. There are sidewalks on the east side north of Gellhaus Lane. The intersections with Gellhaus Lane and I 265 eastbound ramps are controlled with a traffic signal. North of Gellhaus Lane the road has a continuous two-way left turn lane. At Gellhaus Lane there is a southbound left turn lane, a northbound right turn lane. At the I 265 interchange there are left turn lanes on every approach and the right turns from Billtown Road operate as free-flow.

Peak hour traffic count for the intersections were obtained on Wednesday, September 18, 2024. The a.m. peak hour was 7:00 to 8:00 a.m. and the p.m. peak hour from Gellhaus Lane south was 4:45 to 5:45, north of Gellhaus Lane was 5:00 to 6:00. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes. The Appendix contains the full count data.



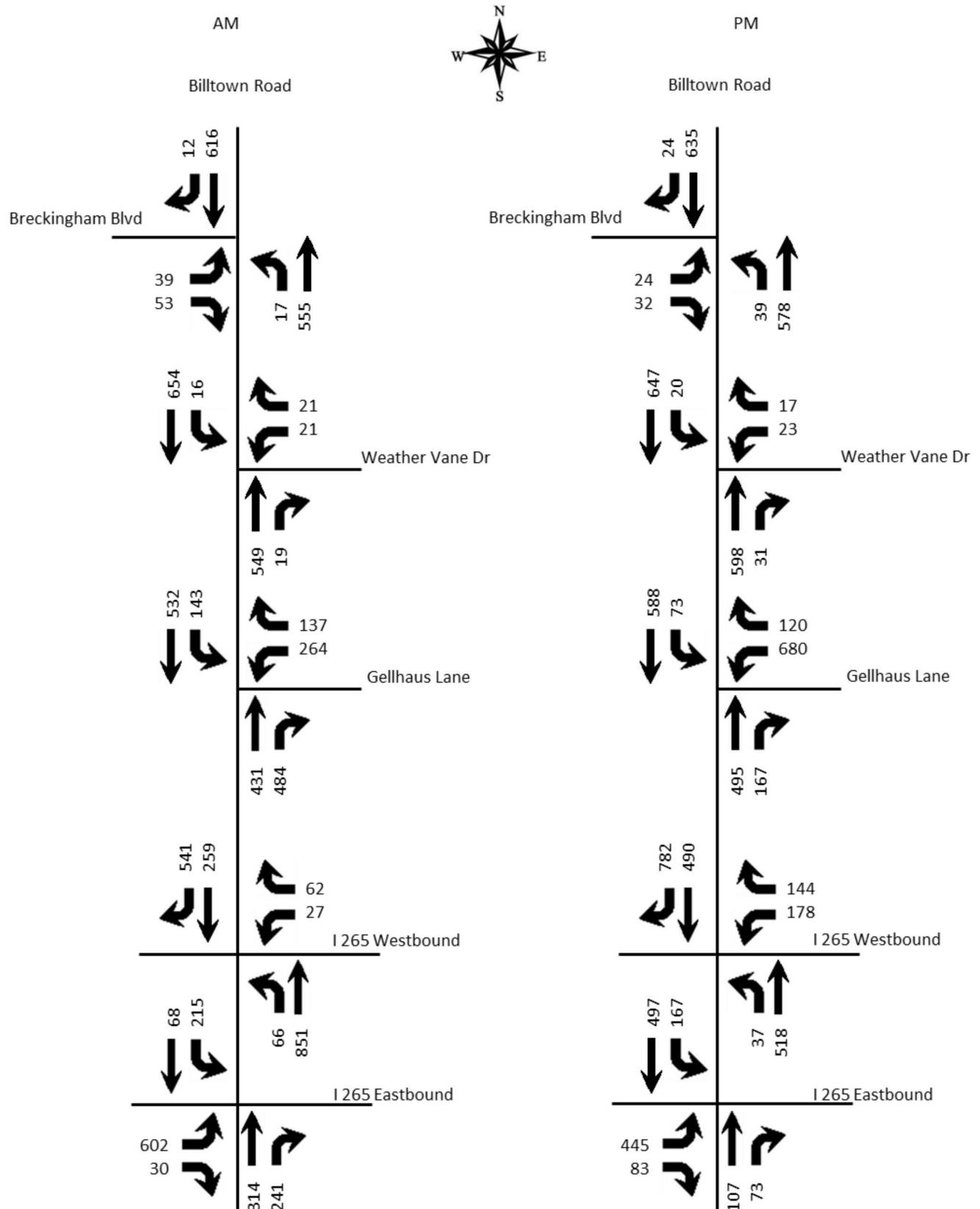


Figure 2. Existing Peak Hour Volumes

## FUTURE CONDITIONS

The project completion date is 2027. An annual growth rate of 1.1 percent was applied to all 2024 volumes. See the appendix for the historical trend rate analysis. **Figure 3** illustrates the 2027 traffic volumes without the development.

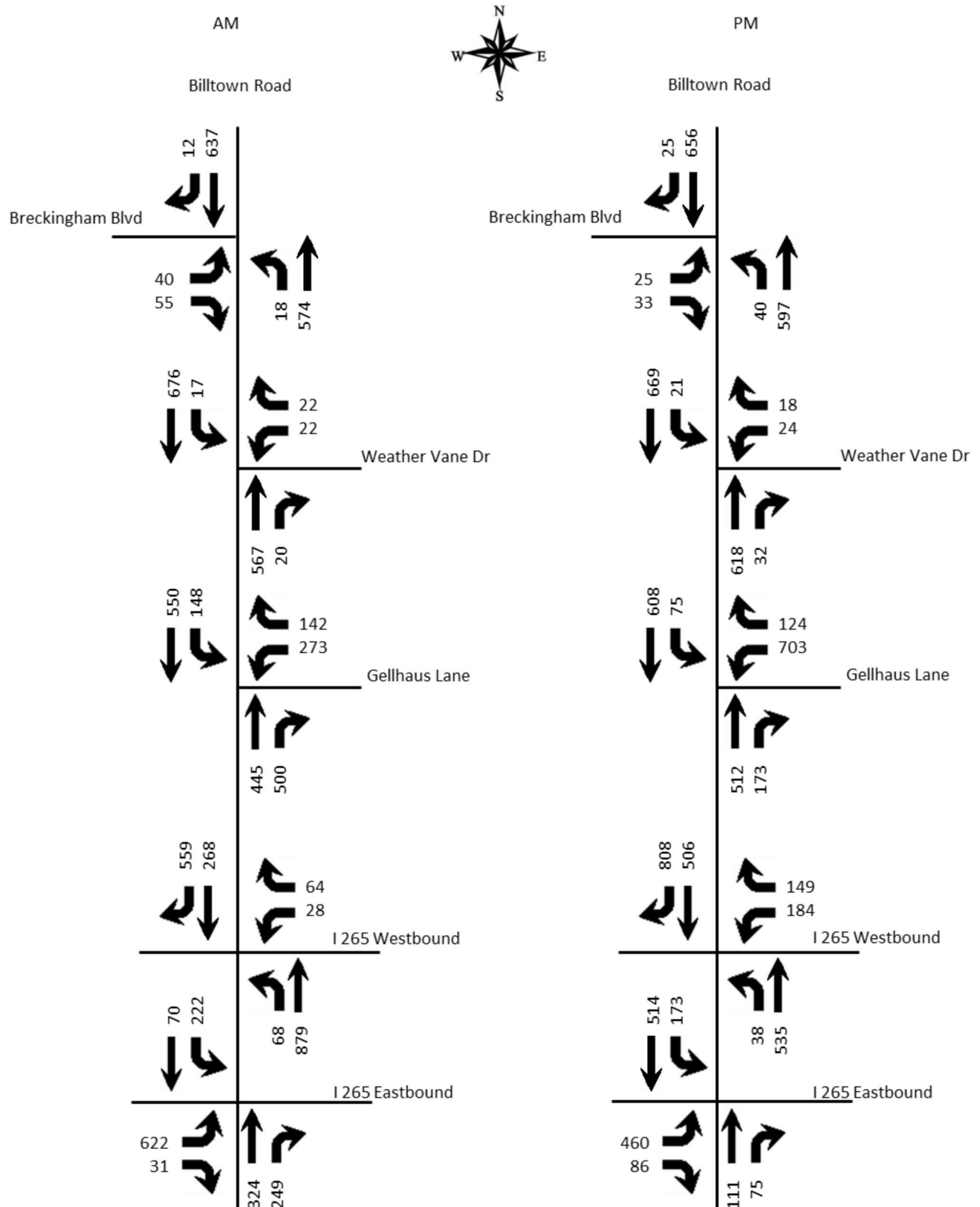


Figure 3. 2027 Peak Hour No Build Volumes

## TRIP GENERATION

The Institute of Transportation Engineers Trip Generation Manual, 11<sup>th</sup> Edition contains trip generation rates for a wide range of developments. The land uses listed in **Table 1** were reviewed and determined to be the best match. The trip generation results are listed in **Table 1**. The trips were assigned to the highway network with the percentages shown in **Figure 4**. These percentages reflect the origins of primary trips to the site. Pass-by trips were assigned according the directional traffic flow on Billtown Road. **Figure 5** shows the trips generated by this development and distributed throughout the road network during the peak hours. **Figure 6** displays the individual turning movements for the peak hours when the development is completed.

**Table 1. Peak Hour Trips Generated by Site**

**AM Peak Hour**

Land use	ITE Code	Intensity	Rate/EQ	% IN	% Out	Total Trips			Pass-by Trips		New Trips		
						In	Out	Total	%	Volume	In	Out	Total
Coffee Shop w drive	937	900 sf	$T = 85.88(X)$	0.51	0.49	39	38	77	0%	0	39	38	77
Fast Food w drive	934	3,230 sf	$T = 44.61(X)$	0.51	0.49	73	71	144	50%	72	37	36	72
Convenience w gas	945	16 pump	$T = 31.6 (X)$	0.5	0.5	253	253	506	76%	385	61	61	121
Multi-Family (1-3)	220	240 units	$T = 0.31(X) + 22.85$	0.24	0.76	23	74	97	0%	0	23	74	97
Total						388	436	824	55.4%	457	159	208	367

**PM Peak Hour**

Land use	ITE Code	Intensity				Total Trips			Pass-by Trips		New Trips		
						In	Out	Total	%	Volume	In	Out	Total
Coffee Shop w drive	937	900 sf	$T = 38.99(X)$	0.5	0.5	18	17	35	0%	0	18	17	35
Fast Food w drive	934	3,230 sf	$T = 33.03(X)$	0.52	0.48	56	51	107	55%	59	25	23	48
Convenience w gas	945	16 pump	$T = 26.9 (X)$	0.5	0.5	215	215	430	75%	323	54	54	108
Multi-Family (1-3)	220	240 units	$T = 0.43(X) + 20.55$	0.63	0.37	78	46	124	0%	0	78	46	124
Total						367	329	696	54.8%	381	175	140	315

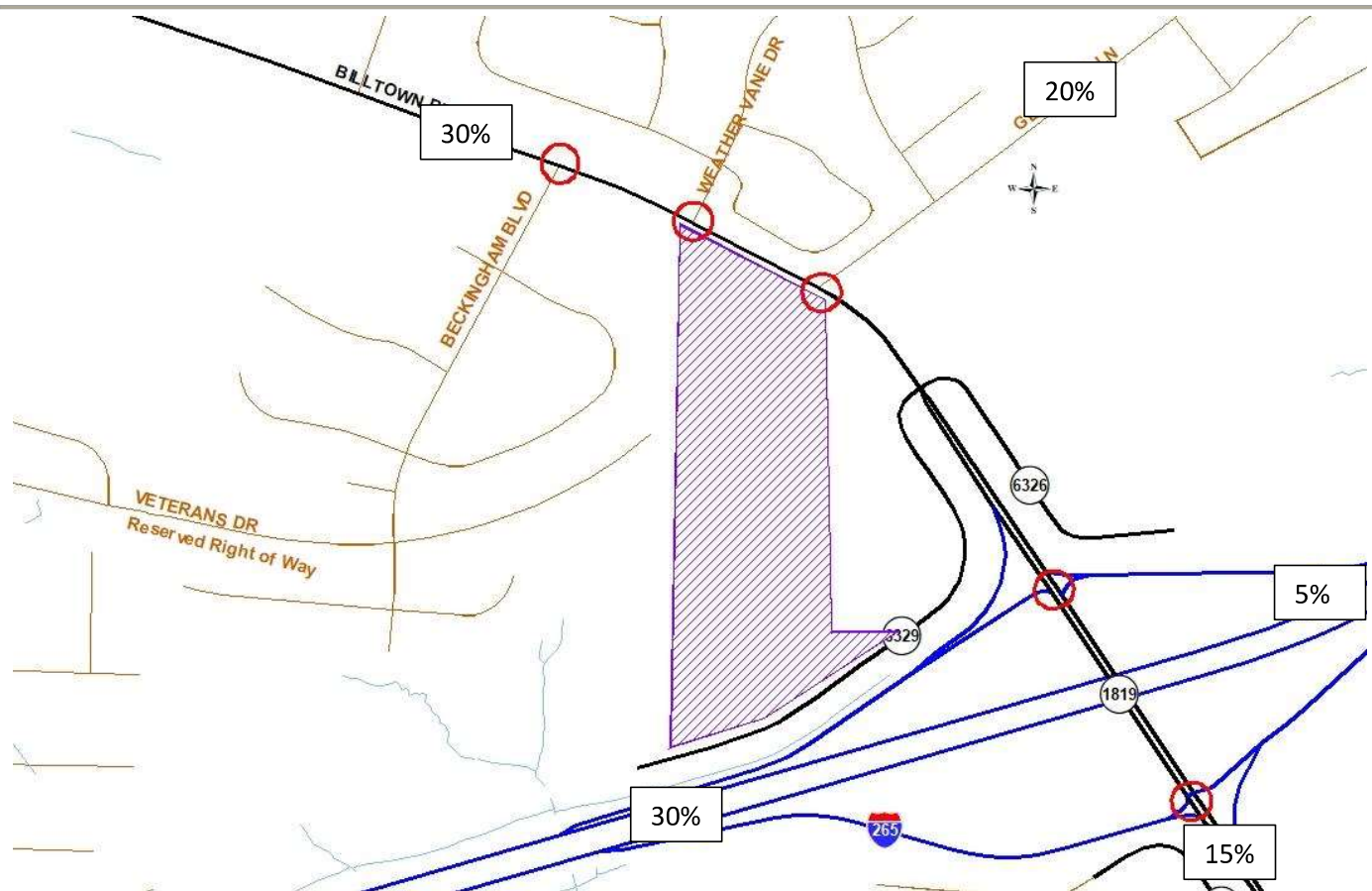
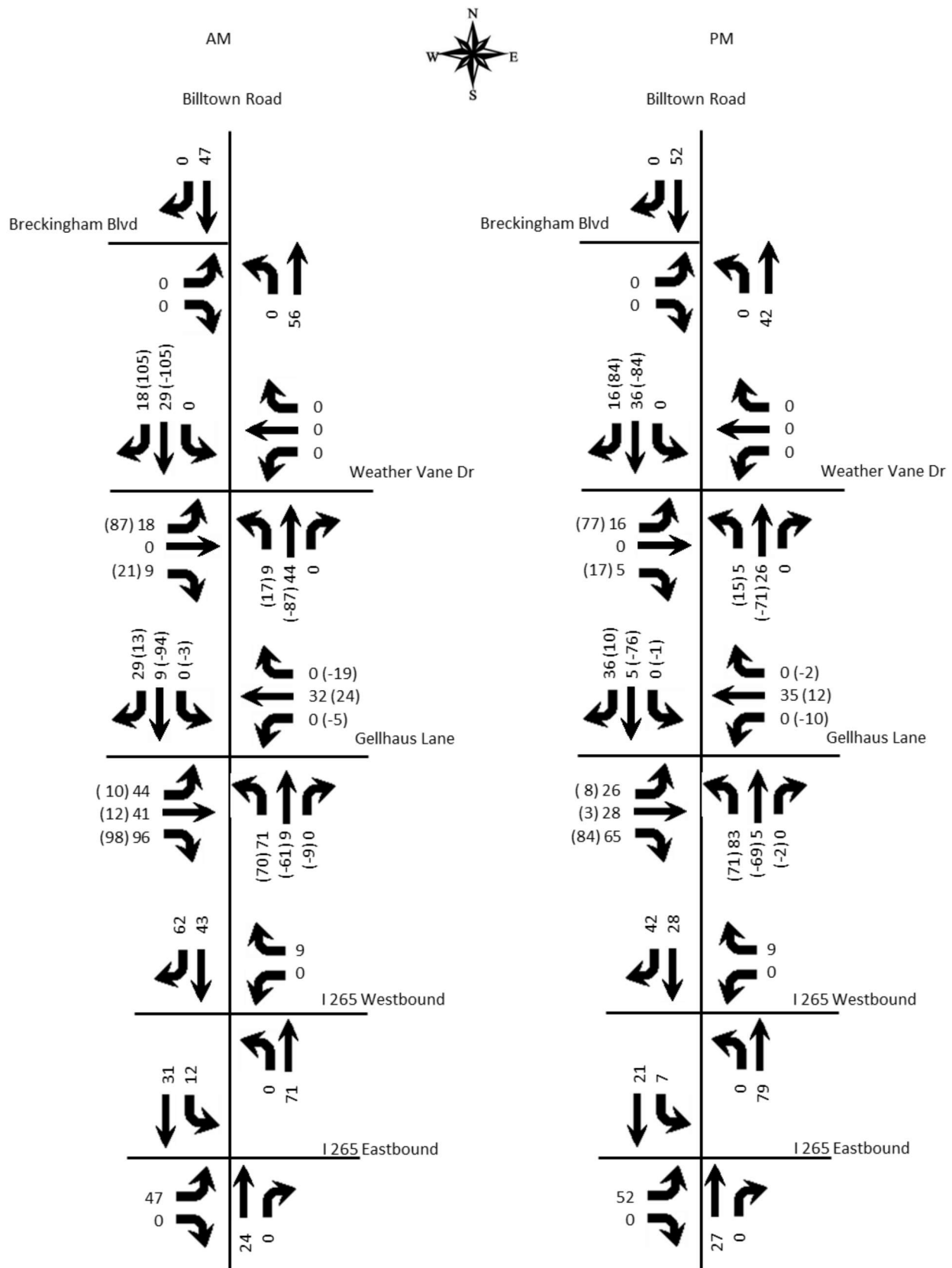


Figure 4. Trip Distribution Percentages



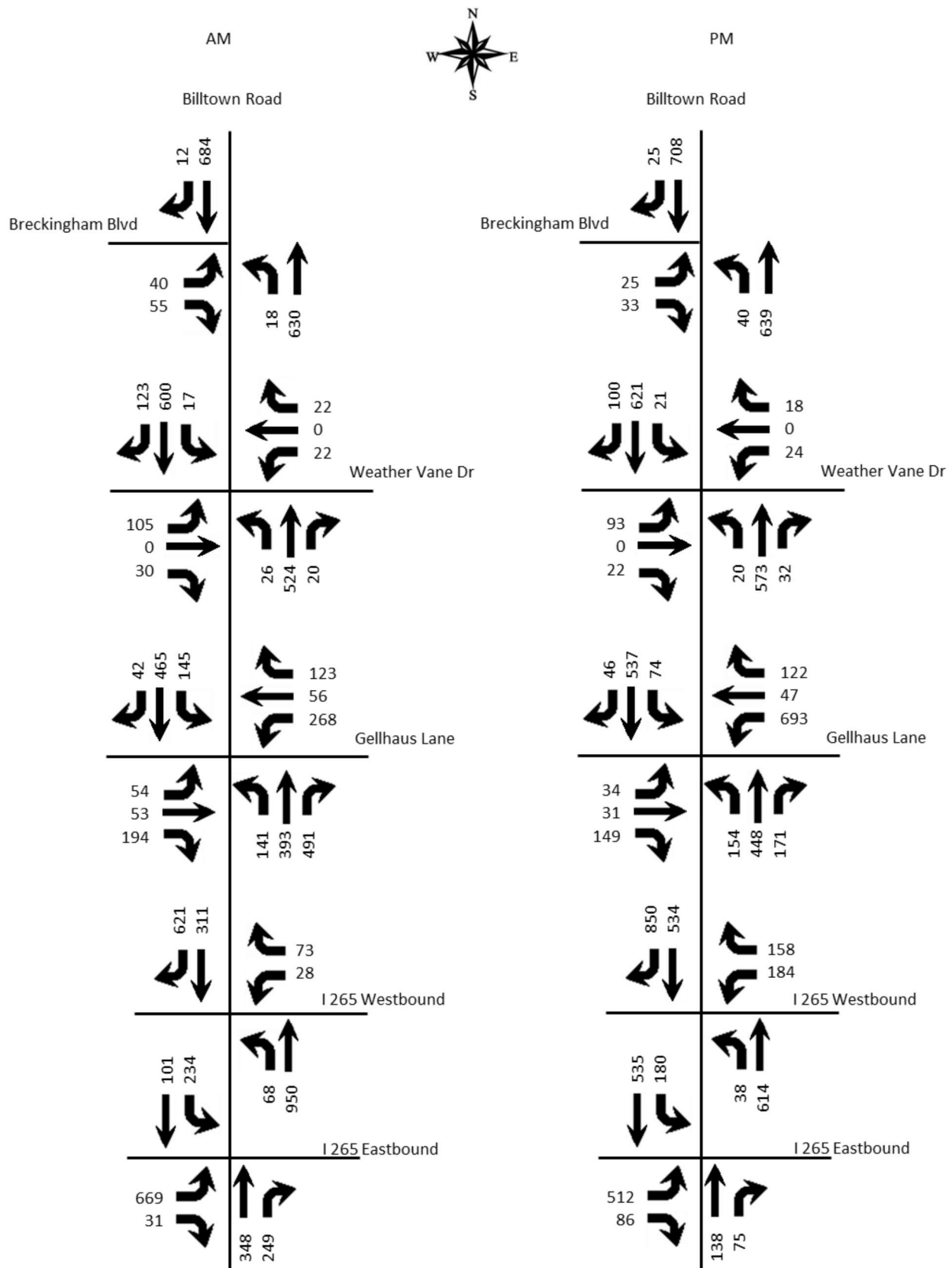


Figure 6. 2027 Build Peak Hour Volumes

## ANALYSIS

The qualitative measure of operation for a roadway facility or intersection is evaluated by assigning a “Level of Service”. Level of Service is a ranking scale from A through F, “A” is the best operating condition and “F” is the worst. Level of Service results depend upon the facility that is analyzed. In this case, the Level of Service is based upon the total delay experienced at an intersection.

To evaluate the impact of the proposed development, the vehicle delays at the intersections were determined using procedures detailed in the Highway Capacity Manual, 7<sup>th</sup> edition. Future delays and Level of Service were determined for the intersections using the HCS Streets and TWSC (version 2024) software. The delays and Level of Service are summarized in **Table 2**.

**Table 2. Peak Hour Level of Service**

Approach	A.M.			P.M.		
	2024 Existing	2027 No Build	2027 Build	2024 Existing	2027 No Build	2027 Build
<b>Billtown Road at Breckingham Boulevard</b>						
Breckingham Boulevard Eastbound	C 21.3	C 22.5	D 25.1	C 16.6	C 17.2	C 18.3
Billtown Road Northbound	A 9.5	A 9.6	A 9.8	A 9.2	A 9.3	A 9.5
<b>Billtown Road at Weather Vane Drives</b>						
Site Entrance Eastbound			E 46.4			D 28.9
Weather Vane Drive Westbound	C 17.6	C 18.3	C 21.5	C 16.5	C 17.0	C 19.4
Billtown Road Northbound			A 9.9			A 9.3
Billtown Road Southbound	A 9.2	A 9.3	A 9.0	A 9.0	A 9.1	A 8.9
<b>Billtown Road at Gellhaus Lane</b>	<b>B 17.2</b>	<b>B 17.7</b>	<b>C 30.5</b>	<b>C 32.8</b>	<b>D 35.5</b>	<b>D 51.2</b>
Veterans Drive Eastbound			C 34.8			E 63.7
Gellhaus Lane Westbound	C 24.9	C 24.7	C 34.4	D 37.9	D 43.1	D 51.5
Billtown Road Northbound	B 18.0	B 18.7	C 24.4	C 33.0	C 34.1	D 38.5
Billtown Road Southbound	B 11.8	B 12.6	C 32.5	C 26.4	C 27.6	E 60.9
<b>Billtown Road at I 265 Westbound Ramps</b>						
I 265 Westbound Ramp	C 20.3	C 21.2	C 23.8	D 25.2	D 27.6	D 33.4
Billtown Road Northbound	A 8.0	A 8.0	A 8.1	A 8.6	A 8.6	A 8.7



	A.M.			P.M.		
Approach	2024 Existing	2027 No Build	2027 Build	2024 Existing	2027 No Build	2027 Build
<b>Billtown Road at I 265 Eastbound Ramps</b>	<b>C</b> <b>32.1</b>	<b>C</b> <b>35.1</b>	<b>D</b> <b>39.6</b>	<b>B</b> <b>19.0</b>	<b>B</b> <b>19.4</b>	<b>C</b> <b>21.8</b>
I 265 Eastbound Ramp	D 42.6	D 47.9	D 52.9	C 27.6	C 27.7	C 29.9
Billtown Road Northbound	C 25.0	C 26.1	C 30.6	B 18.7	B 19.2	C 21.9
Billtown Road Southbound	C 22.9	C 24.2	C 28.1	B 12.4	B 13.0	B 15.1

*Key: Level of Service, Delay in seconds per vehicle*

The entrances were evaluated for turn lanes using the Kentucky Transportation Cabinet Highway Design Guidance Manual dated July, 2020. The traffic impact policy requires using volumes for ten years beyond build-out, or 2037. The 2037 volumes were determined applying a 1.1 percent annual growth rate from 2027. **Figure 7** illustrates the 2037 No Build volumes. **Figure 8** illustrates the 2037 Build Volumes. Using the volumes in Figure 8, the volume warrant is satisfied for a southbound right turn lane at the entrances on Billtown Road. A northbound left turn lane will be required at Gellhaus Lane. Veterans Drive will require a left, a through, and a right turn lane. **Table 3** summarizes the delay and Level of Service for 2037.

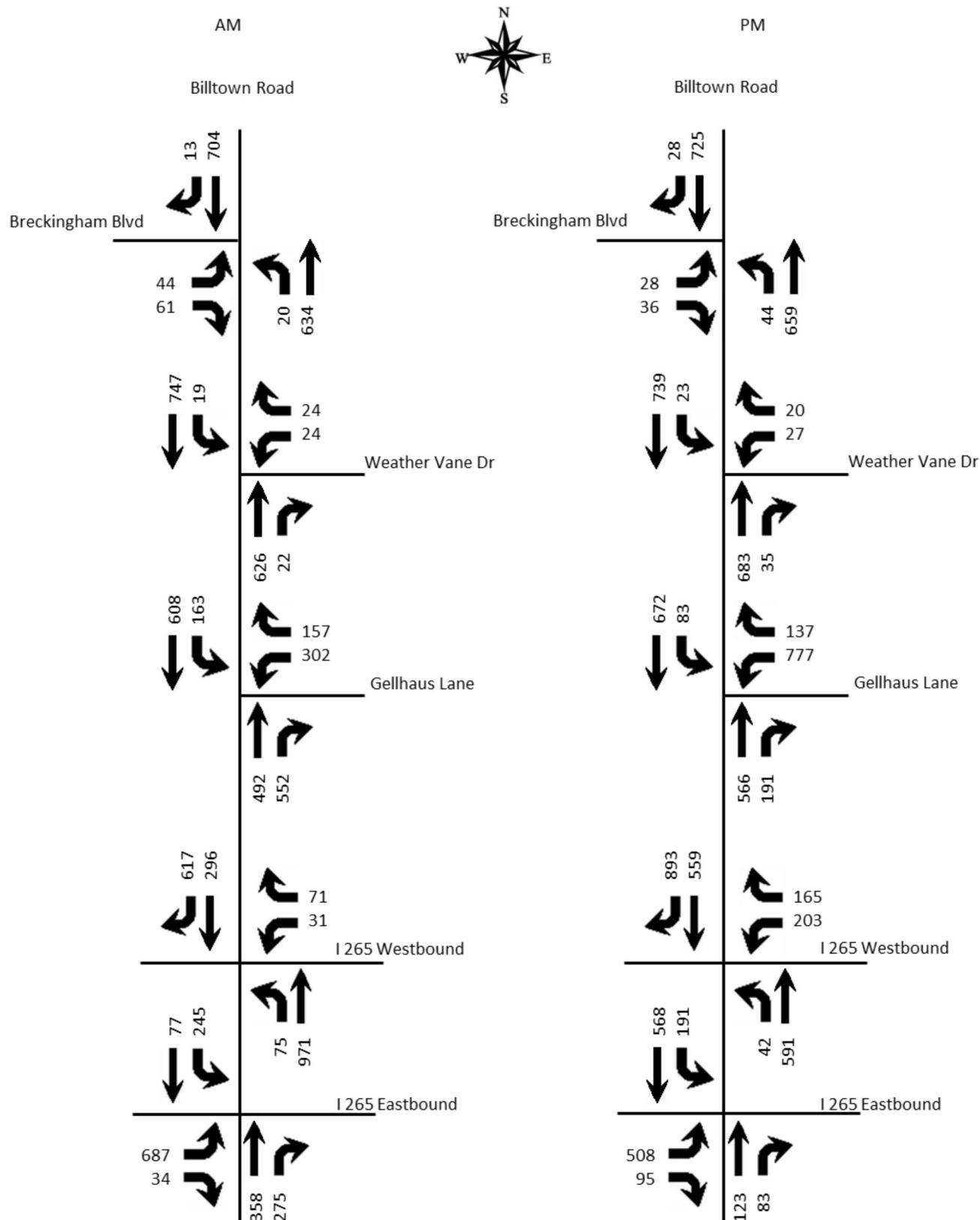


Figure 7. 2037 No Build Peak Hour Volumes

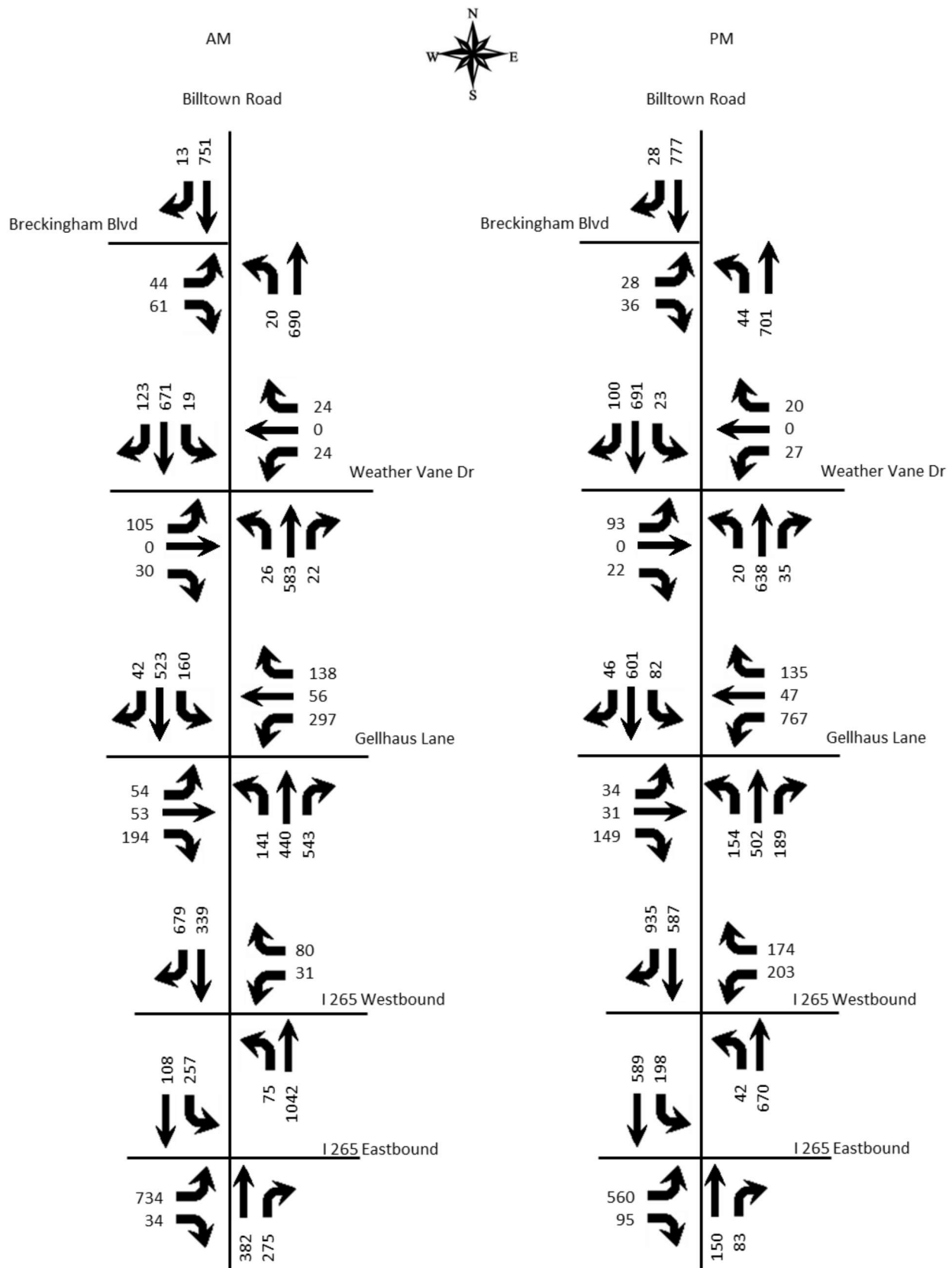


Figure 8. 2037 Build Peak Hour Volumes

**Table 3. 2037 Peak Hour Level of Service**

	A.M.			P.M.		
Approach	2024 Existing	2037 No Build	2037 Build	2024 Existing	2037 No Build	2037 Build
<b>Billtown Road at Breckingham Boulevard</b>						
Breckingham Boulevard Eastbound	C 21.3	D 27.6	D 31.3	C 16.6	C 19.2	C 20.6
Billtown Road Northbound	A 9.5	A 10.0	B 10.2	A 9.2	A 9.6	A 9.9
<b>Billtown Road at Weather Vane Drives</b>						
Site Entrance Eastbound			E 48.3			E 35.2
Weather Vane Drive Westbound	C 17.6	C 20.5	C 22.6	C 16.5	C 18.8	C 22.1
Billtown Road Northbound			B 10.0			A 9.5
Billtown Road Southbound	A 9.2	A 9.6	A 9.1	A 9.0	A 9.4	A 9.2
<b>Billtown Road at Gellhaus Lane</b>	<b>B 17.2</b>	<b>B 19.9</b>	<b>C 33.4</b>	<b>C 32.8</b>	<b>D 50.0</b>	<b>E 67.1</b>
Veterans Drive Eastbound			D 40.0			E 70.3
Gellhaus Lane Westbound	C 24.9	C 24.1	C 33.0	D 37.9	E 78.6	E 79.0
Billtown Road Northbound	B 18.0	C 21.3	C 26.4	C 33.0	C 34.9	D 44.0
Billtown Road Southbound	B 11.8	B 15.9	D 39.7	C 26.4	C 29.7	E 76.2
<b>Billtown Road at I 265 Westbound Ramps</b>						
I 265 Westbound Ramp	C 20.3	C 24.9	D 28.4	D 25.2	E 40.0	F 51.4
Billtown Road Northbound	A 8.0	A 8.1	A 8.2	A 8.6	A 8.8	A 8.9
<b>Billtown Road at I 265 Eastbound Ramps</b>	<b>C 32.1</b>	<b>D 42.3</b>	<b>D 52.4</b>	<b>B 19.0</b>	<b>C 21.2</b>	<b>C 24.5</b>
I 265 Eastbound Ramp	D 42.6	D 52.2	E 62.0	C 27.6	C 29.2	C 33.3
Billtown Road Northbound	C 25.0	C 34.3	D 43.5	B 18.7	C 20.4	C 23.3
Billtown Road Southbound	C 22.9	D 35.8	D 48.3	B 12.4	B 15.1	B 17.5

Key: Level of Service, Delay in seconds per vehicle

The results include an increase in green time for the I 265 Eastbound approach. The signal is not part of a coordinated signal system. The I 265 Westbound approach will begin to experience delays near the Level of Service

F threshold during the pm peak hour. This intersection should be monitored to determine if it meets signal warrants.

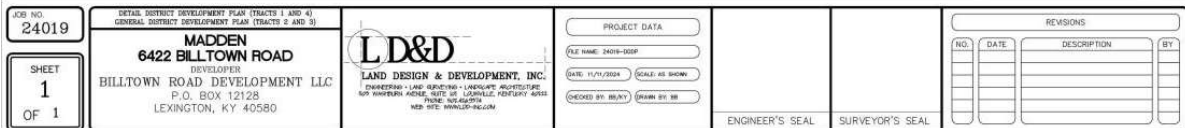
The dimensions for the turn lanes are based upon the current posted speed limit of 45 mph. On Billtown Road the southbound right turn lane at the entrance opposite Weather Vane Drive needs to be 115' full width plus 100' bay taper. On Billtown Road at Gellhaus Lane/Veterans Drive, the southbound right turn lane needs to be 180' full width plus 100' bay taper, the northbound left turn lane needs to be 295' full width with 100' bay taper. The eastbound approach of Veterans Drive needs left turn storage of 70' and right turn storage of 275'. The declaration dimension will be determined by the design speed.

## CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2027 and 2037, there will be an impact to the existing highway network. Both access points on Billtown Road require a southbound right turn lane. The Gellhaus Lane intersection will require a northbound left turn lane.

## APPENDIX





## Traffic Counts

### Classified Turn Movement Count || All vehicles

Louisville, KY



www.marrtraffic.com

#### Site 5

Billtown Rd (South)  
Billtown Rd (North)  
Beckingham Blvd



#### Date

Wednesday, September 18, 2024

#### Weather

Mostly Cloudy  
78°F

[Click here for Detailed Weather](#)

#### Lat/Long

38.151707°, -85.552564°

[Click here for Map](#)



#### 0700 - 1000 (Weekday 3h Session) (09-18-2024)

All vehicles

TIME	Northbound				Southbound				Eastbound				Int Total
	Billtown Rd (South)				Billtown Rd (North)				Beckingham Blvd				
	Left 5.1	Thru 5.2	U-Turn 5.3	App Total	Thru 5.4	Right 5.5	U-Turn 5.6	App Total	Left 5.7	Right 5.8	U-Turn 5.9	App Total	
0700 - 0715	3	139	0	142	141	2	0	143	9	15	1	25	310
0715 - 0730	7	149	0	156	217	2	0	219	12	14	0	26	401
0730 - 0745	6	146	0	152	139	3	0	142	8	10	0	18	312
0745 - 0800	1	121	0	122	119	5	0	124	9	14	0	23	269
Hourly Total	17	555	0	572	616	12	0	628	38	53	1	92	1292
0800 - 0815	6	102	0	108	108	2	0	110	6	8	0	14	232
0815 - 0830	1	93	0	94	94	2	0	96	7	9	0	16	206
0830 - 0845	5	87	0	92	127	1	0	128	4	6	1	11	231
0845 - 0900	5	84	0	89	117	9	0	126	8	6	0	14	229
Hourly Total	17	366	0	383	446	14	0	460	25	29	1	55	898
0900 - 0915	12	79	0	91	95	2	0	97	7	8	1	16	204
0915 - 0930	9	95	0	104	126	5	0	131	4	14	3	21	256
0930 - 0945	6	80	0	86	80	2	0	82	5	12	0	17	185
0945 - 1000	4	72	0	76	60	3	0	63	5	1	0	6	145
Hourly Total	31	326	0	357	361	12	0	373	21	35	4	60	790
Grand Total	65	1247	0	1312	1423	38	0	1461	84	117	6	207	2980
Approach %	4.95	95.05	0.00	-	97.40	2.60	0.00	-	40.58	56.52	2.90	-	
Intersection %	2.18	41.85	0.00	44.03	47.75	1.28	0.00	49.03	2.82	3.93	0.20	6.95	
Heavy Vehicle %	5	3	-	4	4	5	-	4	5	1	0	2	4
PHF	0.61	0.93	0.00	0.92	0.71	0.60	0.00	0.72	0.79	0.88	0.25	0.88	0.81

#### 1400 - 1800 (Weekday 4h Session) (09-18-2024)

All vehicles

TIME	Northbound				Southbound				Eastbound				Int Total
	Billtown Rd (South)				Billtown Rd (North)				Beckingham Blvd				
	Left 5.1	Thru 5.2	U-Turn 5.3	App Total	Thru 5.4	Right 5.5	U-Turn 5.6	App Total	Left 5.7	Right 5.8	U-Turn 5.9	App Total	
1400 - 1415	3	83	0	86	76	2	0	78	1	1	0	2	166
1415 - 1430	7	114	0	121	84	3	0	87	1	6	2	9	217
1430 - 1445	5	119	0	124	109	2	0	111	6	11	0	17	252
1445 - 1500	7	121	0	128	125	9	0	134	5	6	0	11	273
Hourly Total	22	437	0	459	394	16	0	410	13	24	2	39	908
1500 - 1515	11	94	0	105	102	4	0	106	3	2	1	6	217
1515 - 1530	6	100	0	106	101	4	0	105	3	2	0	5	216
1530 - 1545	7	108	0	115	119	4	0	123	3	7	0	10	248
1545 - 1600	13	117	0	130	106	6	0	112	5	4	0	9	251
Hourly Total	37	419	0	456	428	18	0	446	14	15	1	30	932
1600 - 1615	11	116	0	127	156	10	0	166	6	10	0	16	309
1615 - 1630	15	128	0	143	163	3	0	166	3	7	1	11	320
1630 - 1645	8	175	0	183	137	3	0	140	4	7	0	11	334
1645 - 1700	6	133	0	139	137	9	0	146	4	5	0	9	294
Hourly Total	40	552	0	592	593	25	0	618	17	29	1	47	1257
1700 - 1715	7	132	0	139	167	10	0	177	10	7	1	18	334
1715 - 1730	8	135	0	143	160	6	0	166	4	7	0	11	320
1730 - 1745	9	169	0	178	153	2	0	155	5	10	0	15	348
1745 - 1800	15	142	0	157	155	6	0	161	3	8	1	12	330
Hourly Total	39	578	0	617	635	24	0	659	22	32	2	56	1332
Grand Total	138	1986	0	2124	2050	83	0	2133	66	100	6	172	4429
Approach %	6.50	93.50	0.00	-	96.11	3.89	0.00	-	38.37	58.14	3.49	-	
Intersection %	3.12	44.84	0.00	47.96	46.29	1.87	0.00	48.16	1.49	2.26	0.14	3.88	
Heavy Vehicle %	4	3	-	3	3	4	-	3	9	3	0	5	3
PHF	0.65	0.86	0.00	0.87	0.95	0.60	0.00	0.93	0.55	0.80	0.50	0.78	0.96



6422 Billtown Road  
Traffic Impact Study

Classified Turn Movement Count || All vehicles

Louisville, KY



Site 4

Billtown Rd (South)  
Billtown Rd (North)



Date

Wednesday, September 18, 2024

Weather

Mostly Cloudy  
78°F

Lat/Long

38.151171°, -85.550978°

[Click here for Detailed Weather](#)

[Click here for Map](#)

Weather Vane Dr



0700 - 1000 (Weekday 3h Session) (09-18-2024)

All vehicles

TIME	Northbound				Southbound			
	Billtown Rd (South)				Billtown Rd (North)			
	Thru 4.1	Right 4.2	U-Turn 4.3	App Total	Left 4.4	Thru 4.5	U-Turn 4.6	App Total
0700 - 0715	140	5	0	145	5	149	0	154
0715 - 0730	150	6	0	156	4	228	0	232
0730 - 0745	142	4	0	146	4	147	0	151
0745 - 0800	117	4	0	121	3	130	0	133
Hourly Total	549	19	0	568	16	654	0	670
0800 - 0815	107	3	0	110	1	117	0	118
0815 - 0830	94	1	0	95	0	103	0	103
0830 - 0845	88	2	0	90	4	128	0	132
0845 - 0900	86	2	0	88	1	122	0	123
Hourly Total	375	8	0	383	6	470	0	476
0900 - 0915	87	5	0	92	5	99	0	104
0915 - 0930	102	8	0	110	4	135	0	139
0930 - 0945	84	5	0	89	2	91	0	93
0945 - 1000	72	4	0	76	1	59	0	60
Hourly Total	345	22	0	367	12	384	0	396
Grand Total	1269	49	0	1318	34	1508	0	1542
Approach %	96.28	3.72	0.00	-	2.20	97.80	0.00	-
Intersection %	42.92	1.66	0.00	44.57	1.15	51.00	0.00	52.15
Heavy Vehicle %	4	4	-	4	6	3	-	3
PHF	0.92	0.79	0.00	0.91	0.80	0.72	0.00	0.72

Westbound				
Weather Vane Dr				
Left 4.7	Right 4.8	U-Turn 4.9	App Total	Int Total
7	3	0	10	309
2	1	0	3	391
6	11	0	17	314
6	6	0	12	266
21	21	0	42	1280
5	5	0	10	238
5	3	0	8	206
2	2	0	4	226
3	5	0	8	219
15	15	0	30	889
4	2	0	6	202
5	2	0	7	256
5	5	0	10	192
2	0	0	2	138
16	9	0	25	788
52	45	0	97	2957
53.61	46.39	0.00	-	-
1.76	1.52	0.00	3.28	-
4	0	-	2	3
0.75	0.48	0.00	0.62	0.82

1400 - 1800 (Weekday 4h Session) (09-18-2024)

All vehicles

TIME	Northbound				Southbound			
	Billtown Rd (South)				Billtown Rd (North)			
	Thru 4.1	Right 4.2	U-Turn 4.3	App Total	Left 4.4	Thru 4.5	U-Turn 4.6	App Total
1400 - 1415	82	9	0	91	7	71	0	78
1415 - 1430	118	2	0	120	1	89	0	90
1430 - 1445	123	10	0	133	1	119	0	120
1445 - 1500	122	5	0	127	5	125	0	130
Hourly Total	445	26	0	471	14	404	0	418
1500 - 1515	96	4	0	100	3	101	0	104
1515 - 1530	103	7	0	110	3	101	0	104
1530 - 1545	109	3	0	112	3	122	0	125
1545 - 1600	127	3	0	130	4	108	0	112
Hourly Total	435	17	0	452	13	432	0	445
1600 - 1615	123	5	0	128	5	159	0	164
1615 - 1630	143	8	0	151	4	166	0	170
1630 - 1645	174	9	0	183	2	142	0	144
1645 - 1700	134	11	0	145	5	138	0	143
Hourly Total	574	33	0	607	16	605	0	621
1700 - 1715	133	3	0	136	4	167	0	171
1715 - 1730	143	9	0	152	2	157	1	160
1730 - 1745	165	9	0	174	5	167	0	172
1745 - 1800	157	10	0	167	7	156	1	164
Hourly Total	598	31	0	629	18	647	2	667
Grand Total	2052	107	0	2159	61	2088	2	2151
Approach %	95.04	4.96	0.00	-	2.84	97.07	0.09	-
Intersection %	45.83	2.39	0.00	48.22	1.36	46.64	0.04	48.05
Heavy Vehicle %	3	2	-	3	2	3	50	3
PHF	0.91	0.78	0.00	0.90	0.64	0.97	0.50	0.97

Westbound				
Weather Vane Dr				
Left 4.7	Right 4.8	U-Turn 4.9	App Total	Int Total
4	4	0	8	177
6	3	0	9	219
5	1	0	6	259
9	8	0	17	274
24	16	0	40	929
5	6	0	11	215
4	5	0	9	223
7	4	0	11	248
5	3	0	8	250
21	18	0	39	936
8	3	0	11	303
6	6	0	12	333
3	5	0	8	335
11	6	0	17	305
28	20	0	48	1276
5	4	0	9	316
4	3	0	7	319
6	9	0	15	361
8	1	0	9	340
23	17	0	40	1336
96	71	0	167	4477
57.49	42.51	0.00	-	-
2.14	1.59	0.00	3.73	-
2	0	-	1	3
0.72	0.47	0.00	0.67	0.93

6422 Billtown Road  
Traffic Impact Study

Classified Turn Movement Count || All vehicles

Louisville, KY



Site 3

Billtown Rd (South)  
Billtown Rd (North)



Date

Wednesday, September 18, 2024

Weather

Mostly Cloudy  
78°F

[Click here for Detailed Weather](#)

Lat/Long

38.150524°, -85.549378°

[Click here for Map](#)

Gellhaus Ln



0700 - 1000 (Weekday 3h Session) (09-18-2024)

All vehicles

TIME	Northbound					Southbound				
	Billtown Rd (South)					Billtown Rd (North)				
	Thru 3.1	Right 3.2	U-Turn 3.3	App Total	Left 3.4	Thru 3.5	U-Turn 3.6	App Total	Left 3.7	Thru 3.8
0700 - 0715	104	121	0	225	45	116	0	161	81	33
0715 - 0730	95	102	0	197	62	164	0	226	77	62
0730 - 0745	122	134	0	256	22	127	0	149	73	27
0745 - 0800	110	127	0	237	14	125	0	139	33	15
Hourly Total	431	484	0	915	143	532	0	675	264	137
0800 - 0815	103	94	0	197	11	109	0	120	32	9
0815 - 0830	86	87	0	173	12	103	0	115	34	10
0830 - 0845	76	62	0	138	22	108	0	130	37	10
0845 - 0900	73	73	0	146	28	96	0	124	37	18
Hourly Total	338	316	0	654	73	416	0	489	140	47
0900 - 0915	72	53	0	125	32	70	0	102	52	22
0915 - 0930	57	65	0	122	55	77	0	132	87	52
0930 - 0945	49	63	0	112	29	74	0	103	53	38
0945 - 1000	61	36	0	97	7	54	0	61	31	16
Hourly Total	239	217	0	456	123	275	0	398	223	128
Grand Total	1008	1017	0	2025	339	1223	0	1562	627	312
Approach %	49.78	50.22	0.00	-	21.70	78.30	0.00	-	66.77	33.23
Intersection %	22.27	22.47	0.00	44.74	7.49	27.02	0.00	34.51	13.85	6.89
Heavy Vehicle %	3	6	-	4	9	2	-	3	5	5
PHF	0.88	0.90	0.00	0.89	0.58	0.81	0.00	0.75	0.81	0.55

Westbound				
Gellhaus Ln				
Left 3.7	Right 3.8	U-Turn 3.9	App Total	Int Total
81	33	0	114	500
77	62	0	139	562
73	27	0	100	505
33	15	0	48	424
264	137	0	401	1991
32	9	0	41	358
34	10	0	44	332
37	10	0	47	315
37	18	0	55	325
140	47	0	187	1330
52	22	0	74	301
87	52	0	139	393
53	38	0	91	306
31	16	0	47	205
223	128	0	351	1205
627	312	0	939	4526
66.77	33.23	0.00	-	-
13.85	6.89	0.00	20.75	-
5	5	-	5	4
0.81	0.55	0.00	0.72	0.89

1400 - 1800 (Weekday 4h Session) (09-18-2024)

All vehicles

TIME	Northbound					Southbound				
	Billtown Rd (South)					Billtown Rd (North)				
	Thru 3.1	Right 3.2	U-Turn 3.3	App Total	Left 3.4	Thru 3.5	U-Turn 3.6	App Total	Left 3.7	Thru 3.8
1400 - 1415	80	38	0	118	13	60	0	73	29	6
1415 - 1430	71	34	0	105	10	79	0	89	105	48
1430 - 1445	104	44	0	148	18	111	0	129	91	31
1445 - 1500	103	35	0	138	18	121	0	139	66	23
Hourly Total	358	151	0	509	59	371	0	430	291	108
1500 - 1515	81	39	0	120	19	87	0	106	87	17
1515 - 1530	102	35	0	137	13	92	0	105	72	9
1530 - 1545	99	45	0	144	12	111	0	123	89	14
1545 - 1600	123	52	0	175	7	103	0	110	106	14
Hourly Total	405	171	0	576	51	393	0	444	354	54
1600 - 1615	110	51	0	161	26	144	0	170	97	15
1615 - 1630	125	38	0	163	25	152	0	177	139	28
1630 - 1645	107	41	0	148	19	120	0	139	160	71
1645 - 1700	105	47	0	152	21	134	0	155	159	40
Hourly Total	447	177	0	624	91	550	0	641	555	154
1700 - 1715	110	42	0	152	18	155	0	173	180	28
1715 - 1730	141	42	0	183	20	143	0	163	165	20
1730 - 1745	139	36	0	175	14	156	0	170	176	32
1745 - 1800	140	23	0	163	28	133	0	161	100	25
Hourly Total	530	143	0	673	80	587	0	667	621	105
Grand Total	1740	642	0	2382	281	1901	0	2182	1821	421
Approach %	73.05	26.95	0.00	-	12.88	87.12	0.00	-	81.19	18.77
Intersection %	25.56	9.43	0.00	34.99	4.13	27.93	0.00	32.06	26.75	6.18
Heavy Vehicle %	2	7	-	3	14	1	-	3	2	7
PHF	0.88	0.89	0.00	0.90	0.87	0.94	0.00	0.96	0.94	0.75

Westbound				
Gellhaus Ln				
Left 3.7	Right 3.8	U-Turn 3.9	App Total	Int Total
29	6	1	36	227
105	48	0	153	347
91	31	0	122	399
66	23	0	89	366
291	108	1	400	1339
87	17	0	104	330
72	9	0	81	323
89	14	0	103	370
106	14	0	120	405
354	54	0	408	1428
97	15	0	112	443
139	28	0	167	507
160	71	0	231	518
159	40	0	199	506
555	154	0	709	1974
180	28	0	208	533
165	20	0	185	531
176	32	0	208	553
100	25	0	125	449
621	105	0	726	2066
1821	421	1	2243	6807
81.19	18.77	0.04	-	-
26.75	6.18	0.01	32.95	-
2	7	0	3	3
0.94	0.75	0.00	0.96	0.96

# 6422 Billtown Road Traffic Impact Study

## Classified Turn Movement Count || All vehicles

Louisville, KY



### Site 2

Billtown Rd (South)  
Billtown Rd (North)  
I-265 Gene Snyder Fwy W/Bound On-Ramp  
I-265 Gene Snyder Fwy W/Bound Off-Ramp



### Date

Wednesday, September 18, 2024

### Lat/Long

38.147731°, -85.546650°

[Click here for Map](#)

### Weather

Mostly Cloudy  
78°F

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### 0700 - 1000 (Weekday 3h Session) (09-18-2024)

All vehicles

TIME	Northbound				Southbound				Eastbound				Westbound			
	Billtown Rd (South)				Billtown Rd (North)				I-265 Gene Snyder Fwy W/Bound On-Ramp				I-265 Gene Snyder Fwy W/Bound Off-Ramp			
	Left 2.1	Thru 2.2	U-Turn 2.3	App Total	Thru 2.4	Right 2.5	U-Turn 2.6	App Total	Left 2.7	Thru 2.8	Right 2.9	App Total	Left 2.7	Thru 2.8	Right 2.9	App Total
0700 - 0715	6	207	0	213	64	139	0	203	4	0	20	24	4	0	20	440
0715 - 0730	14	193	0	207	86	148	0	234	7	0	11	18	7	0	11	459
0730 - 0745	26	234	0	260	60	144	0	204	5	0	12	17	5	0	12	481
0745 - 0800	20	217	0	237	49	110	0	159	11	0	19	30	11	0	19	426
Hourly Total	66	851	0	917	259	541	0	800	27	0	62	89	27	0	62	1806
0800 - 0815	17	164	0	181	42	96	0	138	6	0	25	31	6	0	25	350
0815 - 0830	25	158	0	183	51	89	0	140	10	0	21	31	10	0	21	354
0830 - 0845	15	110	0	125	48	95	0	143	5	0	25	30	5	0	25	298
0845 - 0900	10	127	0	137	46	87	0	133	15	0	23	38	15	0	23	308
Hourly Total	67	559	0	626	187	367	0	554	36	0	94	130	36	0	94	1310
0900 - 0915	15	93	0	108	41	79	0	120	14	0	26	40	14	0	26	268
0915 - 0930	3	104	0	107	52	113	0	165	9	1	24	34	9	1	24	306
0930 - 0945	8	85	0	93	39	89	0	128	8	0	21	29	8	0	21	250
0945 - 1000	11	81	0	92	29	57	0	86	5	0	22	27	5	0	22	205
Hourly Total	37	363	0	400	161	338	0	499	36	1	93	130	36	1	93	1029
Grand Total	170	1773	0	1943	607	1246	0	1853	99	1	249	349	99	1	249	4145
Approach %	8.75	91.25	0.00	-	32.76	67.24	0.00	-	28.37	0.29	71.35	-	28.37	0.29	71.35	-
Intersection %	4.10	42.77	0.00	46.88	14.64	30.06	0.00	44.70	2.39	0.02	6.01	8.42	2.39	0.02	6.01	8.42
Heavy Vehicle %	1	4	-	4	3	3	-	3	7	0	6	6	7	0	6	4
PHF	0.63	0.91	0.00	0.88	0.75	0.91	0.00	0.85	0.61	0.00	0.78	0.74	0.61	0.00	0.78	0.94

### 1400 - 1800 (Weekday 4h Session) (09-18-2024)

All vehicles

TIME	Northbound				Southbound				Eastbound				Westbound			
	Billtown Rd (South)				Billtown Rd (North)				I-265 Gene Snyder Fwy W/Bound On-Ramp				I-265 Gene Snyder Fwy W/Bound Off-Ramp			
	Left 2.1	Thru 2.2	U-Turn 2.3	App Total	Thru 2.4	Right 2.5	U-Turn 2.6	App Total	Left 2.7	Thru 2.8	Right 2.9	App Total	Left 2.7	Thru 2.8	Right 2.9	App Total
1400 - 1415	9	79	0	88	30	60	0	90	11	0	26	37	11	0	26	215
1415 - 1430	7	91	0	98	56	127	0	183	19	0	25	44	19	0	25	325
1430 - 1445	8	106	0	114	68	132	0	200	17	0	42	59	17	0	42	373
1445 - 1500	5	99	0	104	57	134	0	191	17	0	33	50	17	0	33	345
Hourly Total	29	375	0	404	211	453	0	664	64	0	126	190	64	0	126	1258
1500 - 1515	11	90	0	101	58	116	0	174	50	0	40	90	50	0	40	365
1515 - 1530	12	87	0	99	63	104	0	167	59	1	45	105	59	1	45	371
1530 - 1545	4	93	0	97	79	115	0	194	48	0	50	98	48	0	50	389
1545 - 1600	13	115	0	128	76	136	0	212	62	0	60	122	62	0	60	462
Hourly Total	40	385	0	425	276	471	0	747	219	1	195	415	219	1	195	1587
1600 - 1615	9	119	0	128	77	163	0	240	58	0	52	110	58	0	52	478
1615 - 1630	6	104	0	110	110	183	0	293	36	0	48	84	36	0	48	487
1630 - 1645	13	116	0	129	97	173	0	270	46	0	40	86	46	0	40	485
1645 - 1700	13	111	0	124	110	182	0	292	50	0	38	88	50	0	38	504
Hourly Total	41	450	0	491	394	701	0	1095	190	0	178	368	190	0	178	1954
1700 - 1715	8	133	0	141	132	202	0	334	44	1	29	74	44	1	29	549
1715 - 1730	10	141	0	151	119	188	0	307	38	0	43	81	38	0	43	539
1730 - 1745	6	133	0	139	129	210	0	339	46	0	34	80	46	0	34	558
1745 - 1800	6	124	0	130	82	150	0	232	39	0	33	72	39	0	33	434
Hourly Total	30	531	0	561	462	750	0	1212	167	1	139	307	167	1	139	2080
Grand Total	140	1741	0	1881	1343	2375	0	3718	640	2	638	1280	640	2	638	6879
Approach %	7.44	92.56	0.00	-	36.12	63.88	0.00	-	50.00	0.16	49.84	-	50.00	0.16	49.84	-
Intersection %	2.04	25.31	0.00	27.34	19.52	34.53	0.00	54.05	9.30	0.03	9.27	18.61	9.30	0.03	9.27	18.61
Heavy Vehicle %	4	3	-	3	1	2	-	2	0	50	3	2	0	50	3	2
PHF	0.71	0.92	0.00	0.92	0.93	0.93	0.00	0.94	0.89	0.25	0.84	0.92	0.89	0.25	0.84	0.96

# 6422 Billtown Road Traffic Impact Study

## Classified Turn Movement Count || All vehicles

Louisville, KY



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### Site 1

Billtown Rd (South)  
Billtown Rd (North)  
I-265 Gene Snyder Fwy E/Bound Off-Ramp  
I-265 Gene Snyder Fwy E/Bound On-Ramp



### Date

Wednesday, September 18, 2024

### Lat/Long

38.145476°, -85.544722°

[Click here for Map](#)

### Weather

Mostly Cloudy  
78°F

[Click here for Detailed Weather](#)



### 0700 - 1000 (Weekday 3h Session) (09-18-2024)

All vehicles

TIME	Northbound					Southbound					Eastbound					Westbound				
	Billtown Rd (South)					Billtown Rd (North)					I-265 Gene Snyder Fwy E/Bound Off-Ramp					I-265 Gene Snyder Fwy E/Bound On-Ramp				
	Thru 1.1	Right 1.2	U-Turn 1.3	App Total	Left 1.4	Thru 1.5	U-Turn 1.6	App Total	Left 1.7	Thru 1.8	Right 1.9	App Total	Left 1.7	Thru 1.8	Right 1.9	App Total	Left 1.7	Thru 1.8	Right 1.9	Int Total
0700 - 0715	78	55	0	133	57	12	0	69	145	0	6	151	0	0	0	151	0	0	0	353
0715 - 0730	72	93	0	165	66	19	0	85	153	0	8	161	0	0	0	161	0	0	0	411
0730 - 0745	86	54	0	140	51	21	0	72	157	0	7	164	0	0	0	164	0	0	0	376
0745 - 0800	78	39	0	117	41	16	0	57	147	0	9	156	0	0	0	156	0	0	0	330
Hourly Total	314	241	0	555	215	68	0	283	602	0	30	632	0	0	0	632	0	0	0	1470
0800 - 0815	74	25	0	99	40	11	0	51	116	0	7	123	0	0	0	123	0	0	0	273
0815 - 0830	54	28	0	82	41	21	0	62	119	0	4	123	0	0	0	123	0	0	0	267
0830 - 0845	44	21	0	65	36	18	0	54	83	0	4	87	0	0	0	87	0	0	0	206
0845 - 0900	29	27	0	56	32	28	0	60	108	0	10	118	0	0	0	118	0	0	0	234
Hourly Total	201	101	0	302	149	78	0	227	426	0	25	451	0	0	0	451	0	0	0	980
0900 - 0915	39	24	0	63	35	20	0	55	71	0	5	76	0	0	0	76	0	0	0	194
0915 - 0930	25	22	0	47	43	18	0	61	87	1	4	92	0	0	0	92	0	0	0	200
0930 - 0945	27	21	0	48	32	16	0	48	63	0	3	66	0	0	0	66	0	0	0	162
0945 - 1000	17	21	0	38	20	13	0	33	72	1	6	79	0	0	0	79	0	0	0	150
Hourly Total	108	88	0	196	130	67	0	197	293	2	18	313	0	0	0	313	0	0	0	706
Grand Total	623	430	0	1053	494	213	0	707	1321	2	73	1396	0	0	0	1396	0	0	0	3156
Approach %	59.16	40.84	0.00	-	69.87	30.13	0.00	-	94.63	0.14	5.23	-	0.00	-	-	-	0.00	-	-	-
Intersection %	19.74	13.62	0.00	33.37	15.65	6.75	0.00	22.40	41.86	0.06	2.31	44.23	0.00	0.00	0.00	44.23	0.00	0.00	0.00	-
Heavy Vehicle %	3	2	-	3	3	4	-	3	4	0	5	5	-	-	-	5	-	-	-	4
PHF	0.91	0.65	0.00	0.84	0.81	0.81	0.00	0.83	0.96	0.00	0.83	0.96	0.00	0.00	0.83	0.96	0.00	0.00	0.83	0.89

### 1400 - 1800 (Weekday 4h Session) (09-18-2024)

All vehicles

TIME	Northbound					Southbound					Eastbound					Westbound				
	Billtown Rd (South)					Billtown Rd (North)					I-265 Gene Snyder Fwy E/Bound Off-Ramp					I-265 Gene Snyder Fwy E/Bound On-Ramp				
	Thru 1.1	Right 1.2	U-Turn 1.3	App Total	Left 1.4	Thru 1.5	U-Turn 1.6	App Total	Left 1.7	Thru 1.8	Right 1.9	App Total	Left 1.7	Thru 1.8	Right 1.9	App Total	Left 1.7	Thru 1.8	Right 1.9	Int Total
1400 - 1415	19	8	0	27	15	40	0	55	74	0	6	80	0	0	0	80	0	0	0	162
1415 - 1430	16	12	0	28	24	45	0	69	78	0	18	96	0	0	0	96	0	0	0	193
1430 - 1445	26	14	0	40	40	49	0	89	85	0	13	98	0	0	0	98	0	0	0	227
1445 - 1500	15	17	0	32	31	45	0	76	90	1	23	114	0	0	0	114	0	0	0	222
Hourly Total	76	51	0	127	110	179	0	289	327	1	60	388	0	0	0	388	0	0	0	804
1500 - 1515	22	13	0	35	30	71	0	101	80	0	18	98	0	0	0	98	0	0	0	234
1515 - 1530	24	11	0	35	26	98	0	124	74	0	14	88	0	0	0	88	0	0	0	247
1530 - 1545	13	14	0	27	33	94	0	127	94	0	23	117	0	0	0	117	0	0	0	271
1545 - 1600	22	9	0	31	33	108	0	141	100	0	19	119	0	0	0	119	0	0	0	291
Hourly Total	81	47	0	128	122	371	0	493	348	0	74	422	0	0	0	422	0	0	0	1043
1600 - 1615	22	12	0	34	30	96	0	126	105	0	13	118	0	0	0	118	0	0	0	278
1615 - 1630	21	17	0	38	37	106	0	143	93	0	14	107	0	0	0	107	0	0	0	288
1630 - 1645	30	17	0	47	38	110	0	148	92	0	17	109	0	0	0	109	0	0	0	304
1645 - 1700	29	16	0	45	34	117	0	151	97	0	19	116	0	0	0	116	0	0	0	312
Hourly Total	102	62	0	164	139	429	0	568	387	0	63	450	0	0	0	450	0	0	0	1182
1700 - 1715	26	10	0	36	49	132	0	181	120	0	25	145	0	0	0	145	0	0	0	362
1715 - 1730	24	19	0	43	37	118	0	155	120	0	21	141	0	0	0	141	0	0	0	339
1730 - 1745	28	28	0	56	47	130	0	177	108	0	18	126	0	0	0	126	0	0	0	359
1745 - 1800	31	15	0	46	32	89	0	121	104	0	18	122	0	0	0	122	0	0	0	289
Hourly Total	109	72	0	181	165	469	0	634	452	0	82	534	0	0	0	534	0	0	0	1349
Grand Total	368	232	0	600	536	1448	0	1984	1514	1	279	1794	0	0	0	1794	0	0	0	4378
Approach %	61.33	38.67	0.00	-	27.02	72.98	0.00	-	84.39	0.06	15.55	-	0.00	-	-	-	0.00	-	-	-
Intersection %	8.41	5.30	0.00	13.70	12.24	33.07	0.00	45.32	34.58	0.02	6.37	40.98	0.00	0.00	0.00	40.98	0.00	0.00	0.00	-
Heavy Vehicle %	4	2	-	3	1	1	-	1	3	0	2	3	-	-	-	3	-	-	-	2
PHF	0.92	0.65	0.00	0.80	0.85	0.94	0.00	0.92	0.93	0.00	0.83	0.91	0.00	0.00	0.83	0.91	0.00	0.00	0.83	0.95



## TIS Simplified Traffic Forecast

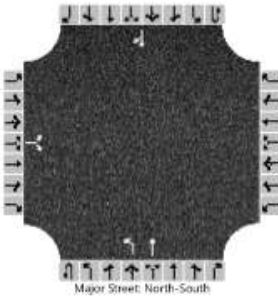
Count Year	2024	Number of Counts	14
Opening Year	2027		
Design Year	2037	Growth Rate	1.09%
Years Back	15		

KYTC Traffic Count Station #1	
STA ID	056325
Paste Count Data Here	
2024	
2023	11952
2022	
2021	
2020	10375
2019	
2018	
2017	10727
2016	
2015	
2014	9813
2013	
2012	10138
2011	
2010	
2009	
2008	10300
2007	
2006	
2005	9350
2004	
2003	
2002	10200
2001	
2000	
1999	9070

KYTC Traffic Count Station #2	
STA ID	056B53
Paste Count Data Here	
2024	
2023	6173
2022	
2021	
2020	4444
2019	
2018	
2017	
2016	
2015	5588
2014	5108
2013	
2012	
2011	
2010	
2009	
2008	
2007	
2006	
2005	
2004	
2003	
2002	
2001	
2000	
1999	

KYTC Traffic Count Station #3	
STA ID	056323
Paste Count Data Here	
2024	
2023	5053
2022	
2021	
2020	3820
2019	
2018	
2017	4566
2016	
2015	
2014	4388
2013	
2012	4050
2011	
2010	
2009	
2008	3660
2007	
2006	
2005	3710
2004	
2003	
2002	2750
2001	
2000	2590
1999	

HCS Reports

HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection				Billtown Road at Breckingham Blvd					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street				Breckingham Blvd					
Analysis Year	2024							North/South Street				Billtown Road					
Time Analyzed	AM Peak							Peak Hour Factor				0.81					
Intersection Orientation	North-South							Analysis Time Period (hrs)				0.25					
Project Description	Madden Billtown																
Lanes																	
																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		39		53						17	555				616	12	
Percent Heavy Vehicles (%)		5		0						6							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage		Left Only											1				
Critical and Follow-up Headways																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.45		6.20						4.16							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.55		3.30						2.25							
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			114							21							
Capacity, c (veh/h)			333							823							
v/c Ratio			0.34							0.03							
95% Queue Length, Q <sub>95</sub> (veh)			1.5							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			38.1							2.6							
Control Delay (s/veh)			21.3							9.5							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)		21.3								0.3							
Approach LOS		C								A							



HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2027							North/South Street	Billtown Road								
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.81								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<p>Major Street: North-South</p>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		40		55						18	574				637	12	
Percent Heavy Vehicles (%)		5		0						6							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only					1						
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.45		6.20						4.16							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.55		3.30						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			117							22							
Capacity, c (veh/h)			321							805							
v/c Ratio			0.37							0.03							
95% Queue Length, Q <sub>95</sub> (veh)			1.6							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			40.7							2.6							
Control Delay (s/veh)			22.5							9.6							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)		22.5								0.3							
Approach LOS		C								A							

HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2027							North/South Street	Billtown Road								
Time Analyzed	AM Peak Build							Peak Hour Factor	0.81								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<p>Major Street: North-South</p>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		40		55						18	630				684	12	
Percent Heavy Vehicles (%)		5		0						6							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only								1			
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.45		6.20						4.16							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.55		3.30						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			117							22							
Capacity, c (veh/h)			295							765							
v/c Ratio			0.40							0.03							
95% Queue Length, Q <sub>95</sub> (veh)			1.8							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			45.8							2.6							
Control Delay (s/veh)			25.1							9.8							
Level of Service (LOS)			D							A							
Approach Delay (s/veh)		25.1								0.3							
Approach LOS		D								A							



HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2037							North/South Street	Billtown Road								
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.81								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		44		61						20	634				704	13	
Percent Heavy Vehicles (%)		5		0						6							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only								1			
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.45		6.20						4.16							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.55		3.30						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			130							25							
Capacity, c (veh/h)			286							748							
v/c Ratio			0.45							0.03							
95% Queue Length, Q <sub>95</sub> (veh)			2.2							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			55.9							2.6							
Control Delay (s/veh)			27.6							10.0							
Level of Service (LOS)			D							A							
Approach Delay (s/veh)		27.6								0.3							
Approach LOS		D								A							

HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2037							North/South Street	Billtown Road								
Time Analyzed	AM Peak Build							Peak Hour Factor	0.81								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	10	1	2	3	4	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		44		61						20	690				751	13	
Percent Heavy Vehicles (%)		5		0						6							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only								1			
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.45		6.20						4.16							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.55		3.30						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			130							25							
Capacity, c (veh/h)			263							711							
v/c Ratio			0.49							0.03							
95% Queue Length, Q <sub>95</sub> (veh)			2.5							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			63.5							2.6							
Control Delay (s/veh)			31.3							10.2							
Level of Service (LOS)			D							B							
Approach Delay (s/veh)		31.3								0.3							
Approach LOS		D								A							

HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2024							North/South Street	Billtown Road								
Time Analyzed	PM Peak							Peak Hour Factor	0.96								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		24		32						39	578				635	24	
Percent Heavy Vehicles (%)		4		3						5							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only								1			
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.44		6.23						4.15							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.54		3.33						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			58							41							
Capacity, c (veh/h)			368							893							
v/c Ratio			0.16							0.05							
95% Queue Length, Q <sub>95</sub> (veh)			0.6							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			15.4							2.6							
Control Delay (s/veh)			16.6							9.2							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)		16.6								0.6							
Approach LOS		C								A							



HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2027							North/South Street	Billtown Road								
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.96								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<p>Major Street: North-South</p>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	10	1	2	3	4	5	6		
Number of Lanes		0	1	0		0	0	0		1	1	0		0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		25		33						40	597				656	25	
Percent Heavy Vehicles (%)		4		3						5							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage		Left Only								1							
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.44		6.23						4.15							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.54		3.33						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			60							42							
Capacity, c (veh/h)			356							876							
v/c Ratio			0.17							0.05							
95% Queue Length, Q <sub>95</sub> (veh)			0.6							0.1							
95% Queue Length, Q <sub>95</sub> (ft)			15.4							2.6							
Control Delay (s/veh)			17.2							9.3							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)		17.2								0.6							
Approach LOS		C								A							

HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2027							North/South Street	Billtown Road								
Time Analyzed	PM Peak Build							Peak Hour Factor	0.96								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		25		33						40	639				708	25	
Percent Heavy Vehicles (%)		4		3						5							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only								1			
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.44		6.23						4.15							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.54		3.33						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			60							42							
Capacity, c (veh/h)			331							836							
v/c Ratio			0.18							0.05							
95% Queue Length, Q <sub>95</sub> (veh)			0.7							0.2							
95% Queue Length, Q <sub>95</sub> (ft)			18.0							5.2							
Control Delay (s/veh)			18.3							9.5							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)		18.3								0.6							
Approach LOS		C								A							

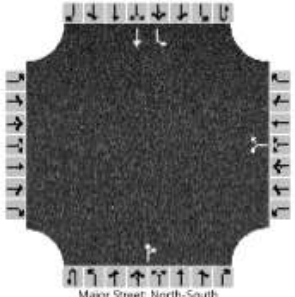
HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2037							North/South Street	Billtown Road								
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.96								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		28		36						44	659				725	28	
Percent Heavy Vehicles (%)		4		3						5							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage	Left Only								1								
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.44		6.23						4.15							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.54		3.33						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			67							46							
Capacity, c (veh/h)			319							821							
v/c Ratio			0.21							0.06							
95% Queue Length, Q <sub>95</sub> (veh)			0.8							0.2							
95% Queue Length, Q <sub>95</sub> (ft)			20.6							5.2							
Control Delay (s/veh)			19.2							9.6							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)	19.2								0.6								
Approach LOS	C								A								



HCS Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Billtown Road at Breckingham Blvd								
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction									
Date Performed	11/18/2024							East/West Street	Breckingham Blvd								
Analysis Year	2037							North/South Street	Billtown Road								
Time Analyzed	PM Peak Build							Peak Hour Factor	0.96								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Madden Billtown																
<b>Lanes</b>																	
<b>Vehicle Volumes and Adjustments</b>																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	10	1	2	3	4	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0	
Configuration			LR							L	T					TR	
Volume (veh/h)		28		36						44	701				777	28	
Percent Heavy Vehicles (%)		4		3						5							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized																	
Median Type   Storage						Left Only								1			
<b>Critical and Follow-up Headways</b>																	
Base Critical Headway (sec)		7.1		6.2						4.1							
Critical Headway (sec)		6.44		6.23						4.15							
Base Follow-Up Headway (sec)		3.5		3.3						2.2							
Follow-Up Headway (sec)		3.54		3.33						2.25							
<b>Delay, Queue Length, and Level of Service</b>																	
Flow Rate, v (veh/h)			67							46							
Capacity, c (veh/h)			297							783							
v/c Ratio			0.22							0.06							
95% Queue Length, Q <sub>95</sub> (veh)			0.8							0.2							
95% Queue Length, Q <sub>95</sub> (ft)			20.6							5.2							
Control Delay (s/veh)			20.6							9.9							
Level of Service (LOS)			C							A							
Approach Delay (s/veh)		20.6								0.6							
Approach LOS		C								A							

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2024							North/South Street	Billtown Rd							
Time Analyzed	AM Peak							Peak Hour Factor	0.82							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						21		21			549	19		16	654	
Percent Heavy Vehicles (%)						0		0						6		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						51								20		
Capacity, c (veh/h)						337								884		
v/c Ratio						0.15								0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.5								0.1		
95% Queue Length, Q <sub>95</sub> (ft)						12.5								2.6		
Control Delay (s/veh)						17.6								9.2		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)					17.6								0.2			
Approach LOS					C								A			



HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2027							North/South Street	Billtown Rd							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.82							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
Lanes																
																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						22		22			567	20		17	676	
Percent Heavy Vehicles (%)						0		0						6		
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Left Only								1							
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.25		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						54								21		
Capacity, c (veh/h)						325								867		
v/c Ratio						0.17								0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.6								0.1		
95% Queue Length, Q <sub>95</sub> (ft)						15.0								2.6		
Control Delay (s/veh)						18.3								9.3		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)	18.3								0.2							
Approach LOS	C								A							

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HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2027							North/South Street	Billtown Rd							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.83							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4	5	6	
Number of Lanes		0	1	0		0	1	0		0	1	1	0	0	1	1
Configuration			LR				LR			L		TR		L	T	R
Volume (veh/h)		105		30		22		22		26	524	20		17	600	123
Percent Heavy Vehicles (%)		0		0		0		0		3				6		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized													No			
Median Type   Storage	Left Only								1							
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)		7.1		6.2		7.1		6.2		4.1				4.1		
Critical Headway (sec)		7.10		6.20		7.10		6.20		4.13				4.16		
Base Follow-Up Headway (sec)		3.5		3.3		3.5		3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50		3.30		3.50		3.30		2.23				2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)			163				53				31				20	
Capacity, c (veh/h)			240				271				770				913	
v/c Ratio			0.68				0.20				0.04				0.02	
95% Queue Length, Q <sub>95</sub> (veh)			4.3				0.7				0.1				0.1	
95% Queue Length, Q <sub>95</sub> (ft)			107.5				17.5				2.6				2.6	
Control Delay (s/veh)			46.4				21.5				9.9				9.0	
Level of Service (LOS)			E				C				A				A	
Approach Delay (s/veh)	46.4				21.5				0.5				0.2			
Approach LOS	E				C				A				A			

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2037							North/South Street	Billtown Rd							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.82							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						24		24			626	22		19	747	
Percent Heavy Vehicles (%)						0		0						6		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						59								23		
Capacity, c (veh/h)						290								812		
v/c Ratio						0.20								0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.7								0.1		
95% Queue Length, Q <sub>95</sub> (ft)						17.5								2.6		
Control Delay (s/veh)						20.5								9.6		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)					20.5								0.2			
Approach LOS					C								A			

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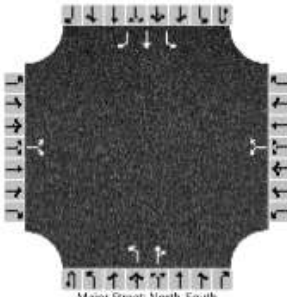


HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2037							North/South Street	Billtown Rd							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.88							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<p>Major Street: North-South</p>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1
Configuration			LR				LR			L		TR		L	T	R
Volume (veh/h)		105		30		24		24		26	583	22		17	671	123
Percent Heavy Vehicles (%)		0		0		0		0		3				6		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized													No			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)		7.1		6.2		7.1		6.2		4.1				4.1		
Critical Headway (sec)		7.10		6.20		7.10		6.20		4.13				4.16		
Base Follow-Up Headway (sec)		3.5		3.3		3.5		3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50		3.30		3.50		3.30		2.23				2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)			153				55				30				19	
Capacity, c (veh/h)			228				259				749				888	
v/c Ratio			0.67				0.21				0.04				0.02	
95% Queue Length, Q <sub>95</sub> (veh)			4.2				0.8				0.1				0.1	
95% Queue Length, Q <sub>95</sub> (ft)			105.0				20.0				2.6				2.6	
Control Delay (s/veh)			48.3				22.6				10.0				9.1	
Level of Service (LOS)			E				C				B				A	
Approach Delay (s/veh)	48.3				22.6				0.4				0.2			
Approach LOS	E				C				A				A			

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2024							North/South Street	Billtown Rd							
Time Analyzed	PM Peak							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						23		17			598	31		20	647	
Percent Heavy Vehicles (%)						4		0						5		
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Left Only								1							
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.44		6.20						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.54		3.30						2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						42								21		
Capacity, c (veh/h)						355								918		
v/c Ratio						0.12								0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.4								0.1		
95% Queue Length, Q <sub>95</sub> (ft)						10.2								2.6		
Control Delay (s/veh)						16.5								9.0		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)					16.5								0.3			
Approach LOS					C								A			

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2027							North/South Street	Billtown Rd							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						24		18			618	32		21	669	
Percent Heavy Vehicles (%)						4		0						5		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.44		6.20						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.54		3.30						2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						44								22		
Capacity, c (veh/h)						344								901		
v/c Ratio						0.13								0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.4								0.1		
95% Queue Length, Q <sub>95</sub> (ft)						10.2								2.6		
Control Delay (s/veh)						17.0								9.1		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)					17.0								0.3			
Approach LOS					C								A			



HCS Two-Way Stop-Control Report																			
General Information								Site Information											
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr										
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction											
Date Performed	11/18/2024							East/West Street	Weather Vane Dr										
Analysis Year	2027							North/South Street	Billtown Rd										
Time Analyzed	PM Peak Build							Peak Hour Factor	0.96										
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25										
Project Description	Madden Billtown																		
Lanes																			
																			
Vehicle Volumes and Adjustments																			
Approach	Eastbound				Westbound				Northbound				Southbound						
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R			
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6			
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1			
Configuration			LR				LR			L		TR		L	T	R			
Volume (veh/h)		93		22		24		18		20	573	32		21	621	100			
Percent Heavy Vehicles (%)		0		0		4		0		0				5					
Proportion Time Blocked																			
Percent Grade (%)		0				0													
Right Turn Channelized															No				
Median Type   Storage						Left Only									1				
Critical and Follow-up Headways																			
Base Critical Headway (sec)		7.1		6.2		7.1		6.2		4.1				4.1					
Critical Headway (sec)		7.10		6.20		7.14		6.20		4.10				4.15					
Base Follow-Up Headway (sec)		3.5		3.3		3.5		3.3		2.2				2.2					
Follow-Up Headway (sec)		3.50		3.30		3.54		3.30		2.20				2.25					
Delay, Queue Length, and Level of Service																			
Flow Rate, v (veh/h)			120				44			21				22					
Capacity, c (veh/h)			268				293			867				938					
v/c Ratio			0.45				0.15			0.02				0.02					
95% Queue Length, Q <sub>95</sub> (veh)			2.2				0.5			0.1				0.1					
95% Queue Length, Q <sub>95</sub> (ft)			55.0				12.7			2.5				2.6					
Control Delay (s/veh)			28.9				19.4			9.3				8.9					
Level of Service (LOS)			D				C			A				A					
Approach Delay (s/veh)		28.9				19.4					0.3					0.3			
Approach LOS		D				C					A					A			



HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2037							North/South Street	Billtown Rd							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						27		20			683	35		23	739	
Percent Heavy Vehicles (%)						4		0						5		
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Left Only								1							
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.44		6.20						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.54		3.30						2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						49								24		
Capacity, c (veh/h)						310								847		
v/c Ratio						0.16								0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.6								0.1		
95% Queue Length, Q <sub>95</sub> (ft)						15.3								2.6		
Control Delay (s/veh)						18.8								9.4		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)					18.8								0.3			
Approach LOS					C								A			

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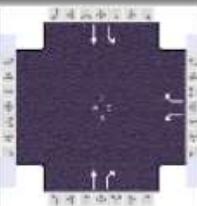
HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown at Weather Vane Dr							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	Weather Vane Dr							
Analysis Year	2037							North/South Street	Billtown Rd							
Time Analyzed	PM Peak Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<p>Major Street: North-South</p>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1
Configuration			LR				LR			L		TR		L	T	R
Volume (veh/h)		93		22		27		20		20	638	35		23	691	100
Percent Heavy Vehicles (%)		0		0		4		0		0				5		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized													No			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)		7.1		6.2		7.1		6.2		4.1				4.1		
Critical Headway (sec)		7.10		6.20		7.14		6.20		4.10				4.15		
Base Follow-Up Headway (sec)		3.5		3.3		3.5		3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50		3.30		3.54		3.30		2.20				2.25		
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)			120				49			21				24		
Capacity, c (veh/h)			235				259			815				882		
v/c Ratio			0.51				0.19			0.03				0.03		
95% Queue Length, Q <sub>95</sub> (veh)			2.6				0.7			0.1				0.1		
95% Queue Length, Q <sub>95</sub> (ft)			65.0				17.8			2.5				2.6		
Control Delay (s/veh)			35.2				22.1			9.5				9.2		
Level of Service (LOS)			E				C			A				A		
Approach Delay (s/veh)	35.2				22.1				0.3				0.3			
Approach LOS	E				C				A				A			



## HCS Signalized Intersection Results Summary

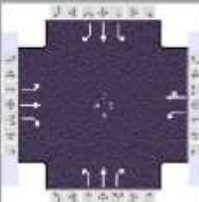
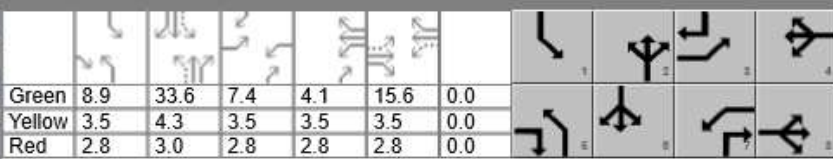
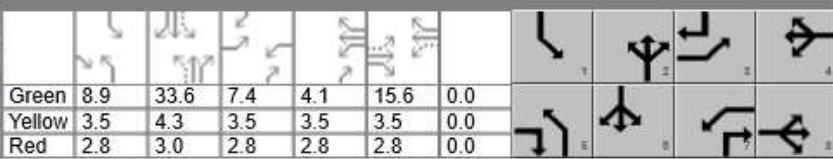
General Information						Intersection Information													
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250											
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other									
Jurisdiction				Time Period		AM Peak		PHF		0.89									
Urban Street		Billtown Road		Analysis Year		2024		Analysis Period		1> 7:00									
Intersection		Gellhaus Lane		File Name		Billtown AM 24.xus													
Project Description		Madden Billtown																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h							264		137		431	484	143	532					
Signal Information																			
Cycle, s	71.4	Reference Phase	2																
Offset, s	24	Reference Point	End																
Uncoordinated	Yes	Simult. Gap E/W	On																
Force Mode	Fixed	Simult. Gap N/S	On																
Green	5.8	27.3	18.4	0.0	0.0	0.0													
Yellow	3.5	4.3	3.5	0.0	0.0	0.0													
Red	2.8	3.0	2.8	0.0	0.0	0.0													
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase										4				2		1		6	
Case Number										9.0				7.3		1.0		4.0	
Phase Duration, s										24.7				34.6		12.1		46.7	
Change Period, ( Y+R c ), s										6.3				7.3		6.3		7.3	
Max Allow Headway ( MAH ), s										6.7				4.0		4.0		4.0	
Queue Clearance Time ( g s ), s										13.0				17.1		5.8		17.1	
Green Extension Time ( g e ), s										5.3				3.3		0.0		4.7	
Phase Call Probability										1.00				1.00		0.96		1.00	
Max Out Probability										0.00				0.00		1.00		0.26	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement							7		14		2	12	1	6					
Adjusted Flow Rate ( v ), veh/h							297		154		477	287	161	598					
Adjusted Saturation Flow Rate ( s ), veh/h/ln							1725		1535		1870	1585	1711	1870					
Queue Service Time ( g s ), s							11.0		5.3		15.1	9.8	3.8	15.1					
Cycle Queue Clearance Time ( g c ), s							11.0		5.3		15.1	9.8	3.8	15.1					
Green Ratio ( g/C )							0.26		0.34		0.38	0.38	0.49	0.55					
Capacity ( c ), veh/h							446		521		715	606	387	1031					
Volume-to-Capacity Ratio ( X )							0.665		0.296		0.667	0.473	0.415	0.580					
Back of Queue ( Q ), ft/ln ( 95 th percentile)							218		87		205	124	59	218					
Back of Queue ( Q ), veh/ln ( 95 th percentile)							8.3		3.3		8.1	4.9	2.2	8.6					
Queue Storage Ratio ( RQ ) ( 95 th percentile)							0.79		0.31		0.21	0.82	0.20	0.48					
Uniform Delay ( d 1 ), s/veh							23.7		17.3		18.3	16.6	12.8	10.6					
Incremental Delay ( d 2 ), s/veh							4.6		0.9		0.4	0.2	0.7	0.8					
Initial Queue Delay ( d 3 ), s/veh							0.0		0.0		0.0	0.0	0.0	0.0					
Control Delay ( d ), s/veh							28.4		18.2		18.7	16.9	13.5	11.4					
Level of Service (LOS)							C		B		B	B	B	B					
Approach Delay, s/veh / LOS				0.0			24.9			18.0			11.8			B			
Intersection Delay, s/veh / LOS				17.2										B					
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.26			B			1.94			B						
Bicycle LOS Score / LOS							F			1.77			B						

## HCS Signalized Intersection Results Summary

General Information						Intersection Information													
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250											
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other									
Jurisdiction				Time Period		AM Peak		PHF		0.89									
Urban Street		Billtown Road		Analysis Year		2027 No Build		Analysis Period		1> 7:00									
Intersection		Gellhaus Lane		File Name		Billtown AM 27 NB.xus													
Project Description		Madden Billtown																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h							273		142		445	500	148	550					
Signal Information																			
Cycle, s	72.0	Reference Phase	2																
Offset, s	24	Reference Point	End																
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.8	27.2	19.1	0.0	0.0	0.0									
				Yellow	3.5	4.3	3.5	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.8	3.0	2.8	0.0	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase										4				2		1		6	
Case Number										9.0				7.3		1.0		4.0	
Phase Duration, s										25.4				34.5		12.1		46.6	
Change Period, ( Y+R c ), s										6.3				7.3		6.3		7.3	
Max Allow Headway ( MAH ), s										6.7				4.0		4.0		4.0	
Queue Clearance Time ( g s ), s										13.4				18.1		6.0		18.2	
Green Extension Time ( g e ), s										5.6				3.5		0.0		4.7	
Phase Call Probability										1.00				1.00		0.96		1.00	
Max Out Probability										0.00				0.00		1.00		0.33	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement							7		14		2	12	1	6					
Adjusted Flow Rate ( v ), veh/h							307		160		493	305	166	618					
Adjusted Saturation Flow Rate ( s ), veh/h/ln							1725		1535		1870	1585	1711	1870					
Queue Service Time ( g s ), s							11.4		5.5		16.1	10.7	4.0	16.2					
Cycle Queue Clearance Time ( g c ), s							11.4		5.5		16.1	10.7	4.0	16.2					
Green Ratio ( g/C )							0.27		0.35		0.38	0.38	0.49	0.55					
Capacity ( c ), veh/h							458		532		705	598	370	1020					
Volume-to-Capacity Ratio ( X )							0.669		0.300		0.699	0.510	0.449	0.606					
Back of Queue ( Q ), ft/ln ( 90 th percentile)							203		89		201	122	63	213					
Back of Queue ( Q ), veh/ln ( 90 th percentile)							7.8		3.4		7.9	4.8	2.4	8.4					
Queue Storage Ratio ( RQ ) ( 90 th percentile)							0.74		0.33		0.20	0.81	0.21	0.47					
Uniform Delay ( d 1 ), s/veh							23.6		17.2		19.0	17.3	13.4	11.1					
Incremental Delay ( d 2 ), s/veh							4.6		0.9		0.4	0.2	0.9	1.0					
Initial Queue Delay ( d 3 ), s/veh							0.0		0.0		0.0	0.0	0.0	0.0					
Control Delay ( d ), s/veh							28.2		18.0		19.4	17.5	14.3	12.2					
Level of Service ( LOS )							C		B		B	B	B	B					
Approach Delay, s/veh / LOS				0.0			24.7			18.7			12.6			B			
Intersection Delay, s/veh / LOS				17.7										B					
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.26			B			1.94			B						
Bicycle LOS Score / LOS							F			1.82			B						

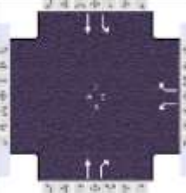
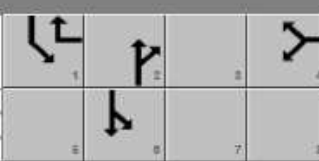


## HCS Signalized Intersection Results Summary

General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ		Analysis Date	Nov 10, 2024		Area Type	Other								
Jurisdiction			Time Period	AM Peak		PHF	0.89								
Urban Street	Billtown Road		Analysis Year	2027 Build		Analysis Period	1> 7:00								
Intersection	Gellhaus Lane		File Name	Billtown AM 27 B.xus											
Project Description	Madden Billtown														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				54	53	194	268	141	123	141	393	491	145	465	42
Signal Information															
Cycle, s	102.1	Reference Phase	2												
Offset, s	24	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	8.9	33.6	7.4	4.1	15.6	0.0					
				Yellow	3.5	4.3	3.5	3.5	3.5	0.0					
				Red	2.8	3.0	2.8	2.8	2.8	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				3	8	7	4	5	2	1	6				
Case Number				1.1	3.0	1.1	4.0	1.1	3.0	1.1	3.0				
Phase Duration, s				13.7	21.9	24.1	32.3	15.2	40.9	15.2	40.9				
Change Period, ( Y+R c ), s				6.3	6.3	6.3	6.3	6.3	7.3	6.3	7.3				
Max Allow Headway ( MAH ), s				3.1	5.1	6.6	5.1	4.0	4.0	4.0	4.0				
Queue Clearance Time ( g s ), s				4.7	14.2	16.1	17.5	7.6	22.8	8.3	28.5				
Green Extension Time ( g e ), s				0.1	1.4	1.7	1.9	0.3	5.3	0.4	5.0				
Phase Call Probability				0.82	1.00	1.00	1.00	0.99	1.00	0.99	1.00				
Max Out Probability				0.00	0.25	0.56	0.56	0.00	0.03	0.00	0.08				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate ( v ), veh/h				61	60	218	301	297		156	436	295	163	522	47
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1810	1900	1610	1725	1753		1810	1870	1585	1711	1870	1610
Queue Service Time ( g s ), s				2.7	2.8	12.2	14.1	15.5		5.6	20.8	11.6	6.3	26.5	1.8
Cycle Queue Clearance Time ( g c ), s				2.7	2.8	12.2	14.1	15.5		5.6	20.8	11.6	6.3	26.5	1.8
Green Ratio ( g/C )				0.22	0.15	0.24	0.35	0.25		0.42	0.33	0.50	0.42	0.33	0.40
Capacity ( c ), veh/h				293	290	386	534	446		273	616	798	335	616	647
Volume-to-Capacity Ratio ( X )				0.207	0.206	0.565	0.564	0.665		0.572	0.707	0.369	0.486	0.848	0.073
Back of Queue ( Q ), ft/ln ( 95 th percentile)				54	58	206	262	288		90	292	141	116	450	30
Back of Queue ( Q ), veh/ln ( 95 th percentile)				2.1	2.3	8.3	10.0	11.5		3.6	11.5	5.6	4.4	17.7	1.2
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00	0.00	0.00	0.95	0.00		0.00	0.29	0.94	0.39	1.00	0.00
Uniform Delay ( d 1 ), s/veh				32.0	37.9	34.2	26.6	34.2		23.8	29.9	15.4	21.8	31.9	18.8
Incremental Delay ( d 2 ), s/veh				0.1	0.1	0.5	2.6	5.6		0.6	0.4	0.1	1.1	5.0	0.0
Initial Queue Delay ( d 3 ), s/veh				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( d ), s/veh				32.1	38.0	34.6	29.1	39.8		24.4	30.4	15.5	22.9	36.8	18.9
Level of Service (LOS)				C	D	C	C	D		C	C	B	C	D	B
Approach Delay, s/veh / LOS				34.8		C	34.4		C	24.4		C	32.5		C
Intersection Delay, s/veh / LOS				30.5						C					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.45		B	2.12		B	1.92		B	2.11		B
Bicycle LOS Score / LOS				1.05		A	1.47		A	1.97		B	1.70		B



## HCS Signalized Intersection Results Summary

General Information						Intersection Information															
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250													
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other											
Jurisdiction				Time Period		AM Peak		PHF		0.89											
Urban Street		Billtown Road		Analysis Year		2037 No Build		Analysis Period		1> 7:00											
Intersection		Gellhaus Lane		File Name		Billtown AM 37 NB.xus															
Project Description		Madden Billtown																			
Demand Information						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h									302		157		492	552	163	608					
Signal Information																					
Cycle, s	74.0	Reference Phase	2																		
Offset, s	24	Reference Point	End																		
Uncoordinated	Yes	Simult. Gap E/W	On																		
Force Mode	Fixed	Simult. Gap N/S	On																		
Green	6.0	26.7	21.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Yellow	3.5	4.3	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Red	2.8	3.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Timer Results						EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase												4				2		1		6	
Case Number												9.0				7.3		1.0		4.0	
Phase Duration, s												27.7				34.0		12.3		46.3	
Change Period, ( Y+R c ), s												6.3				7.3		6.3		7.3	
Max Allow Headway ( MAH ), s												6.7				4.0		4.0		4.0	
Queue Clearance Time ( g s ), s												14.9				21.6		6.7		22.3	
Green Extension Time ( g e ), s												6.3				4.3		0.0		4.3	
Phase Call Probability												1.00				1.00		0.98		1.00	
Max Out Probability												0.00				0.00		1.00		0.62	
Movement Group Results						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement									7		14		2	12	1	6					
Adjusted Flow Rate ( v ), veh/h									339		176		546	363	183	683					
Adjusted Saturation Flow Rate ( s ), veh/h/ln									1725		1535		1870	1585	1711	1870					
Queue Service Time ( g s ), s									12.9		6.1		19.6	14.1	4.7	20.3					
Cycle Queue Clearance Time ( g c ), s									12.9		6.1		19.6	14.1	4.7	20.3					
Green Ratio ( g/C )									0.29		0.37		0.36	0.36	0.47	0.53					
Capacity ( c ), veh/h									501		570		675	572	317	984					
Volume-to-Capacity Ratio ( X )									0.677		0.309		0.808	0.634	0.579	0.694					
Back of Queue ( Q ), ft/ln ( 95 th percentile)									244		99		253	164	83	297					
Back of Queue ( Q ), veh/ln ( 95 th percentile)									9.3		3.8		10.0	6.5	3.1	11.7					
Queue Storage Ratio ( RQ ) ( 95 th percentile)									0.89		0.36		0.25	1.10	0.28	0.66					
Uniform Delay ( d 1 ), s/veh									23.3		16.6		21.4	19.7	15.7	13.1					
Incremental Delay ( d 2 ), s/veh									4.4		0.8		0.7	0.3	2.6	2.1					
Initial Queue Delay ( d 3 ), s/veh									0.0		0.0		0.0	0.0	0.0	0.0					
Control Delay ( d ), s/veh									27.6		17.4		22.1	20.0	18.4	15.3					
Level of Service (LOS)									C		B		C	C	B	B					
Approach Delay, s/veh / LOS						0.0				24.1		C	21.3		C	15.9		B			
Intersection Delay, s/veh / LOS						19.9												B			
Multimodal Results						EB			WB			NB			SB						
Pedestrian LOS Score / LOS						2.26		B		1.94		B		1.91		B		0.68		A	
Bicycle LOS Score / LOS										F		2.01		B		1.92		B			

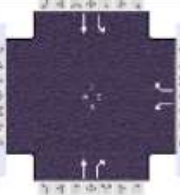









## HCS Signalized Intersection Results Summary

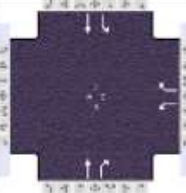





General Information						Intersection Information									
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250							
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other					
Jurisdiction				Time Period		AM Peak		PHF		0.89					
Urban Street		Billtown Road		Analysis Year		2037 Build		Analysis Period		1> 7:00					
Intersection		Gellhaus Lane		File Name		Billtown AM 37 B.xus									
Project Description		Madden Billtown													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				54	53	194	297	56	138	141	440	543	160	523	42
Signal Information															
Cycle, s	111.3	Reference Phase	2												
Offset, s	24	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	8.4	1.4	38.0	5.1	9.3	16.7									
Yellow	3.5	0.0	4.3	3.5	3.5	3.5									
Red	2.8	0.0	3.0	2.8	2.8	2.8									
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				3	8	7	4	5	2	1	6				
Case Number				1.1	3.0	1.1	4.0	1.1	3.0	1.1	3.0				
Phase Duration, s				11.4	23.0	27.0	38.6	14.7	45.3	16.1	46.7				
Change Period, ( Y+R c ), s				6.3	6.3	6.3	6.3	6.3	7.3	6.3	7.3				
Max Allow Headway ( MAH ), s				4.1	5.4	6.6	5.4	4.0	4.0	4.0	4.0				
Queue Clearance Time ( g s ), s				5.1	15.5	19.3	13.8	8.1	27.9	9.5	35.0				
Green Extension Time ( g e ), s				0.1	1.2	1.3	2.3	0.3	6.0	0.4	4.3				
Phase Call Probability				0.85	1.00	1.00	1.00	0.99	1.00	1.00	1.00				
Max Out Probability				0.00	0.36	1.00	0.23	0.00	0.12	0.01	0.50				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate ( v ), veh/h				61	60	218	334	218		156	488	353	180	588	47
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1810	1900	1610	1725	1684		1810	1870	1585	1711	1870	1610
Queue Service Time ( g s ), s				3.1	3.1	13.5	17.3	11.8		6.1	25.9	15.1	7.5	33.0	2.0
Cycle Queue Clearance Time ( g c ), s				3.1	3.1	13.5	17.3	11.8		6.1	25.9	15.1	7.5	33.0	2.0
Green Ratio ( g/C )				0.20	0.15	0.23	0.35	0.29		0.42	0.34	0.53	0.43	0.35	0.40
Capacity ( c ), veh/h				325	285	364	544	488		235	638	835	310	661	643
Volume-to-Capacity Ratio ( X )				0.187	0.209	0.600	0.613	0.446		0.666	0.765	0.423	0.580	0.889	0.073
Back of Queue ( Q ), ft/ln ( 95 th percentile)				62	66	231	313	216		93	350	171	141	579	33
Back of Queue ( Q ), veh/ln ( 95 th percentile)				2.5	2.6	9.2	11.9	8.6		3.7	13.8	6.7	5.4	22.8	1.3
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00	0.00	0.00	1.14	0.00		0.00	0.35	1.14	0.47	1.29	0.00
Uniform Delay ( d 1 ), s/veh				37.3	41.6	38.6	29.0	32.3		26.8	32.7	16.1	24.1	34.0	20.7
Incremental Delay ( d 2 ), s/veh				0.3	0.4	1.6	3.3	1.8		0.7	0.7	0.1	1.7	11.5	0.0
Initial Queue Delay ( d 3 ), s/veh				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( d ), s/veh				37.6	41.9	40.2	32.3	34.0		27.5	33.4	16.1	25.8	45.5	20.8
Level of Service (LOS)				D	D	D	C	C		C	C	B	C	D	C
Approach Delay, s/veh / LOS				40.0		D	33.0		C	26.4		C	39.7		D
Intersection Delay, s/veh / LOS				33.4					C						
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.46		B	2.12		B	1.93		B	2.11		B
Bicycle LOS Score / LOS				1.05		A	1.40		A	2.15		B	1.83		B



## HCS Signalized Intersection Results Summary

General Information						Intersection Information													
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250											
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other									
Jurisdiction				Time Period		PM Peak		PHF		0.96									
Urban Street		Billtown Road		Analysis Year		2024		Analysis Period		1> 4:45									
Intersection		Gellhaus Lane		File Name		Billtown PM 24.xus													
Project Description		Madden Billtown																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h							680		120	495	167	73	588						
Signal Information																			
Cycle, s	104.9	Reference Phase	2	Green	5.4	33.8	45.9	0.0	0.0	0.0									
Offset, s	0	Reference Point	End	Yellow	3.5	4.3	3.5	0.0	0.0	0.0									
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.8	3.0	2.8	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On																
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase										4				2		1		6	
Case Number										9.0				7.3		1.0		4.0	
Phase Duration, s										52.2				41.1		11.7		52.7	
Change Period, ( Y+R c ), s										6.3				7.3		6.3		7.3	
Max Allow Headway ( MAH ), s										6.7				4.0		4.0		4.0	
Queue Clearance Time ( g s ), s										40.5				28.3		5.7		30.7	
Green Extension Time ( g e ), s										5.3				5.4		0.2		5.4	
Phase Call Probability										1.00				1.00		0.89		1.00	
Max Out Probability										0.81				0.00		0.00		0.00	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement							7		14		2	12	1		6				
Adjusted Flow Rate ( v ), veh/h							708		125		505	150	76		613				
Adjusted Saturation Flow Rate ( s ), veh/h/ln							1795		1585		1870	1510	1386		1885				
Queue Service Time ( g s ), s							38.5		5.1		26.3	7.9	3.7		28.7				
Cycle Queue Clearance Time ( g c ), s							38.5		5.1		26.3	7.9	3.7		28.7				
Green Ratio ( g/C )							0.44		0.44		0.32	0.32	0.39		0.43				
Capacity ( c ), veh/h							785		693		603	486	189		817				
Volume-to-Capacity Ratio ( X )							0.902		0.180		0.838	0.308	0.402		0.750				
Back of Queue ( Q ), ft/ln ( 95 th percentile)							647		85		396	125	67		448				
Back of Queue ( Q ), veh/ln ( 95 th percentile)							25.7		3.4		15.6	4.7	2.2		17.8				
Queue Storage Ratio ( RQ ) ( 95 th percentile)							2.35		0.31		0.40	0.83	0.22		0.90				
Uniform Delay ( d 1 ), s/veh							27.5		18.0		33.1	26.8	24.8		25.0				
Incremental Delay ( d 2 ), s/veh							13.8		0.3		1.7	0.2	1.4		1.4				
Initial Queue Delay ( d 3 ), s/veh							0.0		0.0		0.0	0.0	0.0		0.0				
Control Delay ( d ), s/veh							41.3		18.4		34.8	27.0	26.2		26.4				
Level of Service (LOS)							D		B		C	C	C		C				
Approach Delay, s/veh / LOS				0.0		37.9		D		33.0		C		26.4		C			
Intersection Delay, s/veh / LOS				32.8						C									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				1.98		B		1.96		B		1.93		B		0.71		A	
Bicycle LOS Score / LOS								F		1.59		B		1.62		B			

## HCS Signalized Intersection Results Summary

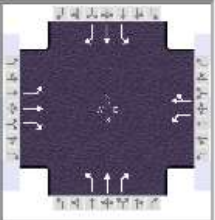
General Information						Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250														
Analyst	DBZ	Analysis Date	Nov 10, 2024		Area Type	Other															
Jurisdiction		Time Period	PM Peak		PHF	0.96															
Urban Street	Billtown Road	Analysis Year	2027 No Build		Analysis Period	1> 4:45															
Intersection	Gellhaus Lane	File Name	Billtown PM 27 NB.xus																		
Project Description	Madden Billtown																				
Demand Information						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h									703		124	512	173	75	608						
Signal Information																					
Cycle, s	109.8	Reference Phase	2			Green	5.6	36.2	48.1	0.0	0.0	0.0									
Offset, s	0	Reference Point	End			Yellow	3.5	4.3	3.5	0.0	0.0	0.0									
Uncoordinated	Yes	Simult. Gap E/W	On			Red	2.8	3.0	2.8	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On																		
Timer Results						EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase												4				2		1		6	
Case Number												9.0				7.3		1.0		4.0	
Phase Duration, s												54.4				43.5		11.9		55.4	
Change Period, ( Y+R c ), s												6.3				7.3		6.3		7.3	
Max Allow Headway ( MAH ), s												6.7				4.0		4.0		4.0	
Queue Clearance Time ( g s ), s												44.5				30.5		5.9		33.2	
Green Extension Time ( g e ), s												3.5				5.7		0.2		5.7	
Phase Call Probability												1.00				1.00		0.91		1.00	
Max Out Probability												1.00				0.00		0.00		0.00	
Movement Group Results						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement									7		14		2	12	1	6					
Adjusted Flow Rate ( v ), veh/h									732		129		522	156	78	633					
Adjusted Saturation Flow Rate ( s ), veh/h/ln									1795		1585		1870	1510	1386	1885					
Queue Service Time ( g s ), s									42.5		5.5		28.5	8.5	3.9	31.2					
Cycle Queue Clearance Time ( g c ), s									42.5		5.5		28.5	8.5	3.9	31.2					
Green Ratio ( g/C )									0.44		0.44		0.33	0.33	0.40	0.44					
Capacity ( c ), veh/h									786		694		618	499	184	826					
Volume-to-Capacity Ratio ( X )									0.932		0.186		0.846	0.313	0.424	0.766					
Back of Queue ( Q ), ft/ln ( 95 th percentile)									728		93		425	133	72	485					
Back of Queue ( Q ), veh/ln ( 95 th percentile)									28.9		3.7		16.7	5.0	2.3	19.3					
Queue Storage Ratio ( RQ ) ( 95 th percentile)									2.65		0.34		0.42	0.89	0.24	0.97					
Uniform Delay ( d 1 ), s/veh									29.3		18.9		34.2	27.5	25.8	26.1					
Incremental Delay ( d 2 ), s/veh									18.0		0.4		1.8	0.2	1.5	1.5					
Initial Queue Delay ( d 3 ), s/veh									0.0		0.0		0.0	0.0	0.0	0.0					
Control Delay ( d ), s/veh									47.4		19.3		36.0	27.7	27.3	27.6					
Level of Service ( LOS )									D		B		D	C	C	C					
Approach Delay, s/veh / LOS						0.0				43.1		D		34.1		C		27.6		C	
Intersection Delay, s/veh / LOS						35.5						D									
Multimodal Results						EB			WB			NB			SB						
Pedestrian LOS Score / LOS						1.99		B		1.96		B		1.93		B		0.71		A	
Bicycle LOS Score / LOS										F		1.63		B		1.66		B			



## HCS Signalized Intersection Results Summary

### General Information

Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Nov 10, 2024	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.96
Urban Street	Billtown Road	Analysis Year	2027 Build	Analysis Period	1> 4:45
Intersection	Gellhaus Lane	File Name	Billtown PM 27 B.xus		
Project Description	Madden Billtown				



### Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	34	31	149	693	47	120	154	448	171	74	537	46

### Signal Information

Cycle, s	164.8	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	8.0	4.0	53.5	4.8	43.4	17.2		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	4.0	4.0	4.0		
				Red	2.8	0.0	3.0	2.8	2.8	2.8		

### Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	5	2	1	6
Case Number	1.1	3.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	11.6	24.0	61.8	74.1	18.2	64.8	14.3	60.8
Change Period, (Y+R), s	6.8	6.8	6.8	6.8	6.8	7.3	6.3	7.3
Max Allow Headway (MAH), s	3.1	5.0	3.1	5.0	3.0	4.0	4.0	4.0
Queue Clearance Time (g <sub>s</sub> ), s	4.9	16.5	58.0	13.2	11.3	35.8	8.1	49.0
Green Extension Time (g <sub>e</sub> ), s	0.0	0.6	0.0	1.4	0.1	4.9	0.1	4.6
Phase Call Probability	0.80	1.00	1.00	1.00	1.00	1.00	0.97	1.00
Max Out Probability	0.00	0.28	1.00	0.08	0.00	0.01	0.00	0.06

### Movement Group Results

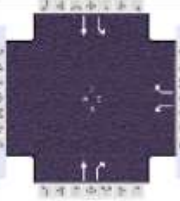

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	35	32	155	722	174		154	448	151	77	559	48
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1900	1610	1795	1682		1810	1870	1510	1386	1885	1610
Queue Service Time (g <sub>s</sub> ), s	2.9	2.6	14.5	56.0	11.2		9.3	33.8	5.8	6.1	47.0	3.4
Cycle Queue Clearance Time (g <sub>c</sub> ), s	2.9	2.6	14.5	56.0	11.2		9.3	33.8	5.8	6.1	47.0	3.4
Green Ratio (g/C)	0.13	0.10	0.17	0.46	0.41		0.39	0.35	0.68	0.37	0.32	0.32
Capacity (c), veh/h	225	198	279	785	687		204	653	1030	207	612	523
Volume-to-Capacity Ratio (X)	0.158	0.163	0.556	0.920	0.253		0.756	0.687	0.147	0.372	0.913	0.092
Back of Queue (Q), ft/ln (95 th percentile)	60	56	251	964	208		163	514	88	118	803	61
Back of Queue (Q), veh/ln (95 th percentile)	2.4	2.3	10.0	38.2	8.3		6.5	20.2	3.3	3.8	31.9	2.4
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	3.50	0.00		0.00	0.51	0.59	0.39	0.00	0.00
Uniform Delay (d <sub>1</sub> ), s/veh	63.2	67.3	62.3	40.4	32.2		41.0	46.0	9.2	37.7	53.4	38.7
Incremental Delay (d <sub>2</sub> ), s/veh	0.1	0.1	0.6	15.6	0.5		1.5	1.0	0.0	1.1	12.4	0.1
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	63.3	67.4	63.0	56.0	32.7		42.5	46.9	9.3	38.8	65.8	38.8
Level of Service (LOS)	E	E	E	E	C		D	D	A	D	E	D
Approach Delay, s/veh / LOS	63.7		E	51.5		D	38.5		D	60.9		E
Intersection Delay, s/veh / LOS	51.2						D					

### Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.18		B	2.12		B	1.94		B	2.13		B
Bicycle LOS Score / LOS	0.86		A	1.97		B	1.78		B	1.62		B



## HCS Signalized Intersection Results Summary

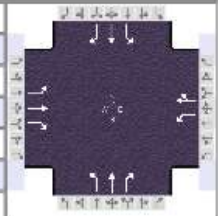
General Information						Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250														
Analyst	DBZ		Analysis Date	Nov 10, 2024		Area Type	Other														
Jurisdiction			Time Period	PM Peak		PHF	0.96														
Urban Street	Billtown Road		Analysis Year	2037 No Build		Analysis Period	1> 4:45														
Intersection	Gellhaus Lane		File Name	Billtown PM 37 NB.xus																	
Project Description		Madden Billtown																			
Demand Information						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h									777		137		566	191	83	672					
Signal Information																					
Cycle, s	118.9	Reference Phase	2																		
Offset, s	0	Reference Point	End																		
Uncoordinated	Yes	Simult. Gap E/W	On				Green	6.4	42.7	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On				Yellow	3.5	4.3	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
						Red	2.8	3.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Timer Results						EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase												4				2		1		6	
Case Number												9.0				7.3		1.0		4.0	
Phase Duration, s												56.3				50.0		12.7		62.6	
Change Period, ( Y+R c ), s												6.3				7.3		6.3		7.3	
Max Allow Headway ( MAH ), s												6.7				4.0		4.0		4.0	
Queue Clearance Time ( g s ), s												52.0				36.1		6.5		39.6	
Green Extension Time ( g e ), s												0.0				6.6		0.2		6.6	
Phase Call Probability												1.00				1.00		0.94		1.00	
Max Out Probability												1.00				0.02		0.00		0.02	
Movement Group Results						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement									7		14		2	12	1	6					
Adjusted Flow Rate ( v ), veh/h									809		143		578	175	86	700					
Adjusted Saturation Flow Rate ( s ), veh/h/ln									1795		1585		1870	1510	1386	1885					
Queue Service Time ( g s ), s									50.0		6.8		34.1	10.0	4.5	37.6					
Cycle Queue Clearance Time ( g c ), s									50.0		6.8		34.1	10.0	4.5	37.6					
Green Ratio ( g/C )									0.42		0.42		0.36	0.36	0.43	0.47					
Capacity ( c ), veh/h									755		666		671	542	182	877					
Volume-to-Capacity Ratio ( X )									1.073		0.214		0.860	0.322	0.476	0.798					
Back of Queue ( Q ), ft/ln ( 95 th percentile)									1102		119		496	151	84	580					
Back of Queue ( Q ), veh/ln ( 95 th percentile)									43.7		4.7		19.5	5.7	2.7	23.0					
Queue Storage Ratio ( RQ ) ( 95 th percentile)									4.01		0.43		0.50	1.00	0.28	1.16					
Uniform Delay ( d 1 ), s/veh									34.5		22.0		35.4	27.6	27.0	27.0					
Incremental Delay ( d 2 ), s/veh									54.0		0.4		1.7	0.2	1.9	2.8					
Initial Queue Delay ( d 3 ), s/veh									0.0		0.0		0.0	0.0	0.0	0.0					
Control Delay ( d ), s/veh									88.5		22.4		37.1	27.8	28.9	29.8					
Level of Service (LOS)									F		C		D	C	C	C					
Approach Delay, s/veh / LOS						0.0				78.6		E		34.9		C		29.7		C	
Intersection Delay, s/veh / LOS						50.0						D									
Multimodal Results						EB			WB			NB			SB						
Pedestrian LOS Score / LOS						1.99		B		1.96		B		1.93		B		0.71		A	
Bicycle LOS Score / LOS										F		1.75		B		1.79		B			



## HCS Signalized Intersection Results Summary

### General Information

Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Nov 10, 2024	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.96
Urban Street	Billtown Road	Analysis Year	2037 Build	Analysis Period	1> 4:45
Intersection	Gellhaus Lane	File Name	Billtown PM 37 B.xus		
Project Description	Madden Billtown				



### Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	34	31	149	767	47	135	154	502	189	82	601	46

### Signal Information

Cycle, s	180.8	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	9.2	3.6	62.3	5.0	48.2	18.6		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	4.0	4.0	4.0		
				Red	2.8	0.0	3.0	2.8	2.8	2.8		

### Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	5	2	1	6
Case Number	1.1	3.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	11.8	25.4	66.8	80.4	19.1	73.1	15.5	69.6
Change Period, (Y+R), s	6.8	6.8	6.8	6.8	6.8	7.3	6.3	7.3
Max Allow Headway (MAH), s	3.1	5.1	3.1	5.1	3.0	4.0	4.0	4.0
Queue Clearance Time (g <sub>s</sub> ), s	5.1	18.0	63.0	15.7	12.1	45.4	9.2	60.9
Green Extension Time (g <sub>e</sub> ), s	0.0	0.6	0.0	1.4	0.1	5.3	0.1	1.3
Phase Call Probability	0.83	1.00	1.00	1.00	1.00	1.00	0.99	1.00
Max Out Probability	0.00	0.51	1.00	0.23	0.00	0.12	0.00	0.99

### Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	35	32	155	799	190		157	512	173	85	626	48
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1900	1610	1795	1676		1810	1870	1510	1386	1885	1610
Queue Service Time (g <sub>s</sub> ), s	3.1	2.8	16.0	61.0	13.7		10.1	43.4	7.1	7.2	58.9	3.6
Cycle Queue Clearance Time (g <sub>c</sub> ), s	3.1	2.8	16.0	61.0	13.7		10.1	43.4	7.1	7.2	58.9	3.6
Green Ratio (g/C)	0.13	0.10	0.17	0.46	0.41		0.41	0.36	0.70	0.40	0.34	0.34
Capacity (c), veh/h	214	195	274	774	682		177	681	1051	188	649	555
Volume-to-Capacity Ratio (X)	0.165	0.166	0.565	1.032	0.278		0.886	0.752	0.164	0.453	0.964	0.086
Back of Queue (Q), ft/ln (95 th percentile)	66	62	273	527	244		185	649	106	141	1044	66
Back of Queue (Q), veh/ln (95 th percentile)	2.6	2.5	10.9	20.9	9.8		7.4	25.5	4.0	4.5	41.4	2.6
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	1.92	0.00		0.00	0.65	0.71	0.47	0.00	0.00
Uniform Delay (d <sub>1</sub> ), s/veh	69.7	74.0	68.8	48.3	35.8		44.8	50.3	9.4	40.7	58.2	40.0
Incremental Delay (d <sub>2</sub> ), s/veh	0.1	0.1	0.7	40.8	0.6		9.2	2.3	0.0	1.7	25.5	0.1
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	69.9	74.2	69.5	89.1	36.5		54.0	52.6	9.5	42.4	83.6	40.1
Level of Service (LOS)	E	E	E	F	D		D	D	A	D	F	D
Approach Delay, s/veh / LOS	70.3		E	79.0		E	44.0		D	76.2		E
Intersection Delay, s/veh / LOS	67.1						E					

### Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.19		B	2.13		B	1.94		B	2.14		B
Bicycle LOS Score / LOS	0.86		A	2.12		B	1.91		B	1.74		B



HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2024							North/South Street	Billtown Road							
Time Analyzed	AM Peak							Peak Hour Factor	0.94							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<p>Major Street: North-South</p>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						27		62		66	851				259	541
Percent Heavy Vehicles (%)						4		2		2						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.14		6.22		4.12						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.54		3.32		2.22						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						29		66		70						
Capacity, c (veh/h)						212		335		1287						
v/c Ratio						0.14		0.20		0.05						
95% Queue Length, Q <sub>95</sub> (veh)						0.5		0.7		0.2						
95% Queue Length, Q <sub>95</sub> (ft)						12.9		17.8		5.1						
Control Delay (s/veh)						24.7		18.4		8.0						
Level of Service (LOS)						C		C		A						
Approach Delay (s/veh)					20.3				0.6							
Approach LOS					C				A							

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2027							North/South Street	Billtown Road							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.94							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						28		64		68	879				268	559
Percent Heavy Vehicles (%)						4		2		2						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.14		6.22		4.12						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.54		3.32		2.22						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						30		68		72						
Capacity, c (veh/h)						202		322		1277						
v/c Ratio						0.15		0.21		0.06						
95% Queue Length, Q <sub>95</sub> (veh)						0.5		0.8		0.2						
95% Queue Length, Q <sub>95</sub> (ft)						12.9		20.3		5.1						
Control Delay (s/veh)						25.9		19.2		8.0						
Level of Service (LOS)						D		C		A						
Approach Delay (s/veh)					21.2				0.6							
Approach LOS					C				A							

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2027							North/South Street	Billtown Road							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.94							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						28		73		68	950				311	621
Percent Heavy Vehicles (%)						4		2		2						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.14		6.22		4.12						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.54		3.32		2.22						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						30		78		72						
Capacity, c (veh/h)						181		291		1229						
v/c Ratio						0.16		0.27		0.06						
95% Queue Length, Q <sub>95</sub> (veh)						0.6		1.1		0.2						
95% Queue Length, Q <sub>95</sub> (ft)						15.5		27.9		5.1						
Control Delay (s/veh)						28.8		21.8		8.1						
Level of Service (LOS)						D		C		A						
Approach Delay (s/veh)					23.8				0.5							
Approach LOS					C				A							



HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2037							North/South Street	Billtown Road							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.94							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4	5	6	
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						31		71		75	971				296	617
Percent Heavy Vehicles (%)						4		2		2						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.14		6.22		4.12						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.54		3.32		2.22						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						33		76		80						
Capacity, c (veh/h)						173		282		1245						
v/c Ratio						0.19		0.27		0.06						
95% Queue Length, Q <sub>95</sub> (veh)						0.7		1.1		0.2						
95% Queue Length, Q <sub>95</sub> (ft)						18.1		27.9		5.1						
Control Delay (s/veh)						30.7		22.3		8.1						
Level of Service (LOS)						D		C		A						
Approach Delay (s/veh)					24.9				0.6							
Approach LOS					C				A							

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2037							North/South Street	Billtown Road							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.94							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						31		80		75	1042				339	679
Percent Heavy Vehicles (%)						4		2		2						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.14		6.22		4.12						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.54		3.32		2.22						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						33		85		80						
Capacity, c (veh/h)						155		255		1198						
v/c Ratio						0.21		0.33		0.07						
95% Queue Length, Q <sub>95</sub> (veh)						0.8		1.4		0.2						
95% Queue Length, Q <sub>95</sub> (ft)						20.6		35.6		5.1						
Control Delay (s/veh)						34.5		26.0		8.2						
Level of Service (LOS)						D		D		A						
Approach Delay (s/veh)					28.4				0.6							
Approach LOS					D				A							

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2024							North/South Street	Billtown Road							
Time Analyzed	PM Peak							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						178		144		37	518				490	782
Percent Heavy Vehicles (%)						0		2		3						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.10		6.22		4.13						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.50		3.32		2.23						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						185		150		39						
Capacity, c (veh/h)						302		542		1050						
v/c Ratio						0.61		0.28		0.04						
95% Queue Length, Q <sub>95</sub> (veh)						3.8		1.1		0.1						
95% Queue Length, Q <sub>95</sub> (ft)						95.0		27.9		2.6						
Control Delay (s/veh)						34.1		14.2		8.6						
Level of Service (LOS)						D		B		A						
Approach Delay (s/veh)					25.2				0.6							
Approach LOS					D				A							



HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2027							North/South Street	Billtown Road							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						184		149		38	535				506	808
Percent Heavy Vehicles (%)						0		2		3						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.10		6.22		4.13						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.50		3.32		2.23						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						192		155		40						
Capacity, c (veh/h)						292		530		1035						
v/c Ratio						0.66		0.29		0.04						
95% Queue Length, Q <sub>95</sub> (veh)						4.3		1.2		0.1						
95% Queue Length, Q <sub>95</sub> (ft)						107.5		30.5		2.6						
Control Delay (s/veh)						38.1		14.6		8.6						
Level of Service (LOS)						E		B		A						
Approach Delay (s/veh)					27.6				0.6							
Approach LOS					D				A							

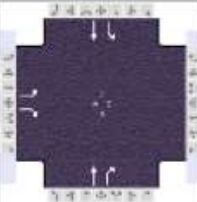
HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2027							North/South Street	Billtown Road							
Time Analyzed	PM Peak Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						184		158		38	614				534	850
Percent Heavy Vehicles (%)						0		2		3						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.10		6.22		4.13						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.50		3.32		2.23						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						192		165		40						
Capacity, c (veh/h)						264		476		1009						
v/c Ratio						0.73		0.35		0.04						
95% Queue Length, Q <sub>95</sub> (veh)						5.1		1.5		0.1						
95% Queue Length, Q <sub>95</sub> (ft)						127.5		38.1		2.6						
Control Delay (s/veh)						48.0		16.5		8.7						
Level of Service (LOS)						E		C		A						
Approach Delay (s/veh)					33.4				0.5							
Approach LOS					D				A							

HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2037							North/South Street	Billtown Road							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						203		165		42	591				559	893
Percent Heavy Vehicles (%)						0		2		3						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.10		6.22		4.13						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.50		3.32		2.23						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						211		172		44						
Capacity, c (veh/h)						260		491		987						
v/c Ratio						0.81		0.35		0.04						
95% Queue Length, Q <sub>95</sub> (veh)						6.4		1.6		0.1						
95% Queue Length, Q <sub>95</sub> (ft)						160.0		40.6		2.6						
Control Delay (s/veh)						59.4		16.2		8.8						
Level of Service (LOS)						F		C		A						
Approach Delay (s/veh)					40.0				0.6							
Approach LOS					E				A							



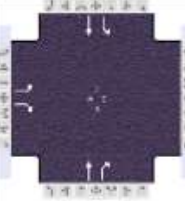
HCS Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Billtown Road at I 265 Westbound							
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC							Jurisdiction								
Date Performed	11/18/2024							East/West Street	I 265 Westbound							
Analysis Year	2037							North/South Street	Billtown Road							
Time Analyzed	PM Peak Build							Peak Hour Factor	0.96							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Madden Billtown															
<b>Lanes</b>																
<b>Vehicle Volumes and Adjustments</b>																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	1	0	0	0	1	1
Configuration						L		R		L	T				T	R
Volume (veh/h)						203		174		42	670				587	935
Percent Heavy Vehicles (%)						0		2		3						
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No								Yes			
Median Type   Storage					Left Only								1			
<b>Critical and Follow-up Headways</b>																
Base Critical Headway (sec)						7.1		6.2		4.1						
Critical Headway (sec)						7.10		6.22		4.13						
Base Follow-Up Headway (sec)						3.5		3.3		2.2						
Follow-Up Headway (sec)						3.50		3.32		2.23						
<b>Delay, Queue Length, and Level of Service</b>																
Flow Rate, v (veh/h)						211		181		44						
Capacity, c (veh/h)						235		441		963						
v/c Ratio						0.90		0.41		0.05						
95% Queue Length, Q <sub>95</sub> (veh)						7.5		2.0		0.1						
95% Queue Length, Q <sub>95</sub> (ft)						187.5		50.8		2.6						
Control Delay (s/veh)						79.3		18.8		8.9						
Level of Service (LOS)						F		C		A						
Approach Delay (s/veh)					51.4				0.5							
Approach LOS					F				A							

## HCS Signalized Intersection Results Summary

General Information						Intersection Information													
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250											
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other									
Jurisdiction				Time Period		AM Peak		PHF		0.89									
Urban Street		Billtown Road		Analysis Year		2024		Analysis Period		1> 7:00									
Intersection		I 265 Eastbound		File Name		Billtown AM 24.xus													
Project Description		Madden Billtown																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h				602		30					314	241	215	68					
Signal Information																			
Cycle, s	99.3	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	Yes	Simult. Gap E/W	On	Green	12.1	25.6	40.6	0.0	0.0	0.0									
				Yellow	3.5	5.1	4.0	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Red	3.0	2.4	3.0	0.0	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						8								2		1		6	
Case Number						9.0								7.3		1.0		4.0	
Phase Duration, s						47.6								33.1		18.6		51.7	
Change Period, ( Y+R c ), s						7.0								7.5		6.5		7.5	
Max Allow Headway ( MAH ), s						5.1								6.1		4.5		6.1	
Queue Clearance Time ( g s ), s						37.9								19.5		11.5		4.3	
Green Extension Time ( g e ), s						2.6								6.1		0.6		6.8	
Phase Call Probability						1.00								1.00		1.00		1.00	
Max Out Probability						0.72								0.07		0.11		0.01	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				3		18					2	12	1	6					
Adjusted Flow Rate ( v ), veh/h				676		34					353	271	241	76					
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1781							1841		1753	1870					
Queue Service Time ( g s ), s				35.9							17.5		9.5	2.3					
Cycle Queue Clearance Time ( g c ), s				35.9							17.5		9.5	2.3					
Green Ratio ( g/C )				0.41							0.26		0.40	0.45					
Capacity ( c ), veh/h				728							474		369	832					
Volume-to-Capacity Ratio ( X )				0.929							0.744		0.653	0.092					
Back of Queue ( Q ), ft/ln ( 95 th percentile)				626							327		170	44					
Back of Queue ( Q ), veh/ln ( 95 th percentile)				24.7							12.7		6.6	1.7					
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00							0.00		0.34	0.00					
Uniform Delay ( d 1 ), s/veh				28.0							33.9		23.3	15.9					
Incremental Delay ( d 2 ), s/veh				16.5							4.9		1.8	0.1					
Initial Queue Delay ( d 3 ), s/veh				0.0							0.0		0.0	0.0					
Control Delay ( d ), s/veh				44.4		5.0					38.8	7.0	25.1	16.0					
Level of Service (LOS)				D		A					D	A	C	B					
Approach Delay, s/veh / LOS				42.6		D		0.0			25.0		C	22.9		C			
Intersection Delay, s/veh / LOS							32.1						C						
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				1.95		B	1.95		B	1.41		A	1.68		B				
Bicycle LOS Score / LOS						F				1.52		B	1.01		A				

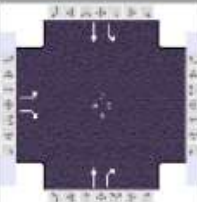
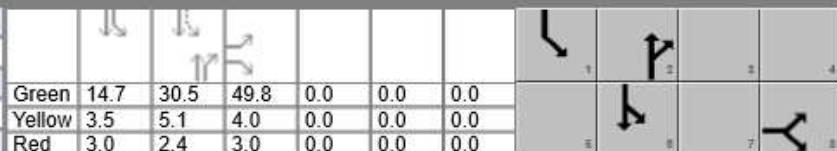
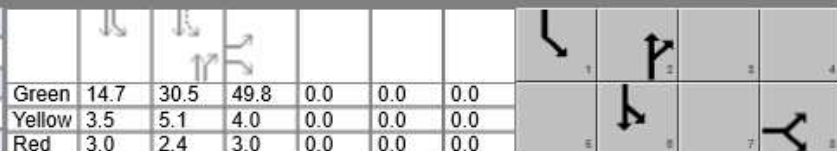
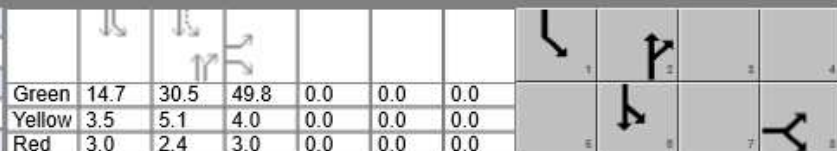


## HCS Signalized Intersection Results Summary

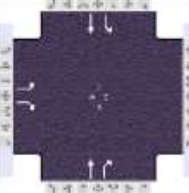







General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250										
Analyst	DBZ	Analysis Date	Nov 10, 2024	Area Type	Other										
Jurisdiction		Time Period	AM Peak	PHF	0.89										
Urban Street	Billtown Road	Analysis Year	2027 No Build	Analysis Period	1> 7:00										
Intersection	I 265 Eastbound	File Name	Billtown AM 27 NB.xus												
Project Description	Madden Billtown														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				622		31					324	249	222	70	
Signal Information															
Cycle, s	103.8	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On	Green	12.9	27.0	43.0	0.0	0.0	0.0					
				Yellow	3.5	5.1	4.0	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	3.0	2.4	3.0	0.0	0.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					8				2	1	6				
Case Number					9.0				7.3	1.0	4.0				
Phase Duration, s					50.0				34.5	19.4	53.9				
Change Period, ( Y+R c ), s					7.0				7.5	6.5	7.5				
Max Allow Headway ( MAH ), s					5.1				6.1	4.5	6.1				
Queue Clearance Time ( g s ), s					41.3				20.9	12.3	4.5				
Green Extension Time ( g e ), s					1.6				5.9	0.6	7.0				
Phase Call Probability					1.00				1.00	1.00	1.00				
Max Out Probability					1.00				0.10	0.18	0.01				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18				2	12	1	6		
Adjusted Flow Rate ( v ), veh/h				699		35				364	280	250	79		
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1781						1841		1753	1870		
Queue Service Time ( g s ), s				39.3						18.9		10.3	2.5		
Cycle Queue Clearance Time ( g c ), s				39.3						18.9		10.3	2.5		
Green Ratio ( g/C )				0.41						0.26		0.40	0.45		
Capacity ( c ), veh/h				737						478		364	835		
Volume-to-Capacity Ratio ( X )				0.948						0.761		0.685	0.094		
Back of Queue ( Q ), ft/ln ( 90 th percentile)				656						324		166	47		
Back of Queue ( Q ), veh/ln ( 90 th percentile)				25.8						12.6		6.4	1.9		
Queue Storage Ratio ( RQ ) ( 90 th percentile)				0.00						0.00		0.33	0.00		
Uniform Delay ( d 1 ), s/veh				29.4						35.5		24.4	16.6		
Incremental Delay ( d 2 ), s/veh				20.6						5.3		2.2	0.1		
Initial Queue Delay ( d 3 ), s/veh				0.0						0.0		0.0	0.0		
Control Delay ( d ), s/veh				50.0		5.0				40.7	7.0	26.6	16.7		
Level of Service (LOS)				D		A				D	A	C	B		
Approach Delay, s/veh / LOS				47.9	D	0.0				26.1	C	24.2	C		
Intersection Delay, s/veh / LOS				35.1						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				1.96	B	1.96	B	1.41	A	1.68	B				
Bicycle LOS Score / LOS					F			1.55	B	1.03	A				



## HCS Signalized Intersection Results Summary

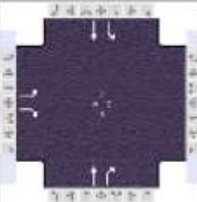
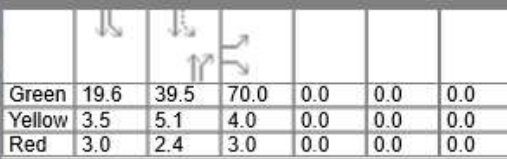

General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering						Duration, h	0.250							
Analyst	DBZ		Analysis Date	Nov 10, 2024		Area Type	Other								
Jurisdiction			Time Period	AM Peak		PHF	0.89								
Urban Street	Billtown Road		Analysis Year	2027 Build		Analysis Period	1> 7:00								
Intersection	I 265 Eastbound		File Name	Billtown AM 27 B.xus											
Project Description	Madden Billtown														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				669		31					348	249	234	101	
Signal Information															
Cycle, s	115.9	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	14.7	30.5	49.8	0.0	0.0	0.0	0.0				
				Yellow	3.5	5.1	4.0	0.0	0.0	0.0	0.0				
				Red	3.0	2.4	3.0	0.0	0.0	0.0	0.0				
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					8				2	1	6				
Case Number					9.0				7.3	1.0	4.0				
Phase Duration, s					56.8				38.0	21.2	59.1				
Change Period, ( Y+R c ), s					7.0				7.5	6.5	7.5				
Max Allow Headway ( MAH ), s					5.1				6.0	4.5	6.0				
Queue Clearance Time ( g s ), s					49.6				25.1	14.1	6.1				
Green Extension Time ( g e ), s					0.2				5.4	0.5	7.7				
Phase Call Probability					1.00				1.00	1.00	1.00				
Max Out Probability					1.00				0.20	0.49	0.02				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18				2	12		1	6	
Adjusted Flow Rate ( v ), veh/h				752		35				391	280		262	113	
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1781						1841			1753	1870	
Queue Service Time ( g s ), s				47.6						23.1			12.1	4.1	
Cycle Queue Clearance Time ( g c ), s				47.6						23.1			12.1	4.1	
Green Ratio ( g/C )				0.43						0.26			0.41	0.45	
Capacity ( c ), veh/h				781						484			346	833	
Volume-to-Capacity Ratio ( X )				0.963						0.808			0.758	0.136	
Back of Queue ( Q ), ft/ln ( 95 th percentile)				831						424			212	80	
Back of Queue ( Q ), veh/ln ( 95 th percentile)				32.7						16.5			8.2	3.1	
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00						0.00			0.42	0.00	
Uniform Delay ( d 1 ), s/veh				31.6						40.0			27.7	19.0	
Incremental Delay ( d 2 ), s/veh				23.5						7.4			4.3	0.1	
Initial Queue Delay ( d 3 ), s/veh				0.0						0.0			0.0	0.0	
Control Delay ( d ), s/veh				55.1		5.0				47.4	7.0		32.0	19.1	
Level of Service (LOS)				E		A				D	A		C	B	
Approach Delay, s/veh / LOS				52.9		D		0.0		30.6		C	28.1		C
Intersection Delay, s/veh / LOS				39.6						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				1.96		B	1.96		B	1.42		A	1.69		B
Bicycle LOS Score / LOS						F				1.59		B	1.11		A

## HCS Signalized Intersection Results Summary

General Information						Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250										
Analyst	DBZ		Analysis Date	Nov 10, 2024		Area Type	Other										
Jurisdiction			Time Period	AM Peak		PHF	0.89										
Urban Street	Billtown Road		Analysis Year	2037 No Build		Analysis Period	1> 7:00										
Intersection	I 265 Eastbound		File Name	Billtown AM 37 NB.xus													
Project Description	Madden Billtown																
Demand Information						EB			WB			NB			SB		
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h						687		34				358	275	245	77		
Signal Information																	
Cycle, s	129.8	Reference Phase	2														
Offset, s	0	Reference Point	End														
Uncoordinated	Yes	Simult. Gap E/W	On														
Force Mode	Fixed	Simult. Gap N/S	On														
						Green	16.8	34.0	58.0	0.0	0.0	0.0					
						Yellow	3.5	5.1	4.0	0.0	0.0	0.0					
						Red	3.0	2.4	3.0	0.0	0.0	0.0					
Timer Results						EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase							8				2	1	6				
Case Number							9.0				7.3	1.0	4.0				
Phase Duration, s							65.0				41.5	23.3	64.8				
Change Period, ( Y+R c ), s							7.0				7.5	6.5	7.5				
Max Allow Headway ( MAH ), s							5.1				6.1	4.5	6.1				
Queue Clearance Time ( g s ), s							56.1				28.8	16.4	5.5				
Green Extension Time ( g e ), s							1.9				5.2	0.4	8.0				
Phase Call Probability							1.00				1.00	1.00	1.00				
Max Out Probability							1.00				0.32	1.00	0.02				
Movement Group Results						EB			WB			NB			SB		
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement						3		18				2	12	1	6		
Adjusted Flow Rate ( v ), veh/h						772		38				402	309	276	87		
Adjusted Saturation Flow Rate ( s ), veh/h/ln						1781						1841		1753	1870		
Queue Service Time ( g s ), s						54.1						26.8		14.4	3.5		
Cycle Queue Clearance Time ( g c ), s						54.1						26.8		14.4	3.5		
Green Ratio ( g/C )						0.45						0.26		0.41	0.44		
Capacity ( c ), veh/h						810						482		336	825		
Volume-to-Capacity Ratio ( X )						0.953						0.834		0.823	0.105		
Back of Queue ( Q ), ft/ln ( 90 th percentile)						859						461		242	70		
Back of Queue ( Q ), veh/ln ( 90 th percentile)						33.8						17.9		9.4	2.8		
Queue Storage Ratio ( RQ ) ( 90 th percentile)						0.00						0.00		0.48	0.00		
Uniform Delay ( d 1 ), s/veh						34.1						45.2		31.4	21.2		
Incremental Delay ( d 2 ), s/veh						20.5						10.0		8.9	0.1		
Initial Queue Delay ( d 3 ), s/veh						0.0						0.0		0.0	0.0		
Control Delay ( d ), s/veh						54.5		5.0				55.2	7.0	40.3	21.3		
Level of Service (LOS)						D		A				E	A	D	C		
Approach Delay, s/veh / LOS						52.2		D		0.0		34.3		C	35.8		D
Intersection Delay, s/veh / LOS						42.3						D					
Multimodal Results						EB			WB			NB			SB		
Pedestrian LOS Score / LOS						1.96		B	1.96		B	1.42		A	1.69		B
Bicycle LOS Score / LOS								F				1.66		B	1.08		A

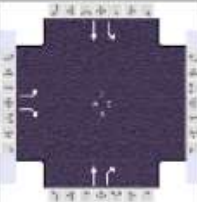
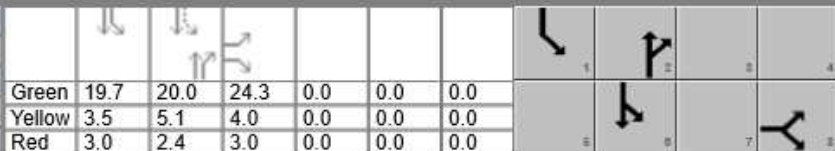


## HCS Signalized Intersection Results Summary

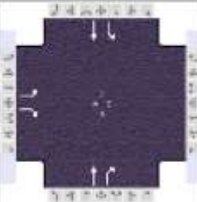
General Information						Intersection Information													
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250											
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other									
Jurisdiction				Time Period		AM Peak		PHF		0.89									
Urban Street		Billtown Road		Analysis Year		2037 Build		Analysis Period		1> 7:00									
Intersection		I 265 Eastbound		File Name		Billtown AM 37 B.xus													
Project Description		Madden Billtown																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h				734		34					382	275	257	108					
Signal Information																			
Cycle, s	150.1	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	19.6	39.5	70.0	0.0	0.0	0.0									
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.1	4.0	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Red	3.0	2.4	3.0	0.0	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						8								2		1		6	
Case Number						9.0								7.3		1.0		4.0	
Phase Duration, s						77.0								47.0		26.1		73.1	
Change Period, ( Y+R c ), s						7.0								7.5		6.5		7.5	
Max Allow Headway ( MAH ), s						5.1								6.0		4.5		6.0	
Queue Clearance Time ( g s ), s						70.2								35.6		19.6		7.9	
Green Extension Time ( g e ), s						0.0								3.8		0.1		8.6	
Phase Call Probability						1.00								1.00		1.00		1.00	
Max Out Probability						1.00								0.71		1.00		0.04	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				3		18					2	12	1	6					
Adjusted Flow Rate ( v ), veh/h				825		38					429	309	289	121					
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1781							1841		1753	1870					
Queue Service Time ( g s ), s				68.2							33.6		17.6	5.9					
Cycle Queue Clearance Time ( g c ), s				68.2							33.6		17.6	5.9					
Green Ratio ( g/C )				0.47							0.26		0.41	0.44					
Capacity ( c ), veh/h				842							484		314	818					
Volume-to-Capacity Ratio ( X )				0.979							0.886		0.921	0.149					
Back of Queue ( Q ), ft/ln ( 95 th percentile)				1137							627		333	117					
Back of Queue ( Q ), veh/ln ( 95 th percentile)				44.8							24.3		12.9	4.6					
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00							0.00		0.67	0.00					
Uniform Delay ( d 1 ), s/veh				38.8							53.2		37.0	25.4					
Incremental Delay ( d 2 ), s/veh				25.9							16.7		20.9	0.1					
Initial Queue Delay ( d 3 ), s/veh				0.0							0.0		0.0	0.0					
Control Delay ( d ), s/veh				64.7		5.0					69.8	7.0	57.8	25.5					
Level of Service (LOS)				E		A					E	A	E	C					
Approach Delay, s/veh / LOS				62.0		E		0.0			43.5		D		48.3		D		
Intersection Delay, s/veh / LOS				52.4						D									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				1.97		B		1.97		B		1.43		A		1.70		B	
Bicycle LOS Score / LOS						F					1.71		B		1.16		A		



## HCS Signalized Intersection Results Summary

General Information						Intersection Information															
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250													
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other											
Jurisdiction				Time Period		PM Peak		PHF		0.98											
Urban Street		Billtown Road		Analysis Year		2024		Analysis Period		1> 4:45											
Intersection		I 265 Eastbound		File Name		Billtown PM 24.xus															
Project Description		Madden Billtown																			
Demand Information						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h						445		83				107	73	167	497						
Signal Information																					
Cycle, s	85.0	Reference Phase	2																		
Offset, s	0	Reference Point	End																		
Uncoordinated	Yes	Simult. Gap E/W	On																		
Force Mode	Fixed	Simult. Gap N/S	On																		
Timer Results						EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase								8								2		1		6	
Case Number								9.0								7.3		1.0		4.0	
Phase Duration, s								31.3								27.5		26.2		53.7	
Change Period, ( Y+R c ), s								7.0								7.5		6.5		7.5	
Max Allow Headway ( MAH ), s								3.2								4.0		4.0		4.0	
Queue Clearance Time ( g s ), s								23.2								6.2		6.6		16.6	
Green Extension Time ( g e ), s								1.1								2.6		0.5		2.6	
Phase Call Probability								1.00								1.00		0.98		1.00	
Max Out Probability								0.00								0.00		0.00		0.00	
Movement Group Results						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement						3		18				2	12	1	6						
Adjusted Flow Rate ( v ), veh/h						454		85				109	74	175	520						
Adjusted Saturation Flow Rate ( s ), veh/h/ln						1753						1811		1810	1900						
Queue Service Time ( g s ), s						21.2						4.2		4.6	14.6						
Cycle Queue Clearance Time ( g c ), s						21.2						4.2		4.6	14.6						
Green Ratio ( g/C )						0.29						0.24		0.49	0.54						
Capacity ( c ), veh/h						502						426		746	1032						
Volume-to-Capacity Ratio ( X )						0.905						0.256		0.234	0.504						
Back of Queue ( Q ), ft/ln ( 95 th percentile)						352						81		74	193						
Back of Queue ( Q ), veh/ln ( 95 th percentile)						13.6						3.1		3.0	7.7						
Queue Storage Ratio ( RQ ) ( 95 th percentile)						0.00						0.00		0.15	0.00						
Uniform Delay ( d 1 ), s/veh						29.2						26.4		12.5	12.2						
Incremental Delay ( d 2 ), s/veh						2.6						0.3		0.1	0.2						
Initial Queue Delay ( d 3 ), s/veh						0.0						0.0		0.0	0.0						
Control Delay ( d ), s/veh						31.8		5.0				26.8	7.0	12.5	12.4						
Level of Service (LOS)						C		A				C	A	B	B						
Approach Delay, s/veh / LOS						27.6		C		0.0		18.7		B		12.4		B			
Intersection Delay, s/veh / LOS						19.0						B									
Multimodal Results						EB			WB			NB			SB						
Pedestrian LOS Score / LOS						1.95		B		1.95		B		1.41		A		1.66		B	
Bicycle LOS Score / LOS								F				0.79		A		1.61		B			

## HCS Signalized Intersection Results Summary

General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ		Analysis Date	Nov 10, 2024		Area Type	Other												
Jurisdiction			Time Period	PM Peak		PHF	0.98												
Urban Street	Billtown Road		Analysis Year	2027 No Build		Analysis Period	1> 4:45												
Intersection	I 265 Eastbound		File Name	Billtown PM 27 NB.xus															
Project Description	Madden Billtown																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h				460		86					111	75	173	514					
Signal Information																			
Cycle, s	86.1	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	19.7	20.0	25.4	0.0	0.0	0.0									
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.1	4.0	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Red	3.0	2.4	3.0	0.0	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						8								2		1		6	
Case Number						9.0								7.3		1.0		4.0	
Phase Duration, s						32.4								27.5		26.2		53.7	
Change Period, ( Y+R c ), s						7.0								7.5		6.5		7.5	
Max Allow Headway ( MAH ), s						3.2								4.0		4.0		4.0	
Queue Clearance Time ( g s ), s						24.2								6.4		6.9		17.7	
Green Extension Time ( g e ), s						1.1								2.7		0.5		2.7	
Phase Call Probability						1.00								1.00		0.99		1.00	
Max Out Probability						0.00								0.00		0.00		0.00	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				3		18					2	12		1	6				
Adjusted Flow Rate ( v ), veh/h				469		88					113	77		181	537				
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1753							1811			1810	1900				
Queue Service Time ( g s ), s				22.2							4.4			4.9	15.7				
Cycle Queue Clearance Time ( g c ), s				22.2							4.4			4.9	15.7				
Green Ratio ( g/C )				0.29							0.23			0.48	0.54				
Capacity ( c ), veh/h				516							421			734	1020				
Volume-to-Capacity Ratio ( X )				0.909							0.269			0.246	0.527				
Back of Queue ( Q ), ft/ln ( 95 th percentile)				366							86			79	204				
Back of Queue ( Q ), veh/ln ( 95 th percentile)				14.2							3.3			3.1	8.2				
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00							0.00			0.16	0.00				
Uniform Delay ( d 1 ), s/veh				29.3							27.1			13.0	12.9				
Incremental Delay ( d 2 ), s/veh				2.6							0.3			0.1	0.2				
Initial Queue Delay ( d 3 ), s/veh				0.0							0.0			0.0	0.0				
Control Delay ( d ), s/veh				31.9		5.0					27.4	7.0		13.0	13.0				
Level of Service (LOS)				C		A					C	A		B	B				
Approach Delay, s/veh / LOS				27.7		C		0.0			19.2		B	13.0		B			
Intersection Delay, s/veh / LOS				19.4					B										
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				1.95		B	1.95		B	1.41		A	1.66		B				
Bicycle LOS Score / LOS						F				0.80		A	1.64		B				



## HCS Signalized Intersection Results Summary

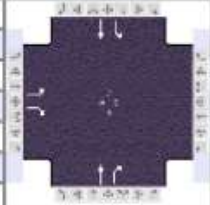
General Information						Intersection Information									
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250							
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other					
Jurisdiction				Time Period		PM Peak		PHF		0.98					
Urban Street		Billtown Road		Analysis Year		2027 Build		Analysis Period		1> 4:45					
Intersection		I 265 Eastbound		File Name		Billtown PM 27 B.xus									
Project Description		Madden Billtown													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				512		86					138	75	180	535	
Signal Information															
Cycle, s	89.9	Reference Phase	2		Green	19.8	20.0	29.1	0.0	0.0	0.0				
Offset, s	0	Reference Point	End		Yellow	3.5	5.1	4.0	0.0	0.0	0.0				
Uncoordinated	Yes	Simult. Gap E/W	On		Red	3.0	2.4	3.0	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					8				2	1	6				
Case Number					9.0				7.3	1.0	4.0				
Phase Duration, s					36.1				27.5	26.3	53.8				
Change Period, ( Y+R c ), s					7.0				7.5	6.5	7.5				
Max Allow Headway ( MAH ), s					3.2				4.0	4.0	4.0				
Queue Clearance Time ( g s ), s					27.8				7.9	7.6	20.1				
Green Extension Time ( g e ), s					1.3				2.9	0.5	2.9				
Phase Call Probability					1.00				1.00	0.99	1.00				
Max Out Probability					0.00				0.00	0.00	0.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18				2	12		1	6	
Adjusted Flow Rate ( v ), veh/h				522		88				141	77		188	557	
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1753						1811			1810	1900	
Queue Service Time ( g s ), s				25.8						5.9			5.6	18.1	
Cycle Queue Clearance Time ( g c ), s				25.8						5.9			5.6	18.1	
Green Ratio ( g/C )				0.32						0.22			0.47	0.52	
Capacity ( c ), veh/h				567						403			678	979	
Volume-to-Capacity Ratio ( X )				0.921						0.349			0.277	0.569	
Back of Queue ( Q ), ft/ln ( 95 th percentile)				425						117			87	233	
Back of Queue ( Q ), veh/ln ( 95 th percentile)				16.5						4.5			3.5	9.3	
Queue Storage Ratio ( RQ ) ( 95 th percentile)				0.00						0.00			0.17	0.00	
Uniform Delay ( d 1 ), s/veh				29.3						29.5			14.8	15.0	
Incremental Delay ( d 2 ), s/veh				4.8						0.5			0.1	0.2	
Initial Queue Delay ( d 3 ), s/veh				0.0						0.0			0.0	0.0	
Control Delay ( d ), s/veh				34.1		5.0				30.0	7.0		14.8	15.2	
Level of Service (LOS)				C		A				C	A		B	B	
Approach Delay, s/veh / LOS				29.9		C		0.0		21.9		C	15.1		B
Intersection Delay, s/veh / LOS				21.8					C						
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				1.95		B	1.95		B	1.41		A	1.67		B
Bicycle LOS Score / LOS						F				0.85		A	1.69		B



## HCS Signalized Intersection Results Summary

### General Information

Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Nov 10, 2024	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.98
Urban Street	Billtown Road	Analysis Year	2037 No Build	Analysis Period	1> 4:45
Intersection	I 265 Eastbound	File Name	Billtown PM 37 NB.xus		
Project Description	Madden Billtown				



### Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	508		95					123	83	191	568	

### Signal Information

Cycle, s	89.7	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	19.8	20.0	28.8	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	5.1	4.0	0.0	0.0	0.0		
				Red	3.0	2.4	3.0	0.0	0.0	0.0		

### Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8				2	1	6
Case Number		9.0				7.3	1.0	4.0
Phase Duration, s		35.8				27.5	26.3	53.8
Change Period, (Y+R), s		7.0				7.5	6.5	7.5
Max Allow Headway (MAH), s		3.2				4.0	4.0	4.0
Queue Clearance Time (g <sub>s</sub> ), s		27.5				7.2	7.8	20.9
Green Extension Time (g <sub>e</sub> ), s		1.3				3.0	0.5	3.0
Phase Call Probability		1.00				1.00	0.99	1.00
Max Out Probability		0.00				0.00	0.00	0.00

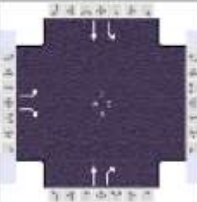
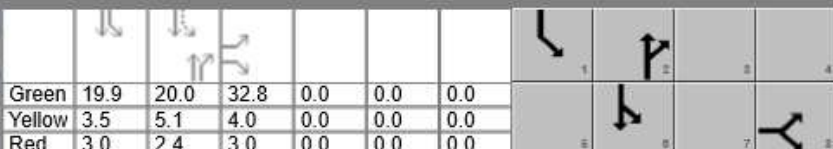
### Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				2	12		1	6	
Adjusted Flow Rate (v), veh/h	518		97				126	85		194	578	
Adjusted Saturation Flow Rate (s), veh/h/ln	1753						1811			1810	1900	
Queue Service Time (g <sub>s</sub> ), s	25.5						5.2			5.8	18.9	
Cycle Queue Clearance Time (g <sub>c</sub> ), s	25.5						5.2			5.8	18.9	
Green Ratio (g/C)	0.32						0.22			0.47	0.52	
Capacity (c), veh/h	564						404			693	982	
Volume-to-Capacity Ratio (X)	0.920						0.311			0.280	0.588	
Back of Queue (Q), ft/ln (95 th percentile)	419						103			81	228	
Back of Queue (Q), veh/ln (95 th percentile)	16.2						3.9			3.2	9.1	
Queue Storage Ratio (RQ) (95 th percentile)	0.00						0.00			0.16	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh	29.3						29.1			14.6	15.0	
Incremental Delay (d <sub>2</sub> ), s/veh	4.4						0.4			0.0	0.2	
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0						0.0			0.0	0.0	
Control Delay (d), s/veh	33.7		5.0				29.5	7.0		14.7	15.2	
Level of Service (LOS)	C		A				C	A		B	B	
Approach Delay, s/veh / LOS	29.2		C		0.0		20.4		C	15.1		B
Intersection Delay, s/veh / LOS	21.2						C					

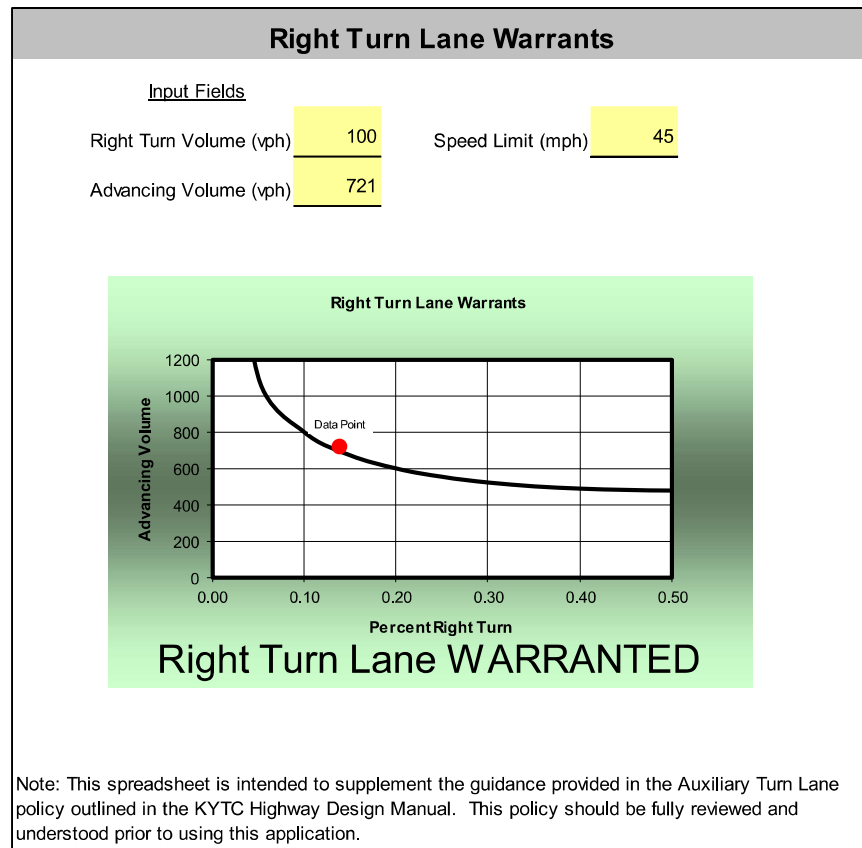
### Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.95		B	1.95		B	1.41		A	1.67		B
Bicycle LOS Score / LOS			F				0.83		A	1.77		B

## HCS Signalized Intersection Results Summary

General Information						Intersection Information															
Agency		Diane B. Zimmerman Traffic Engineering				Duration, h		0.250													
Analyst		DBZ		Analysis Date		Nov 10, 2024		Area Type		Other											
Jurisdiction				Time Period		PM Peak		PHF		0.98											
Urban Street		Billtown Road		Analysis Year		2037 Build		Analysis Period		1> 4:45											
Intersection		I 265 Eastbound		File Name		Billtown PM 37 B.xus															
Project Description		Madden Billtown																			
Demand Information						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Demand ( v ), veh/h						560		95				150	83		198	589					
Signal Information																					
Cycle, s	93.7	Reference Phase	2																		
Offset, s	0	Reference Point	End																		
Uncoordinated	Yes	Simult. Gap E/W	On																		
Force Mode	Fixed	Simult. Gap N/S	On																		
						Green	19.9	20.0	32.8	0.0	0.0	0.0									
						Yellow	3.5	5.1	4.0	0.0	0.0	0.0									
						Red	3.0	2.4	3.0	0.0	0.0	0.0									
Timer Results						EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase								8								2		1		6	
Case Number								9.0								7.3		1.0		4.0	
Phase Duration, s								39.8								27.5		26.4		53.9	
Change Period, ( Y+R c ), s								7.0								7.5		6.5		7.5	
Max Allow Headway ( MAH ), s								3.2								4.0		4.0		4.0	
Queue Clearance Time ( g s ), s								31.5								8.8		8.6		24.2	
Green Extension Time ( g e ), s								1.4								3.3		0.6		3.2	
Phase Call Probability								1.00								1.00		1.00		1.00	
Max Out Probability								0.00								0.00		0.00		0.00	
Movement Group Results						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement						3		18				2	12		1	6					
Adjusted Flow Rate ( v ), veh/h						571		97				153	85		204	607					
Adjusted Saturation Flow Rate ( s ), veh/h/ln						1753						1811			1810	1900					
Queue Service Time ( g s ), s						29.5						6.8			6.6	22.2					
Cycle Queue Clearance Time ( g c ), s						29.5						6.8			6.6	22.2					
Green Ratio ( g/C )						0.35						0.21			0.45	0.50					
Capacity ( c ), veh/h						614						386			637	940					
Volume-to-Capacity Ratio ( X )						0.930						0.396			0.320	0.646					
Back of Queue ( Q ), ft/ln ( 95 th percentile)						494						137			90	267					
Back of Queue ( Q ), veh/ln ( 95 th percentile)						19.2						5.2			3.6	10.7					
Queue Storage Ratio ( RQ ) ( 95 th percentile)						0.00						0.00			0.18	0.00					
Uniform Delay ( d 1 ), s/veh						29.4						31.7			16.7	17.6					
Incremental Delay ( d 2 ), s/veh						8.7						0.7			0.1	0.2					
Initial Queue Delay ( d 3 ), s/veh						0.0						0.0			0.0	0.0					
Control Delay ( d ), s/veh						38.1		5.0				32.3	7.0		16.7	17.8					
Level of Service (LOS)						D		A				C	A		B	B					
Approach Delay, s/veh / LOS						33.3		C		0.0		23.3		C		17.5		B			
Intersection Delay, s/veh / LOS						24.5						C									
Multimodal Results						EB			WB			NB			SB						
Pedestrian LOS Score / LOS						1.95		B	1.95		B	1.42		A	1.67		B				
Bicycle LOS Score / LOS								F				0.88		A	1.81		B				



Billtown Road opposite Weather Vane Drive





I, Diane Bridwell Zimmerman, certify that this Traffic Impact Study has been prepared under my direct supervision, that I am a Professional Engineer registered in the State of Kentucky and have successfully completed the Traffic Impact Study Requirements training course required by KYTC. Furthermore, I certify that this study has been completed in accordance with the KYTC Traffic Impact Study Requirements and in accordance with engineering standards of practice. The results presented have been determined to be accurate representations of existing and anticipated conditions based on the assumptions and methodologies presented in this report.

Diane Bridwell Zimmerman, Professional Engineer License #16462

 <b>College of Engineering</b> <small>Kentucky Transportation Center</small>	<b>TECHNOLOGY TRANSFER PROGRAM</b>
<b>TRAFFIC IMPACT STUDY COURSE Certificate of Completion (3.5 PDH)</b>	
<b>Diane Zimmerman</b> KY PE License No. 16462	<b>TIM THARPE</b> Tim Tharpe, KYTC Director of Traffic Operations
Completed: 02/18/2022 Expires: 02/18/2026 Company: University of Kentucky	 Adam Kirk, Instructor
<b>The official status of this certificate can be verified with the KYTC Division of Traffic Operations</b>	