



MEMORANDUM

Date: April 4, 2022
To: Tamara Twardowski
Collegeville Borough Manager
From: David Leh, P.E.
cc: Damon Drummond, P.E., PTOE
Kristin Norwood, P.E.
Left Turn Phase Analysis - 2nd Avenue & Freeland Drive
Reference: Collegeville Borough, Montgomery County
G&A Job #22-01063

Per Collegeville Borough's request, we have reviewed the conditions at the intersection of 2nd Avenue and Freeland Drive to determine if an advanced left turn phase is warranted for the southwest approach of 2nd Avenue at the existing signalized intersection. The results of the analysis are summarized below.

Traffic counts were obtained at the intersection on Tuesday, March 8, 2022 during a typical, non-holiday weekday. In order to properly analyze the conditions at the intersection, twelve hours of data were obtained from 7 AM to 7 PM, which included the typical peak roadway hours of 7-9 AM and 4-6 PM. The traffic counts are attached for your reference.

In accordance with PennDOT's *Traffic Signal Design Handbook (Publication 149)* procedures, the volumes were reviewed to determine if the minimum of two (2) left turns were present for each existing signal cycle and if conflict factor thresholds were exceeded for two one-hour periods on a typical day. The conflict factor is determined by multiplying the left turn volume and opposing through volume for each hour analyzed. As noted on the attached conflict factor worksheet, the minimum standard for providing a left turn phase is a conflict factor of 65,000 for an approach with a separate turn lane and two opposing lanes, as is the case at the 2nd Avenue & Freeland Drive location. Neither the minimum turns per cycle nor the conflict factor criterion was met for any of the twelve hours analyzed.

Although traffic volumes are the primary determining factor for a left turn phase, consideration is also given to other factors that may warrant providing a separate left turn phase, such as crash records. Therefore, we reviewed the crash history at the intersection for the most recent five-year period but found only one crash involving a left turning vehicle from 2nd Avenue onto Freeland Drive. Therefore, a left turn phase is also not warranted based on crash data.

In summary, seeing as Freeland Drive provides access to a fully developed residential community that likely will not experience a large increase in traffic, the opposing through volumes would have to increase significantly to meet the established minimum criteria. Although vehicular traffic seems to have mostly returned to pre-pandemic levels, there may still be some residual effects of the work-from-home mandate. Therefore, we suggest a periodic review of the traffic volumes as traffic continues to normalize to determine if the left turn phase criteria is met at a future date.

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Imperial Traffic & Data Collection
www.imperialtdc.com
PO BOX 4637

Cherry Hill, New Jersey, United States 08034
609-706-6100 hfurey@imperialtdc.com

Project: 2nd & Freeland
Municipality: Collegeville, Montgomery County,
PA
Setup: MAK/GP
Location: 40.179816, -75.454607

Count Name: 1. 2nd Avenue & Freeland Drive
Site Code: 1
Start Date: 03/08/2022
Page No: 1

Turning Movement Data

Start Time	2nd Avenue Eastbound						2nd Avenue Westbound						Freeland Drive Northbound						Shooping Ceneter Access Southbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
7:00 AM	0	12	99	5	0	116	0	1	105	8	0	114	0	14	0	5	0	19	0	10	0	9	0	19	268
7:15 AM	0	10	129	2	0	141	0	2	112	8	1	122	0	17	1	11	0	29	0	7	2	15	0	24	316
7:30 AM	0	18	130	2	0	150	0	3	105	9	0	117	0	9	2	12	0	23	0	3	1	14	0	18	308
7:45 AM	0	19	114	5	0	138	0	6	132	11	1	149	0	15	0	2	0	17	1	9	0	13	0	23	327
Hourly Total	0	59	472	14	0	545	0	12	454	36	2	502	0	55	3	30	0	88	1	29	3	51	0	84	1219
8:00 AM	0	13	126	12	0	151	0	5	120	10	0	135	0	11	1	6	0	18	0	8	2	16	0	26	330
8:15 AM	0	19	137	5	0	161	0	3	113	6	2	122	0	15	1	6	0	22	0	10	1	15	2	26	331
8:30 AM	0	19	111	7	0	137	0	6	120	9	2	135	0	10	0	5	0	15	0	6	0	14	2	20	307
8:45 AM	0	15	132	4	0	151	0	5	117	8	0	130	0	17	0	7	0	24	0	7	0	13	0	20	325
Hourly Total	0	66	506	28	0	600	0	19	470	33	4	522	0	53	2	24	0	79	0	31	3	58	4	92	1293
9:00 AM	0	21	95	0	0	116	0	6	116	6	0	128	0	12	0	6	0	18	0	4	0	11	0	15	277
9:15 AM	0	30	105	3	0	138	0	4	99	5	0	108	0	3	1	2	0	6	0	8	0	15	0	23	275
9:30 AM	0	16	104	6	0	126	0	2	95	5	0	102	0	7	0	6	0	13	0	7	2	18	0	27	268
9:45 AM	0	16	94	7	0	117	0	4	109	2	0	115	0	5	0	2	0	7	0	4	0	14	0	18	257
Hourly Total	0	83	398	16	0	497	0	16	419	18	0	453	0	27	1	16	0	44	0	23	2	58	0	83	1077
10:00 AM	0	18	82	6	0	106	0	5	124	4	1	133	0	6	0	2	0	8	0	8	0	15	1	23	270
10:15 AM	0	18	100	6	0	124	0	5	111	2	0	118	0	6	0	1	0	7	0	11	0	13	0	24	273
10:30 AM	0	15	96	6	0	117	0	3	106	2	1	111	0	8	2	3	0	13	0	10	0	20	2	30	271
10:45 AM	0	17	109	7	0	133	0	1	125	8	0	134	0	6	1	2	0	9	0	6	1	12	0	19	295
Hourly Total	0	68	387	25	0	480	0	14	466	16	2	496	0	26	3	8	0	37	0	35	1	60	3	96	1109
11:00 AM	0	17	109	9	0	135	0	5	100	8	0	113	0	9	1	3	0	13	0	11	0	20	0	31	292
11:15 AM	0	15	124	5	0	144	0	3	115	5	0	123	0	2	0	1	0	3	0	14	0	9	0	23	293
11:30 AM	0	6	118	7	0	131	0	5	113	2	0	120	0	12	0	4	0	16	0	19	0	15	0	34	301
11:45 AM	0	15	134	2	0	151	0	0	145	4	1	149	0	6	1	2	0	9	0	9	0	17	0	26	335
Hourly Total	0	53	485	23	0	561	0	13	473	19	1	505	0	29	2	10	0	41	0	53	0	61	0	114	1221
12:00 PM	0	14	120	7	2	141	0	6	127	1	0	134	0	9	1	2	0	12	0	11	0	14	0	25	312
12:15 PM	0	18	126	7	0	151	0	2	134	2	1	138	0	7	0	4	0	11	0	17	1	18	0	36	336
12:30 PM	0	9	123	9	0	141	0	1	144	4	2	149	0	9	0	2	1	11	0	15	0	22	2	37	338
12:45 PM	0	16	133	9	0	158	0	5	142	0	0	147	0	8	0	5	0	13	0	13	0	15	0	28	346
Hourly Total	0	57	502	32	2	591	0	14	547	7	3	568	0	33	1	13	1	47	0	56	1	69	2	126	1332
1:00 PM	0	16	117	7	0	140	0	4	127	5	0	136	0	11	1	2	0	14	0	8	0	20	0	28	318
1:15 PM	0	20	126	5	0	151	0	5	124	4	0	133	0	7	2	5	0	14	0	10	1	8	0	19	317
1:30 PM	0	16	134	4	0	154	0	4	142	2	0	148	0	4	0	3	0	7	0	14	2	13	0	29	338
1:45 PM	0	16	138	7	0	161	0	9	134	2	0	145	0	9	0	2	0	11	0	9	0	19	0	28	345
Hourly Total	0	68	515	23	0	606	0	22	527	13	0	562	0	31	3	12	0	46	0	41	3	60	0	104	1318

2:00 PM	0	13	124	8	0	145	0	1	125	3	0	129	0	3	0	2	0	5	0	11	0	9	0	20	299
2:15 PM	0	20	133	6	0	159	0	4	117	2	0	123	0	8	0	5	0	13	0	15	0	16	0	31	326
2:30 PM	0	27	122	7	0	156	0	3	155	2	0	160	0	7	0	0	0	7	0	11	0	21	0	32	355
2:45 PM	0	12	141	8	0	161	0	9	116	2	0	127	0	5	0	2	0	7	0	10	0	23	0	33	328
Hourly Total	0	72	520	29	0	621	0	17	513	9	0	539	0	23	0	9	0	32	0	47	0	69	0	116	1308
3:00 PM	0	14	153	11	0	178	0	8	128	2	0	138	0	9	0	1	0	10	0	12	1	20	0	33	359
3:15 PM	0	12	186	10	0	208	0	6	148	2	0	156	0	9	1	9	1	19	0	18	3	16	0	37	420
3:30 PM	0	15	159	16	0	190	0	7	164	3	1	174	0	6	0	7	0	13	0	8	1	16	0	25	402
3:45 PM	0	13	166	8	0	187	0	8	130	4	1	142	0	9	1	5	0	15	0	10	1	14	0	25	369
Hourly Total	0	54	664	45	0	763	0	29	570	11	2	610	0	33	2	22	1	57	0	48	6	66	0	120	1550
4:00 PM	0	8	165	10	0	183	0	6	144	3	0	153	0	16	3	4	0	23	0	17	1	20	0	38	397
4:15 PM	0	21	156	14	0	191	0	7	146	3	1	156	0	16	0	3	0	19	0	7	0	15	0	22	388
4:30 PM	0	11	161	14	0	186	0	3	139	5	0	147	0	9	1	4	0	14	0	8	2	18	0	28	375
4:45 PM	0	14	168	15	0	197	0	5	159	2	0	166	0	10	0	3	0	13	0	9	0	15	0	24	400
Hourly Total	0	54	650	53	0	757	0	21	588	13	1	622	0	51	4	14	0	69	0	41	3	68	0	112	1560
5:00 PM	0	25	162	10	0	197	0	6	156	3	0	165	0	8	0	7	0	15	0	13	2	27	0	42	419
5:15 PM	0	15	176	11	0	202	0	5	142	3	1	150	0	5	0	5	0	10	0	14	1	21	0	36	398
5:30 PM	0	15	176	20	0	211	0	13	160	4	0	177	0	7	2	1	0	10	0	7	1	19	0	27	425
5:45 PM	0	32	156	17	0	205	0	11	157	4	0	172	0	9	2	8	0	19	0	9	3	14	0	26	422
Hourly Total	0	87	670	58	0	815	0	35	615	14	1	664	0	29	4	21	0	54	0	43	7	81	0	131	1664
6:00 PM	0	14	160	10	0	184	0	4	164	3	1	171	0	9	1	2	0	12	0	6	0	30	0	36	403
6:15 PM	0	11	136	12	0	159	0	11	149	4	0	164	0	10	0	4	0	14	0	14	0	11	0	25	362
6:30 PM	0	11	113	10	0	134	0	8	119	3	0	130	0	8	1	5	0	14	0	12	1	15	3	28	306
6:45 PM	0	8	107	5	0	120	0	9	104	3	0	116	0	11	0	2	0	13	0	9	1	10	0	20	269
Hourly Total	0	44	516	37	0	597	0	32	536	13	1	581	0	38	2	13	0	53	0	41	2	66	3	109	1340
Grand Total	0	765	6285	383	2	7433	0	244	6178	202	17	6624	0	428	27	192	2	647	1	488	31	767	12	1287	15991
Approach %	0.0	10.3	84.6	5.2	-	-	0.0	3.7	93.3	3.0	-	-	0.0	66.2	4.2	29.7	-	-	0.1	37.9	2.4	59.6	-	-	-
Total %	0.0	4.8	39.3	2.4	-	46.5	0.0	1.5	38.6	1.3	-	41.4	0.0	2.7	0.2	1.2	-	4.0	0.0	3.1	0.2	4.8	-	8.0	-
Lights	0	753	5990	374	-	7117	0	234	5917	202	-	6353	0	414	27	188	-	629	1	478	30	759	-	1268	15367
% Lights	-	98.4	95.3	97.7	-	95.7	-	95.9	95.8	100.0	-	95.9	-	96.7	100.0	97.9	-	97.2	100.0	98.0	96.8	99.0	-	98.5	96.1
Other Vehicles	0	12	295	9	-	316	0	10	261	0	-	271	0	14	0	4	-	18	0	10	1	8	-	19	624
% Other Vehicles	-	1.6	4.7	2.3	-	4.3	-	4.1	4.2	0.0	-	4.1	-	3.3	0.0	2.1	-	2.8	0.0	2.0	3.2	1.0	-	1.5	3.9
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	17	-	-	-	-	-	2	-	-	-	-	-	12	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Left-Turn Conflict

County: Montgomery Job No. 22-01063
 Municipality: Collegetown Borough
 Intersection: 2nd Ave & Freeland Dr/Shopping Center



Count Date: 3/8/2022 AM/PM

AM PEAK HOUR
 Cycle Length = 100
 Cycles Per Hour = 36

OFF PEAK HOUR
 Cycle Length : 80
 Cycles Per Ho 45

PM PEAK HOUR
 Cycle Length = 110
 Cycles Per Hour = 32.727

2nd Avenue

Hour	SB	NB		Total	Lefts per cycle	CF Conflict Factor
	Left	Thru	Right			
7-8 AM	12	472	14	486	0.3	5,832
8-9 AM	19	506	28	534	0.5	10,146
9-10 AM	16	398	16	414	0.4	6,624
10-11 AM	14	387	25	412	0.3	5,768
11-12 PM	13	485	23	508	0.3	6,604
12-1 PM	14	502	32	534	0.3	7,476
1-2 PM	22	515	23	538	0.5	11,836
2-3 PM	17	520	29	549	0.4	9,333
3-4 PM	29	664	45	709	0.6	20,561
4-5 PM	21	650	53	703	0.6	14,763
5-6 PM	35	670	58	728	1.1	25,480
6-7 PM	32	516	37	553	0.7	17,696

Hour	WB	EB		Total	Lefts per cycle	CF Conflict Factor
	Left	Thru	Right			
				0	0.0	0
				0	0.0	0
				0	0.0	0
				0	0.0	0

Approach must meet a minimum 2 vehicles per cycle to be considered for advance left-turn phasing per Pub 149

Criteria: With separate turning lane and two opposing lane (see below), minimum criteria = 65,000 exceeded for two hours

CRITERIA NOT MET

Criteria:

From PennDOT Pub. 149 (Section 3.1):

Minimum Criteria-

1.1 Protected/Permitted Left-turn Phase

A. Without separate turning lanes

- 1 opposing lane; CF = 35,000
- 2 opposing lanes; CF = 45,000

B. With separate turning lane

- 1 opposing lane; CF = 50,000
- 2 opposing lane; CF = 65,000

1.2 Protected/Prohibited Left-turn Phase

(must have a separate turning lane)

- 1 opposing lane; CF = 67,500
- 2 opposing lanes; CF = 90,000

1.1 Protected/Permitted Left-turn Phase

A. Without separate turning lanes

- 1 opposing lane; CF = 35,000
- 2 opposing lanes; CF = 45,000

B. With separate turning lane

- 1 opposing lane; CF = 50,000
- 2 opposing lane; CF = 65,000

1.2 Protected/Prohibited Left-turn Phase

(must have a separate turning lane)

- 1 opposing lane; CF = 67,500
- 2 opposing lanes; CF = 90,000

Date: 3/31/2022

Compiled by: KMN Checked by: _____