

Ref: 9217

February 18, 2022

Mr. Gregory Rondeau, Chairman
Franklin Planning Board
355 East Central Street
Franklin, MA 02038

Re: Response to Traffic Peer Review
Proposed Mixed-Use Development – 230 East Central Street
Franklin, Massachusetts

Dear Chairman Rondeau and Members of the Planning Board:

Vanasse & Associates, Inc. (VAI) is providing responses to the comments that were raised in the February 14, 2022 *Traffic Peer Review* letter prepared by BETA Group, Inc. (BETA) in reference to their review of the January 19, 2022 *Transportation Impact Assessment* (the “January 2022 TIA”) prepared by VAI in support of the proposed TAJ Estates of Franklin II mixed-use development to be located at 230 East Central Street (Route 140) in Franklin, Massachusetts (hereafter referred to as the “Project”). Listed below are the comments that were identified by BETA in the subject letter pertaining to the January 2022 TIA followed by our response on behalf of the Project proponent. Responses to the comments on the Site Plan will be provided by others under separate cover.

Comment T1: *Typically, traffic volume data is collected via automatic traffic recorder (ATR) on the roadway(s) adjacent to a proposed site. Clarify if that data was collected and provide if available.*

Response: An ATR count was performed on Route 140, west of Lewis Street, on January 5th and 6th, 2022 (Wednesday through Thursday, inclusive). The traffic count data is attached and includes vehicle travel speed data as well. A comparison of the peak-hour data as measured at the Project site in 2022 to the peak-hour traffic volumes that form the basis of the January 2022 TIA (derived from 2020 pre-COVID traffic volumes) indicates that the measured traffic volumes are lower than peak-hour traffic volumes that were used in the January 2022 TIA even with consideration of the seasonality of the count data.

Comment T2: *Confirm that the 2017 counting station data is the most recent available to determine the seasonal adjustment.*

Response: Traffic volume data for 2019 (pre-COVID) was obtained from the same MassDOT permanent count station (Station No. 3180). A review of the 2019 count data confirmed the seasonal adjustment that was used in the January 2022 TIA (1.07). The 2019 count station data is attached.

Comment T3: *It is noted that the crashes at the existing site driveway are significantly below the statewide and district averages. Has the crash data for the site intersection been more closely analyzed to determine if any safety improvements could be incorporated at the driveway to create a safer intersection?*

Response: A review of the eight (8) motor vehicle crashes occurring at the existing driveway that serves the Project site does not indicate any discernable crash pattern or trend that is subject to correction. That being said, four (4) of the eight crashes appear to involve a vehicle exiting a driveway, either the existing driveway that serves the Project site or the driveways that serve the Rockland Trust Bank that is opposite the Project site. As documented in the January 2022 TIA, lines of sight at the Project site driveway exceed 650 feet in both directions, both approaching the driveway and for motorists exiting the driveway. Implementation of the recommendations that are provided in the January 2022 TIA, including the installation of a STOP-sign and marked STOP-line for motorists exiting the Project site and maintenance of sight lines, will serve to provide appropriate measures for the driveway to operate in a safe manner.

Comment T4: *Provide the backup data for the Central Square Mixed-Use Development trips applied to the future conditions for reference.*

Response: The project-generated traffic volume networks for the Central Square Mixed-Use Development are attached.

Comment T5: *Provide the weekday morning Build w/Mitigation data sheets that are missing from the Appendix for review.*

Response: The 2029 Build with Mitigation capacity analysis worksheets are attached.

Comment T6: *Off-site mitigation was not included by the proponent. BETA recommends that the proponent provide funds to perform a traffic monitoring program post-development which will determine the timing improvements needed to the study area traffic signals.*

Response: The Project proponent will provide a \$5,000 contribution to the Town to be used to monitor traffic volumes and operating conditions at the Route 140/King Street/Chestnut Street intersection post-development of the Project. The funds will be deposited with the Town as a condition of the issuance of a Building Permit for the Project.

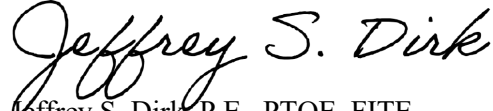


Mr. Gregory Rondeau, Chairman
February 18, 2022
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We trust that this information is responsive to the comments that were raised in the February 14, 2022 *Traffic Peer Review* letter prepared by BETA. If you should have any questions or would like to discuss our responses in more detail, please feel free to contact me.

Sincerely,

VANASSE & ASSOCIATES, INC.



Jeffrey S. Dirk, P.E., PTOE, FITE
Managing partner

Professional Engineer in CT, MA, ME, NH, RI and VA

JSD/jsd

Attachments

cc: J. Centracchio, P.E., PTOE – BETA (via email)
M. Ahmed – Taj Estates II of Franklin, LLC (via email)
File



ATTACHMENTS

2022 AUTOMATIC TRAFFIC RECORDER COUNTS

2019 SEASONAL ADJUSTMENT DATA

2022 VEHICLE TRAVEL SPEED DATA

BACKGROUND DEVELOPMENT NETWORKS

2029 BUILD WITH MITIGATION CAPACITY ANALYSIS WORKSHEETS



2022 AUTOMATIC TRAFFIC RECORDER COUNT DATA



Location : East Central Street
 Location : West of Lewis Street
 City/State: Franklin, MA

92170001

1/4/2022	EB,		Hour Totals		WB,		Hour Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		5		156		11		178		
12:15		3		142		9		162		
12:30		4		161		6		165		
12:45		4	16	159	4	169	30	674	46	1292
1:00		3		145	5	164				
1:15		1		164	4	172				
1:30		2		163	1	154				
1:45		3	9	172	1	185	11	675	20	1319
2:00		2		162	4	182				
2:15		2		151	2	193				
2:30		5		191	2	191				
2:45		3	12	187	0	179	8	745	20	1436
3:00		1		189	1	173				
3:15		5		162	3	234				
3:30		4		194	6	188				
3:45		7	17	169	6	168	16	763	33	1477
4:00		5		160	5	194				
4:15		7		163	4	185				
4:30		9		163	7	207				
4:45		4	25	151	8	174	24	760	49	1397
5:00		15		161	13	215				
5:15		12		138	17	186				
5:30		33		171	17	188				
5:45		39	99	131	26	139	73	728	172	1329
6:00		46		111	44	165				
6:15		45		123	51	123				
6:30		61		107	59	110				
6:45		79	231	102	82	113	236	511	467	954
7:00		106		76	98	107				
7:15		103		67	110	84				
7:30		133		81	89	70				
7:45		148	490	65	110	77	407	338	897	627
8:00		131		59	105	70				
8:15		148		52	117	45				
8:30		138		39	133	62				
8:45		153	570	33	139	41	494	218	1064	401
9:00		149		39	119	43				
9:15		133		46	111	39				
9:30		111		27	117	33				
9:45		102	495	21	105	14	452	129	947	262
10:00		133		23	130	27				
10:15		122		12	130	22				
10:30		138		8	120	19				
10:45		131	524	16	149	9	529	77	1053	136
11:00		144		13	121	16				
11:15		122		9	156	17				
11:30		148		13	142	8				
11:45		153	567	4	150	6	569	47	1136	86
Total	3055	5051			2849	5665			5904	10716
Percent	37.7%	62.3%			33.5%	66.5%			35.5%	64.5%

Location : East Central Street
 Location : West of Lewis Street
 City/State: Franklin, MA

92170001

1/5/2022	EB,		Hour Totals		WB,		Hour Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	8	161			9	184				
12:15	3	175			4	195				
12:30	2	156			0	158				
12:45	1	147	14	639	5	165	18	702	32	1341
1:00	1	137			3	149				
1:15	1	135			4	142				
1:30	4	128			1	174				
1:45	1	150	7	550	2	194	10	659	17	1209
2:00	3	138			3	153				
2:15	1	168			0	182				
2:30	5	147			1	177				
2:45	1	191	10	644	5	171	9	683	19	1327
3:00	1	175			0	191				
3:15	2	171			2	178				
3:30	2	176			0	181				
3:45	6	167	11	689	2	179	4	729	15	1418
4:00	6	159			5	216				
4:15	7	140			6	198				
4:30	4	152			3	153				
4:45	9	139	26	590	8	161	22	728	48	1318
5:00	12	139			14	179				
5:15	13	123			18	164				
5:30	29	143			17	175				
5:45	41	120	95	525	29	145	78	663	173	1188
6:00	39	126			40	143				
6:15	50	100			34	113				
6:30	63	112			60	137				
6:45	92	113	244	451	82	122	216	515	460	966
7:00	98	112			85	108				
7:15	115	69			89	102				
7:30	147	65			119	73				
7:45	147	69	507	315	101	73	394	356	901	671
8:00	115	49			114	75				
8:15	138	50			118	66				
8:30	143	51			121	41				
8:45	130	32	526	182	128	46	481	228	1007	410
9:00	133	42			109	60				
9:15	136	22			119	39				
9:30	96	19			114	38				
9:45	127	24	492	107	106	20	448	157	940	264
10:00	134	21			106	31				
10:15	121	9			122	20				
10:30	121	25			123	9				
10:45	143	13	519	68	164	17	515	77	1034	145
11:00	127	9			139	13				
11:15	145	14			141	12				
11:30	175	11			161	11				
11:45	147	8	594	42	159	14	600	50	1194	92
Total	3045	4802			2795	5547			5840	10349
Percent	38.8%	61.2%			33.5%	66.5%			36.1%	63.9%
Grand Total	6100	9853			5644	11212			11744	21065
Percent	38.2%	61.8%			33.5%	66.5%			35.8%	64.2%
ADT	ADT: 16,404		AADT: 16,404							

2019 SEASONAL ADJUSTMENT DATA



Massachusetts Highway Department

3180: Monthly Hourly Volume for March 2019

Location ID: 3180
County: Norfolk
Functional Class: 1
Location: INTERSTATE 495

Seasonal Factor Group: U1-Boston
Daily Factor Group:
Axle Factor Group: U1-Boston
Growth Factor Group:

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	TOTAL
1	460	327	302	384	731	2501	5354	7456	6537	4988	4406	4744	5041	5499	6711	8283	9127	8595	5933	4284	2622	2125	1595	1091	99096
2	609	414	345	299	393	721	1285	1519	1582	1729	2042	2340	2870	3242	3326	3771	3733	3520	3100	2113	1748	1446	1190	1002	44339
3	531	349	232	169	169	455	892	1627	2172	3035	4066	4820	5262	5239	5145	5261	5107	4734	3468	2422	1571	1059	593	359	58737
4	210	204	170	267	339	596	1111	1804	2358	2761	2979	2546	2563	2708	3043	3840	4156	4605	2933	1942	1473	1121	795	569	45093
5	359	263	263	346	832	2679	6047	8359	7290	5227	4200	4045	4112	4411	5276	7007	7695	8141	5427	3136	2103	1410	1047	656	90331
6	370	266	239	331	719	2672	5917	8422	7214	5207	4120	3957	4267	4476	5444	7285	7985	8147	5147	2850	2063	1503	1111	781	90493
7	407	309	307	429	873	2988	6346	8311	7300	5184	4132	4249	4451	4287	5057	6453	7872	7846	5829	3466	2307	1754	1250	757	92164
8	501	340	350	418	794	2818	5992	7921	6974	5385	4855	5029	5369	6052	7306	7968	9171	9185	6235	3821	2543	1948	1551	982	103508
9	575	410	333	244	390	891	1998	2989	3502	4237	5127	5637	6116	6071	5889	6019	6299	5848	4605	3263	2481	2091	1769	1193	77977
10	646	373	260	225	361	730	1126	1278	1650	2405	3006	3499	3800	4105	4137	3897	3717	3127	2439	1842	1300	826	524	299	45572
11	189	194	290	748	2601	5123	5654	6355	5125	3973	4054	4222	4320	5179	6660	7542	7819	5127	2870	1972	1454	964	621	336	83392
12	268	277	349	757	2658	5763	8407	7324	5078	3990	3886	4158	4536	5438	7162	7849	8145	5001	3140	2116	1523	1033	600	358	89816
13	248	249	324	725	2672	5735	8331	7290	5252	4039	3969	4286	4425	5546	7258	8260	8239	5209	3081	2214	1636	1042	667	411	91108
14	286	273	376	729	2634	5834	8502	7272	5234	4319	4175	4529	4560	5188	7506	8340	8410	5283	3391	2358	1734	1205	769	429	93336
15	309	288	381	650	2468	5232	7227	6565	4873	4401	4800	5187	5582	6591	8370	8570	7962	5585	3690	2517	2003	1496	953	597	96297
16	409	291	254	359	930	1743	2555	3224	4009	4780	5516	5645	5857	5826	5881	5782	5257	4298	3285	2700	2113	1818	1127	683	74342
17	378	262	185	173	375	906	1530	2170	2848	4019	5225	5442	5570	5557	5553	5487	4994	4289	3158	2211	1466	878	550	308	63534
18	211	221	319	755	2657	5582	7978	7255	5171	4083	4008	4002	4233	5091	6698	7605	7880	4957	2698	1982	1373	899	606	362	86626
19	245	267	332	729	2692	5811	8491	7411	5247	4063	3957	4148	4509	5485	7145	7952	8169	4954	3086	2114	1600	977	639	369	90392
20	267	278	360	709	2661	5879	8261	7716	5456	4373	4269	4312	4656	5607	7579	8333	8248	5445	3103	2288	1630	1077	711	390	93608
21	286	289	365	765	2728	5798	8109	7468	5294	4188	4312	4435	4677	5745	7495	7869	8358	5160	3165	2357	1696	1081	732	425	92797
22	280	298	346	704	2414	4923	6960	6684	4956	4349	4649	4960	5398	6525	8204	8402	8182	5450	3418	2375	1853	1464	1023	533	94350
23	364	318	246	350	762	1619	2575	3345	3970	4752	5448	5791	5738	5738	5824	5615	5150	4331	3297	2622	2145	1807	1291	725	73823
24	361	239	157	163	363	930	1453	2205	3323	4364	5169	5323	5308	5568	5718	5346	4896	4136	3028	2152	1520	865	565	292	63444
25	206	216	321	751	2605	5727	8353	7331	5010	4042	4014	4157	4274	5229	6823	7349	7845	4889	2701	1909	1335	893	610	336	86926
26	279	277	329	732	2707	6040	8438	7302	4788	4088	4061	4261	4564	5365	7139	7918	8158	5105	2935	2230	1519	1002	621	376	90234
27	277	265	354	735	2722	5973	8462	7326	5327	4167	4163	4266	4520	5555	7269	8074	8096	5333	3252	2185	1698	1055	705	397	92176
28	268	273	360	731	2711	5919	8190	7461	5616	4355	4176	4551	4537	5775	7673	8103	8364	5534	3381	2485	1846	1136	730	425	94600
29	290	277	375	722	2583	5490	7450	6606	5125	4586	4761	4996	5630	6870	8359	8558	8277	5773	3629	2334	1961	1522	1032	597	97803
30	390	306	265	340	876	1749	2632	3516	4125	5064	5683	5960	5987	5736	5653	6071	5484	4393	3387	2572	2125	1770	1259	642	75985
31	347	239	183	159	355	788	1548	2174	3066	3998	4855	5310	5203	5340	5141	4796	4202	3507	2648	1949	1322	819	533	303	58785

ADT: 81,635

AADT: 87,592

Seasonal Adjustment: 1.07

2022 VEHICLE TRAVEL SPEED DATA



Location : East Central Street
 Location : West of Lewis Street
 City/State: Franklin, MA
 Direction: EB,

92170001

1/4/2022	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	0	4	8	4	0	0	0	0	0	0	0	16
1:00	0	0	0	1	6	2	0	0	0	0	0	0	0	9
2:00	0	0	0	3	3	5	1	0	0	0	0	0	0	12
3:00	0	0	0	4	4	9	0	0	0	0	0	0	0	17
4:00	0	0	0	2	9	14	0	0	0	0	0	0	0	25
5:00	0	0	3	13	43	28	11	1	0	0	0	0	0	99
6:00	1	0	4	48	116	51	10	0	0	1	0	0	0	231
7:00	0	7	36	156	231	51	8	1	0	0	0	0	0	490
8:00	5	4	33	182	278	67	1	0	0	0	0	0	0	570
9:00	2	13	39	202	175	58	4	1	1	0	0	0	0	495
10:00	0	4	39	201	242	35	3	0	0	0	0	0	0	524
11:00	10	27	56	222	207	42	2	1	0	0	0	0	0	567
12:00 PM	9	23	62	201	256	63	3	1	0	0	0	0	0	618
1:00	4	20	72	271	221	50	5	1	0	0	0	0	0	644
2:00	13	22	99	335	182	40	0	0	0	0	0	0	0	691
3:00	9	21	90	340	213	39	2	0	0	0	0	0	0	714
4:00	3	13	122	279	188	29	3	0	0	0	0	0	0	637
5:00	0	7	112	298	154	23	7	0	0	0	0	0	0	601
6:00	1	0	32	182	186	39	3	0	0	0	0	0	0	443
7:00	0	2	22	88	128	44	4	1	0	0	0	0	0	289
8:00	0	2	6	46	97	30	2	0	0	0	0	0	0	183
9:00	0	3	3	22	67	33	3	1	1	0	0	0	0	133
10:00	0	1	0	8	31	18	1	0	0	0	0	0	0	59
11:00	0	0	0	8	19	7	4	1	0	0	0	0	0	39
Total	57	169	830	3116	3064	781	77	9	2	1	0	0	0	8106

Percentile	15th	50th	85th	95th
Speed	25.4	29.7	34.1	36.6
Mean Speed (Average)	29.7			
10 MPH Pace Speed	25-34			
Number in Pace	6135			
Percent in Pace	75.7%			
Number > 30 MPH	3934			
Percent > 30 MPH	48.5%			

92170001

1/5/2022	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	0	3	3	8	0	0	0	0	0	0	0	14
1:00	0	0	0	2	3	1	1	0	0	0	0	0	0	7
2:00	0	0	0	1	5	4	0	0	0	0	0	0	0	10
3:00	0	0	0	0	7	3	1	0	0	0	0	0	0	11
4:00	1	0	3	2	10	8	2	0	0	0	0	0	0	26
5:00	1	0	2	23	35	30	4	0	0	0	0	0	0	95
6:00	0	0	18	69	120	32	4	0	1	0	0	0	0	244
7:00	0	5	45	226	189	38	4	0	0	0	0	0	0	507
8:00	3	5	71	190	214	38	5	0	0	0	0	0	0	526
9:00	4	15	55	192	189	34	3	0	0	0	0	0	0	492
10:00	5	8	68	211	184	41	2	0	0	0	0	0	0	519
11:00	4	13	59	263	214	37	4	0	0	0	0	0	0	594
12:00 PM	8	30	78	281	200	40	2	0	0	0	0	0	0	639
1:00	7	14	64	234	194	35	2	0	0	0	0	0	0	550
2:00	9	25	111	273	179	42	5	0	0	0	0	0	0	644
3:00	14	35	113	313	181	32	1	0	0	0	0	0	0	689
4:00	8	12	151	258	140	21	0	0	0	0	0	0	0	590
5:00	1	5	102	204	196	17	0	0	0	0	0	0	0	525
6:00	0	2	32	194	182	41	0	0	0	0	0	0	0	451
7:00	2	5	26	107	138	32	4	1	0	0	0	0	0	315
8:00	0	1	4	58	101	14	3	1	0	0	0	0	0	182
9:00	0	0	0	20	53	29	5	0	0	0	0	0	0	107
10:00	0	0	1	16	28	21	2	0	0	0	0	0	0	68
11:00	0	0	1	14	16	11	0	0	0	0	0	0	0	42
Total	67	175	1004	3154	2781	609	54	2	1	0	0	0	0	7847
			Percentile	15th	50th	85th	95th							
			Speed	24.8	29.7	33.5	35.9							
			Mean Speed (Average)	29.2										
			10 MPH Pace Speed	25-34										
			Number in Pace	5899										
			Percent in Pace	75.2%										
			Number > 30 MPH	3447										
			Percent > 30 MPH	43.9%										
Grand Total	124	344	1834	6270	5845	1390	131	11	3	1	0	0	0	15953
Stats			Percentile	15th	50th	85th	95th							
			Speed	25.4	29.7	34.1	36.6							
			Mean Speed (Average)	29.5										
			10 MPH Pace Speed	25-34										
			Number in Pace	12083										
			Percent in Pace	75.4%										
			Number > 30 MPH	7444										
			Percent > 30 MPH	46.4%										

Location : East Central Street
 Location : West of Lewis Street
 City/State: Franklin, MA
 Direction: WB,

92170001

1/4/2022	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	1	2	12	9	6	0	0	0	0	0	0	30
1:00	0	0	0	0	4	5	2	0	0	0	0	0	0	11
2:00	0	0	0	1	4	2	1	0	0	0	0	0	0	8
3:00	0	0	1	3	6	5	1	0	0	0	0	0	0	16
4:00	0	1	2	0	11	8	1	1	0	0	0	0	0	24
5:00	0	2	2	4	17	34	11	2	0	0	0	1	0	73
6:00	3	17	26	46	71	57	11	3	0	0	0	1	1	236
7:00	0	23	54	110	147	67	3	1	0	0	0	1	1	407
8:00	2	24	77	165	166	51	4	0	0	2	0	0	3	494
9:00	2	17	55	132	176	63	2	0	1	0	1	0	3	452
10:00	0	9	75	191	190	60	3	1	0	0	0	0	0	529
11:00	2	20	94	225	189	36	3	0	0	0	0	0	0	569
12:00 PM	5	30	96	243	230	62	8	0	0	0	0	0	0	674
1:00	9	34	91	264	213	55	8	1	0	0	0	0	0	675
2:00	23	47	153	326	157	35	4	0	0	0	0	0	0	745
3:00	13	66	168	313	175	27	1	0	0	0	0	0	0	763
4:00	14	54	188	321	166	14	1	1	0	0	1	0	0	760
5:00	4	41	180	277	195	27	3	0	0	0	1	0	0	728
6:00	1	15	61	182	207	41	4	0	0	0	0	0	0	511
7:00	1	2	16	106	137	61	9	2	0	1	0	0	3	338
8:00	0	0	6	48	106	46	11	1	0	0	0	0	0	218
9:00	0	0	5	17	61	36	8	1	0	0	0	0	1	129
10:00	0	0	0	15	28	24	8	2	0	0	0	0	0	77
11:00	0	0	0	2	15	20	10	0	0	0	0	0	0	47
Total	79	402	1351	2993	2683	845	123	16	1	3	3	3	12	8514

Percentile	15th	50th	85th	95th
Speed	23.5	29.1	34.1	37.2
Mean Speed (Average)	29.1			
10 MPH Pace Speed	25-34			
Number in Pace	5649			
Percent in Pace	66.3%			
Number > 30 MPH	3689			
Percent > 30 MPH	43.3%			

92170001

1/5/2022	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70		
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total	
12:00 AM	0	0	1	2	5	10	0	0	0	0	0	0	0	18	
1:00	0	0	0	2	5	2	1	0	0	0	0	0	0	10	
2:00	0	0	0	1	1	4	3	0	0	0	0	0	0	9	
3:00	0	0	1	0	3	0	0	0	0	0	0	0	0	4	
4:00	0	0	2	3	5	6	2	4	0	0	0	0	0	22	
5:00	1	4	5	5	26	26	8	2	0	0	0	0	1	78	
6:00	0	4	38	36	76	47	13	2	0	0	0	0	0	216	
7:00	1	20	50	116	146	58	2	0	0	0	0	0	1	394	
8:00	8	33	44	163	171	51	3	2	2	1	0	1	2	481	
9:00	1	14	36	145	189	57	6	0	0	0	0	0	0	448	
10:00	18	38	122	173	130	30	3	0	0	0	0	1	0	515	
11:00	5	24	90	256	169	51	4	0	0	1	0	0	0	600	
12:00 PM	18	43	174	251	179	35	2	0	0	0	0	0	0	702	
1:00	5	17	106	313	172	39	6	1	0	0	0	0	0	659	
2:00	8	36	173	286	144	32	4	0	0	0	0	0	0	683	
3:00	6	42	188	279	185	28	1	0	0	0	0	0	0	729	
4:00	33	64	203	278	132	15	2	0	1	0	0	0	0	728	
5:00	2	7	122	319	175	36	1	0	0	1	0	0	0	663	
6:00	0	10	52	183	193	73	1	1	0	0	0	2	0	515	
7:00	0	1	23	109	153	63	7	0	0	0	0	0	0	356	
8:00	1	0	10	59	99	52	7	0	0	0	0	0	0	228	
9:00	0	0	3	24	72	45	12	1	0	0	0	0	0	157	
10:00	0	0	7	16	25	27	2	0	0	0	0	0	0	77	
11:00	0	0	1	14	19	14	2	0	0	0	0	0	0	50	
Total	107	357	1451	3033	2474	801	92	13	3	3	0	4	4	8342	
Percentile				15th	50th	85th	95th								
Speed				23.5	29.1	34.1	36.6								
Mean Speed (Average)				28.7											
10 MPH Pace Speed				25-34											
Number in Pace				5487											
Percent in Pace				65.8%											
Number > 30 MPH				3394											
Percent > 30 MPH				40.7%											
Grand Total	186	759	2802	6026	5157	1646	215	29	4	6	3	7	16	16856	
Stats				Percentile	15th	50th	85th	95th							
Speed				23.5	29.1	34.1	37.2								
Mean Speed (Average)				29.0											
10 MPH Pace Speed				25-34											
Number in Pace				11178											
Percent in Pace				66.0%											
Number > 30 MPH				7159											
Percent > 30 MPH				42.3%											

Location : East Central Street
 Location : West of Lewis Street
 City/State: Franklin, MA
 Direction: Combined

92170001

1/4/2022	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	1	6	20	13	6	0	0	0	0	0	0	46
1:00	0	0	0	1	10	7	2	0	0	0	0	0	0	20
2:00	0	0	0	4	7	7	2	0	0	0	0	0	0	20
3:00	0	0	1	7	10	14	1	0	0	0	0	0	0	33
4:00	0	1	2	2	20	22	1	1	0	0	0	0	0	49
5:00	0	2	5	17	60	62	22	3	0	0	0	1	0	172
6:00	4	17	30	94	187	108	21	3	0	1	0	1	1	467
7:00	0	30	90	266	378	118	11	2	0	0	0	1	1	897
8:00	7	28	110	347	444	118	5	0	0	2	0	0	3	1064
9:00	4	30	94	334	351	121	6	1	2	0	1	0	3	947
10:00	0	13	114	392	432	95	6	1	0	0	0	0	0	1053
11:00	12	47	150	447	396	78	5	1	0	0	0	0	0	1136
12:00 PM	14	53	158	444	486	125	11	1	0	0	0	0	0	1292
1:00	13	54	163	535	434	105	13	2	0	0	0	0	0	1319
2:00	36	69	252	661	339	75	4	0	0	0	0	0	0	1436
3:00	22	87	258	653	388	66	3	0	0	0	0	0	0	1477
4:00	17	67	310	600	354	43	4	1	0	0	1	0	0	1397
5:00	4	48	292	575	349	50	10	0	0	0	1	0	0	1329
6:00	2	15	93	364	393	80	7	0	0	0	0	0	0	954
7:00	1	4	38	194	265	105	13	3	0	1	0	0	3	627
8:00	0	2	12	94	203	76	13	1	0	0	0	0	0	401
9:00	0	3	8	39	128	69	11	2	1	0	0	0	1	262
10:00	0	1	0	23	59	42	9	2	0	0	0	0	0	136
11:00	0	0	0	10	34	27	14	1	0	0	0	0	0	86
Total	136	571	2181	6109	5747	1626	200	25	3	4	3	3	12	16620

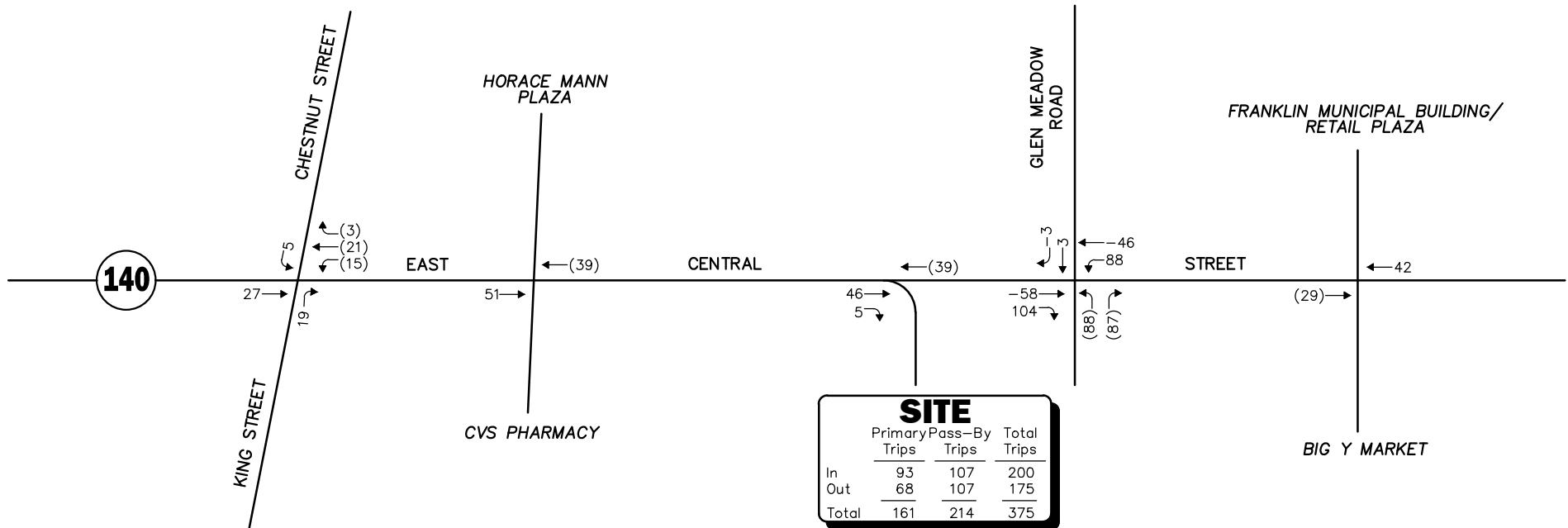
Percentile	15th	50th	85th	95th
Speed	24.8	29.7	34.1	36.6
Mean Speed (Average)	29.4			
10 MPH Pace Speed	25-34			
Number in Pace	11785			
Percent in Pace	70.9%			
Number > 30 MPH	7623			
Percent > 30 MPH	45.9%			

92170001

1/5/2022	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	1	5	8	18	0	0	0	0	0	0	0	32
1:00	0	0	0	4	8	3	2	0	0	0	0	0	0	17
2:00	0	0	0	2	6	8	3	0	0	0	0	0	0	19
3:00	0	0	1	0	10	3	1	0	0	0	0	0	0	15
4:00	1	0	5	5	15	14	4	4	0	0	0	0	0	48
5:00	2	4	7	28	61	56	12	2	0	0	0	0	1	173
6:00	0	4	56	105	196	79	17	2	1	0	0	0	0	460
7:00	1	25	95	342	335	96	6	0	0	0	0	0	1	901
8:00	11	38	115	353	385	89	8	2	2	1	0	1	2	1007
9:00	5	29	91	337	378	91	9	0	0	0	0	0	0	940
10:00	23	46	190	384	314	71	5	0	0	0	0	1	0	1034
11:00	9	37	149	519	383	88	8	0	0	1	0	0	0	1194
12:00 PM	26	73	252	532	379	75	4	0	0	0	0	0	0	1341
1:00	12	31	170	547	366	74	8	1	0	0	0	0	0	1209
2:00	17	61	284	559	323	74	9	0	0	0	0	0	0	1327
3:00	20	77	301	592	366	60	2	0	0	0	0	0	0	1418
4:00	41	76	354	536	272	36	2	0	1	0	0	0	0	1318
5:00	3	12	224	523	371	53	1	0	0	1	0	0	0	1188
6:00	0	12	84	377	375	114	1	1	0	0	0	2	0	966
7:00	2	6	49	216	291	95	11	1	0	0	0	0	0	671
8:00	1	1	14	117	200	66	10	1	0	0	0	0	0	410
9:00	0	0	3	44	125	74	17	1	0	0	0	0	0	264
10:00	0	0	8	32	53	48	4	0	0	0	0	0	0	145
11:00	0	0	2	28	35	25	2	0	0	0	0	0	0	92
Total	174	532	2455	6187	5255	1410	146	15	4	3	0	4	4	16189
			Percentile	15th	50th	85th	95th							
			Speed	24.1	29.1	33.5	36.6							
		Mean Speed (Average)		29.0										
		10 MPH Pace Speed		25-34										
		Number in Pace		11386										
		Percent in Pace		70.3%										
		Number > 30 MPH		6841										
		Percent > 30 MPH		42.3%										
Grand Total	310	1103	4636	12296	11002	3036	346	40	7	7	3	7	16	32809
Stats			Percentile	15th	50th	85th	95th							
			Speed	24.8	29.7	34.1	36.6							
		Mean Speed (Average)		29.2										
		10 MPH Pace Speed		25-34										
		Number in Pace		23261										
		Percent in Pace		70.5%										
		Number > 30 MPH		14603										
		Percent > 30 MPH		44.3%										

BACKGROUND DEVELOPMENT NETWORKS





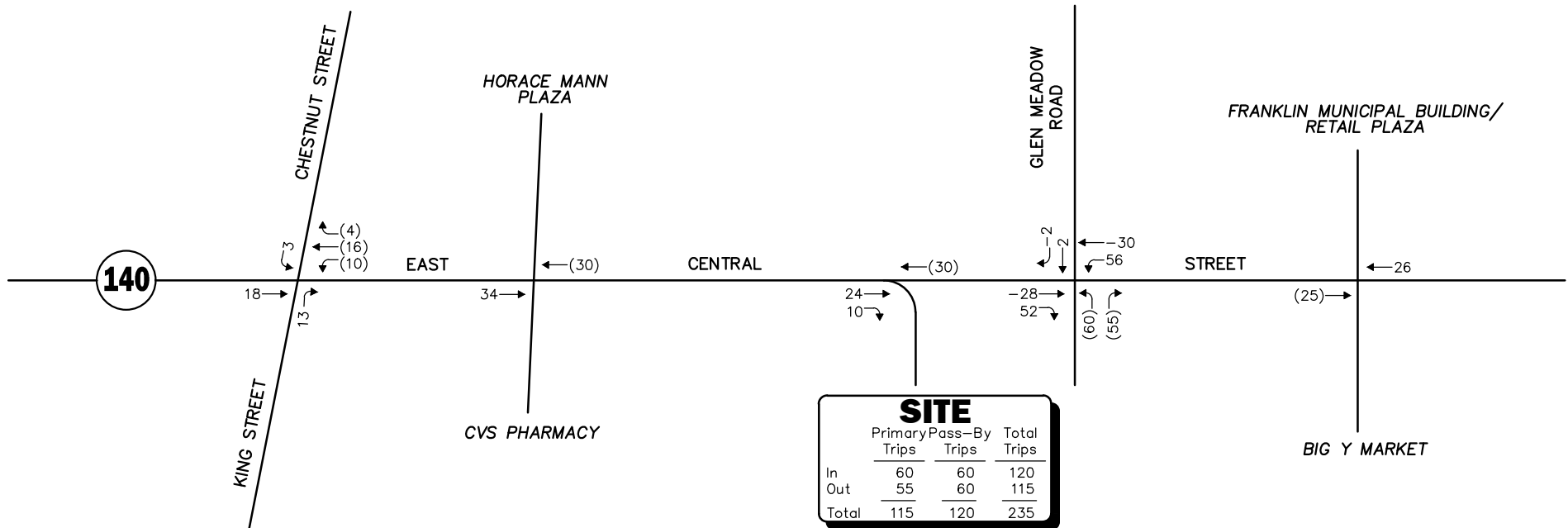
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale



Figure 11

Project-Generated
Weekday Morning
Peak Hour Traffic Volumes



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale



Figure 12

Project-Generated
Weekday Evening
Peak Hour Traffic Volumes

2029 BUILD WITH MITIGATION CAPACITY ANALYSIS WORKSHEETS



2029 Build Weekday Evening Peak Hour w/Mitigation

1: King St/Chestnut St & Route 140

01/18/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	163	475	45	403	488	55	33	302	342	34	336	129
Future Volume (vph)	163	475	45	403	488	55	33	302	342	34	336	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	11	11	11	11	11	11	16	16	16
Storage Length (ft)	100		50	165		50	0		80	0		0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		639			751			457			724	
Travel Time (s)		14.5			17.1			10.4			16.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.91	0.91	0.91	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	4%	1%	1%	0%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	175	559	0	433	584	0	0	368	376	0	616	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	1	4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	11.0	21.0		11.0	21.0		21.0	21.0	11.0	21.0	21.0	
Total Split (s)	22.0	36.0		22.0	36.0		37.0	37.0	22.0	37.0	37.0	
Total Split (%)	18.8%	30.8%		18.8%	30.8%		31.6%	31.6%	18.8%	31.6%	31.6%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Lead/Lag	Lead	Lag		Lead	Lag				Lead			
Lead-Lag Optimize?	Yes	Yes		Yes	Yes				Yes			
Recall Mode	None	None		None	None		None	None	None	None	None	
v/c Ratio	0.56	0.95		1.11	0.83			0.75	0.39		1.11	
Control Delay	21.2	60.0		106.4	40.7			42.0	6.0		103.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	21.2	60.0		106.4	40.7			42.0	6.0		103.6	
Queue Length 50th (ft)	47	318		~240	296			191	33		~409	
Queue Length 95th (ft)	122	#698		#582	#740			#439	126		#691	
Internal Link Dist (ft)		559			671			377			644	
Turn Bay Length (ft)	100			165					80			
Base Capacity (vph)	427	591		391	704			489	972		556	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.41	0.95		1.11	0.83			0.75	0.39		1.11	
Intersection Summary												
Area Type:	Other											
Cycle Length:	117											

Proposed Mixed-Use Development
VAI

Synchro 10 Report
S:\Jobs\9217\Analysis\mb29pm.syn

2029 Build Weekday Evening Peak Hour w/Mitigation
1: King St/Chestnut St & Route 140

01/18/2022

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	22.0
Total Split (%)	19%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

2029 Build Weekday Evening Peak Hour w/Mitigation 1: King St/Chestnut St & Route 140

01/18/2022

Actuated Cycle Length: 99.2

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: King St/Chestnut St & Route 140

 Ø4	 Ø1	 Ø2	 Ø9
37 s	22 s	36 s	22 s
 Ø8	 Ø5	 Ø6	
37 s	22 s	36 s	

2029 Build Weekday Evening Peak Hour w/Mitigation

1: King St/Chestnut St & Route 140

01/18/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	163	475	45	403	488	55	33	302	342	34	336	129
Future Volume (vph)	163	475	45	403	488	55	33	302	342	34	336	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	11	11	11	11	11	16	16	16
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	0.98			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1805	1813		1745	1809			1804	1546		2057	
Flt Permitted	0.16	1.00		0.11	1.00			0.81	1.00		0.79	
Satd. Flow (perm)	300	1813		203	1809			1461	1546		1630	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.91	0.91	0.91	0.81	0.81	0.81
Adj. Flow (vph)	175	511	48	433	525	59	36	332	376	42	415	159
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	125	0	10	0
Lane Group Flow (vph)	175	556	0	433	581	0	0	368	251	0	606	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	4%	1%	1%	0%	1%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	42.0	31.2		53.3	37.5			32.2	49.3		32.2	
Effective Green, g (s)	44.0	32.2		54.3	38.5			33.2	51.3		33.2	
Actuated g/C Ratio	0.43	0.31		0.53	0.37			0.32	0.50		0.32	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	299	565		377	674			470	828		524	
v/s Ratio Prot	0.07	0.31		c0.20	0.32				0.05			
v/s Ratio Perm	0.18			c0.40				0.25	0.11		c0.37	
v/c Ratio	0.59	0.98		1.15	0.86			0.78	0.30		1.16	
Uniform Delay, d1	21.4	35.3		31.2	29.9			31.7	15.4		35.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	2.9	33.6		93.3	11.0			8.3	0.2		90.1	
Delay (s)	24.4	68.9		124.5	40.9			40.0	15.6		125.1	
Level of Service	C	E		F	D			D	B		F	
Approach Delay (s)		58.3			76.5			27.7			125.1	
Approach LOS		E			E			C			F	
Intersection Summary												
HCM 2000 Control Delay			70.1			HCM 2000 Level of Service			E			
HCM 2000 Volume to Capacity ratio			1.15									
Actuated Cycle Length (s)			103.2			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			108.5%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												