

Appendix for Traffic Impact Study

Proposed Coffee Shop with Drive-Through Window

399 Union Street (Route 135)
Ashland, MA

Prepared by
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Taunton, MA 02780
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Prepared for
Salvatore Capital
July 2022
Updated November 2022

APPENDIX A
Traffic Count Data

Transportation Data Corporation

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N: Summer Street
E/W: Union Street/W. Union Street
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571A
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Summer Street From North			Union Street (Route 135) From East			W. Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
06:00 AM	12	3	0	0	31	0	63	27	0	136
06:15 AM	13	6	0	3	47	0	116	32	0	217
06:30 AM	10	1	0	2	48	0	144	33	0	238
06:45 AM	31	5	0	3	67	0	161	42	0	309
Total	66	15	0	8	193	0	484	134	0	900
07:00 AM	27	2	0	7	66	0	155	44	0	301
07:15 AM	24	4	1	6	91	0	136	41	0	303
07:30 AM	45	3	0	8	105	0	140	63	0	364
07:45 AM	52	10	0	4	113	0	139	58	0	376
Total	148	19	1	25	375	0	570	206	0	1344
08:00 AM	35	7	1	2	99	0	149	74	0	367
08:15 AM	36	11	1	7	75	0	130	70	0	330
08:30 AM	40	6	0	5	77	0	158	49	0	335
08:45 AM	39	19	0	8	82	0	117	48	0	313
Total	150	43	2	22	333	0	554	241	0	1345
Grand Total	364	77	3	55	901	0	1608	581	0	3589
Apprch %	82	17.3	0.7	5.8	94.2	0	73.5	26.5	0	
Total %	10.1	2.1	0.1	1.5	25.1	0	44.8	16.2	0	

Start Time	Summer Street From North				Union Street (Route 135) From East				W. Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
07:30 AM	45	3	0	48	8	105	0	113	140	63	0	203	364
07:45 AM	52	10	0	62	4	113	0	117	139	58	0	197	376
08:00 AM	35	7	1	43	2	99	0	101	149	74	0	223	367
08:15 AM	36	11	1	48	7	75	0	82	130	70	0	200	330
Total Volume	168	31	2	201	21	392	0	413	558	265	0	823	1437
% App. Total	83.6	15.4	1		5.1	94.9	0		67.8	32.2	0		
PHF	.808	.705	.500	.810	.656	.867	.000	.882	.936	.895	.000	.923	.955

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:30 AM

Transportation Data Corporation

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Client: McM/L. Young

File Name : 05571A
Site Code : Y2252211
Start Date : 6/1/2022
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Groups Printed- Trucks & Buses

Start Time	Summer Street From North			Union Street (Route 135) From East			W. Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
06:00 AM	0	2	0	0	1	0	0	0	0	3
06:15 AM	0	0	0	0	4	0	0	2	0	6
06:30 AM	1	0	0	0	1	0	2	0	0	4
06:45 AM	1	0	0	0	3	0	2	2	0	8
Total	2	2	0	0	9	0	4	4	0	21
07:00 AM	3	0	0	0	2	0	3	1	0	9
07:15 AM	1	2	0	0	0	0	1	2	0	6
07:30 AM	0	0	0	2	5	0	3	1	0	11
07:45 AM	9	0	0	0	9	0	3	10	0	31
Total	13	2	0	2	16	0	10	14	0	57
08:00 AM	1	0	0	1	2	0	7	6	0	17
08:15 AM	1	2	0	2	3	0	6	2	0	16
08:30 AM	2	1	0	0	3	0	3	1	0	10
08:45 AM	0	0	0	0	2	0	3	1	0	6
Total	4	3	0	3	10	0	19	10	0	49
Grand Total	19	7	0	5	35	0	33	28	0	127
Apprch %	73.1	26.9	0	12.5	87.5	0	54.1	45.9	0	
Total %	15	5.5	0	3.9	27.6	0	26	22	0	

Start Time	Summer Street From North				Union Street (Route 135) From East				W. Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
07:30 AM	0	0	0	0	2	5	0	7	3	1	0	4	11
07:45 AM	9	0	0	9	0	9	0	9	3	10	0	13	31
08:00 AM	1	0	0	1	1	2	0	3	7	6	0	13	17
08:15 AM	1	2	0	3	2	3	0	5	6	2	0	8	16
Total Volume	11	2	0	13	5	19	0	24	19	19	0	38	75
% App. Total	84.6	15.4	0		20.8	79.2	0		50	50	0		
PHF	.306	.250	.000	.361	.625	.528	.000	.667	.679	.475	.000	.731	.605

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:30 AM

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Groups Printed- Bikes by Direction

Start Time	Summer Street From North			Union Street (Route 135) From East			W. Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
06:00 AM	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	0	0	0	0
Total %										

Start Time	Summer Street From North				Union Street (Route 135) From East				W. Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 06:00 AM

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File Name : 05571AA
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Summer Street From North			Union Street (Route 135) From East			W. Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
04:00 PM	53	12	0	7	134	1	106	39	0	352
04:15 PM	48	14	0	11	165	0	109	39	0	386
04:30 PM	56	10	0	7	128	0	121	45	1	368
04:45 PM	56	18	0	10	137	0	123	38	0	382
Total	213	54	0	35	564	1	459	161	1	1488
05:00 PM	73	20	1	12	161	0	117	41	1	426
05:15 PM	91	14	1	6	163	0	128	37	1	441
05:30 PM	54	13	1	10	150	1	119	39	1	388
05:45 PM	65	16	2	12	125	0	106	34	0	360
Total	283	63	5	40	599	1	470	151	3	1615
Grand Total	496	117	5	75	1163	2	929	312	4	3103
Apprch %	80.3	18.9	0.8	6	93.8	0.2	74.6	25.1	0.3	
Total %	16	3.8	0.2	2.4	37.5	0.1	29.9	10.1	0.1	

Start Time	Summer Street From North				Union Street (Route 135) From East				W. Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	56	18	0	74	10	137	0	147	123	38	0	161	382
05:00 PM	73	20	1	94	12	161	0	173	117	41	1	159	426
05:15 PM	91	14	1	106	6	163	0	169	128	37	1	166	441
05:30 PM	54	13	1	68	10	150	1	161	119	39	1	159	388
Total Volume	274	65	3	342	38	611	1	650	487	155	3	645	1637
% App. Total	80.1	19	0.9		5.8	94	0.2		75.5	24	0.5		
PHF	.753	.813	.750	.807	.792	.937	.250	.939	.951	.945	.750	.971	.928

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Groups Printed- Trucks & Buses

Start Time	Summer Street From North			Union Street (Route 135) From East			W. Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
04:00 PM	1	1	0	0	4	0	3	1	0	10
04:15 PM	2	0	0	0	2	0	2	2	0	8
04:30 PM	0	0	0	0	2	0	1	1	0	4
04:45 PM	0	0	0	0	1	0	0	0	0	1
Total	3	1	0	0	9	0	6	4	0	23
05:00 PM	1	0	0	0	1	0	0	0	0	2
05:15 PM	0	0	0	0	1	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	2	1	0	3
05:45 PM	0	0	0	0	2	0	2	0	0	4
Total	1	0	0	0	4	0	4	1	0	10
Grand Total	4	1	0	0	13	0	10	5	0	33
Apprch %	80	20	0	0	100	0	66.7	33.3	0	
Total %	12.1	3	0	0	39.4	0	30.3	15.2	0	

Start Time	Summer Street From North				Union Street (Route 135) From East				W. Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	1	1	0	2	0	4	0	4	3	1	0	4	10
04:15 PM	2	0	0	2	0	2	0	2	2	2	0	4	8
04:30 PM	0	0	0	0	0	2	0	2	1	1	0	2	4
04:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Volume	3	1	0	4	0	9	0	9	6	4	0	10	23
% App. Total	75	25	0		0	100	0		60	40	0		
PHF	.375	.250	.000	.500	.000	.563	.000	.563	.500	.500	.000	.625	.575

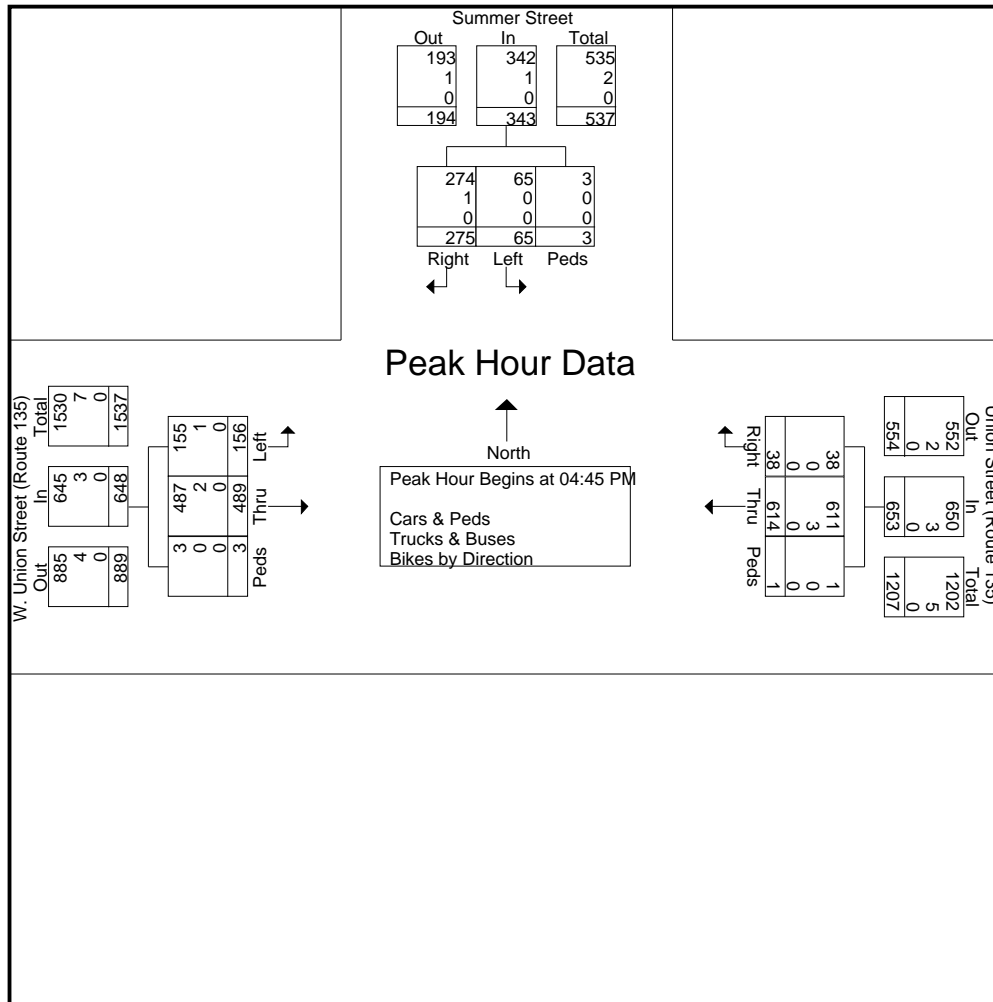
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Start Time	Summer Street From North				Union Street (Route 135) From East				W. Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	56	18	0	74	10	138	0	148	123	38	0	161	383
05:00 PM	74	20	1	95	12	162	0	174	117	41	1	159	428
05:15 PM	91	14	1	106	6	164	0	170	128	37	1	166	442
05:30 PM	54	13	1	68	10	150	1	161	121	40	1	162	391
Total Volume	275	65	3	343	38	614	1	653	489	156	3	648	1644
% App. Total	80.2	19	0.9		5.8	94	0.2		75.5	24.1	0.5		
PHF	.755	.813	.750	.809	.792	.936	.250	.938	.955	.951	.750	.976	.930
Cars & Peds	274	65	3	342	38	611	1	650	487	155	3	645	1637
% Cars & Peds	99.6	100	100	99.7	100	99.5	100	99.5	99.6	99.4	100	99.5	99.6
Trucks & Buses	1	0	0	1	0	3	0	3	2	1	0	3	7
% Trucks & Buses	0.4	0	0	0.3	0	0.5	0	0.5	0.4	0.6	0	0.5	0.4
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0



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N/S: Cherry Street/Summer Street
E: Summer Street
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571B
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Cherry Street From North			Summer Street From East			Summer Street From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
06:00 AM	14	0	0	0	1	0	4	23	0	42
06:15 AM	12	3	0	2	7	0	10	25	0	59
06:30 AM	5	0	0	2	6	0	13	22	0	48
06:45 AM	21	1	0	3	15	0	13	32	0	85
Total	52	4	0	7	29	0	40	102	0	234
07:00 AM	12	2	0	1	17	0	20	31	0	83
07:15 AM	18	0	0	0	10	0	23	24	0	75
07:30 AM	26	1	0	3	22	0	32	39	0	123
07:45 AM	36	1	0	0	26	0	25	37	0	125
Total	92	4	0	4	75	0	100	131	0	406
08:00 AM	24	1	0	1	18	0	41	35	0	120
08:15 AM	26	0	0	1	21	0	47	30	0	125
08:30 AM	16	0	0	3	30	0	31	23	0	103
08:45 AM	28	3	0	2	30	0	28	28	0	119
Total	94	4	0	7	99	0	147	116	0	467
Grand Total	238	12	0	18	203	0	287	349	0	1107
Apprch %	95.2	4.8	0	8.1	91.9	0	45.1	54.9	0	
Total %	21.5	1.1	0	1.6	18.3	0	25.9	31.5	0	

Start Time	Cherry Street From North				Summer Street From East				Summer Street From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	26	1	0	27	3	22	0	25	32	39	0	71	123
07:45 AM	36	1	0	37	0	26	0	26	25	37	0	62	125
08:00 AM	24	1	0	25	1	18	0	19	41	35	0	76	120
08:15 AM	26	0	0	26	1	21	0	22	47	30	0	77	125
Total Volume	112	3	0	115	5	87	0	92	145	141	0	286	493
% App. Total	97.4	2.6	0		5.4	94.6	0		50.7	49.3	0		
PHF	.778	.750	.000	.777	.417	.837	.000	.885	.771	.904	.000	.929	.986

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Groups Printed- Trucks & Buses

Start Time	Cherry Street From North			Summer Street From East			Summer Street From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
06:00 AM	2	0	0	0	0	0	0	0	0	2
06:15 AM	0	0	0	0	0	0	1	1	0	2
06:30 AM	0	0	0	0	1	0	0	0	0	1
06:45 AM	0	0	0	0	1	0	1	1	0	3
Total	2	0	0	0	2	0	2	2	0	8
07:00 AM	1	0	0	0	2	0	1	0	0	4
07:15 AM	3	0	0	0	0	0	0	2	0	5
07:30 AM	0	0	0	0	0	0	1	2	0	3
07:45 AM	6	0	0	0	3	0	6	4	0	19
Total	10	0	0	0	5	0	8	8	0	31
08:00 AM	1	0	0	0	0	0	2	5	0	8
08:15 AM	2	0	0	0	1	0	1	3	0	7
08:30 AM	3	0	0	0	0	0	1	0	0	4
08:45 AM	0	0	0	0	0	0	0	1	0	1
Total	6	0	0	0	1	0	4	9	0	20
Grand Total	18	0	0	0	8	0	14	19	0	59
Apprch %	100	0	0	0	100	0	42.4	57.6	0	
Total %	30.5	0	0	0	13.6	0	23.7	32.2	0	

Start Time	Cherry Street From North				Summer Street From East				Summer Street From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
07:45 AM	6	0	0	6	0	3	0	3	6	4	0	10	19
08:00 AM	1	0	0	1	0	0	0	0	2	5	0	7	8
08:15 AM	2	0	0	2	0	1	0	1	1	3	0	4	7
08:30 AM	3	0	0	3	0	0	0	0	1	0	0	1	4
Total Volume	12	0	0	12	0	4	0	4	10	12	0	22	38
% App. Total	100	0	0		0	100	0		45.5	54.5	0		
PHF	.500	.000	.000	.500	.000	.333	.000	.333	.417	.600	.000	.550	.500

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:45 AM

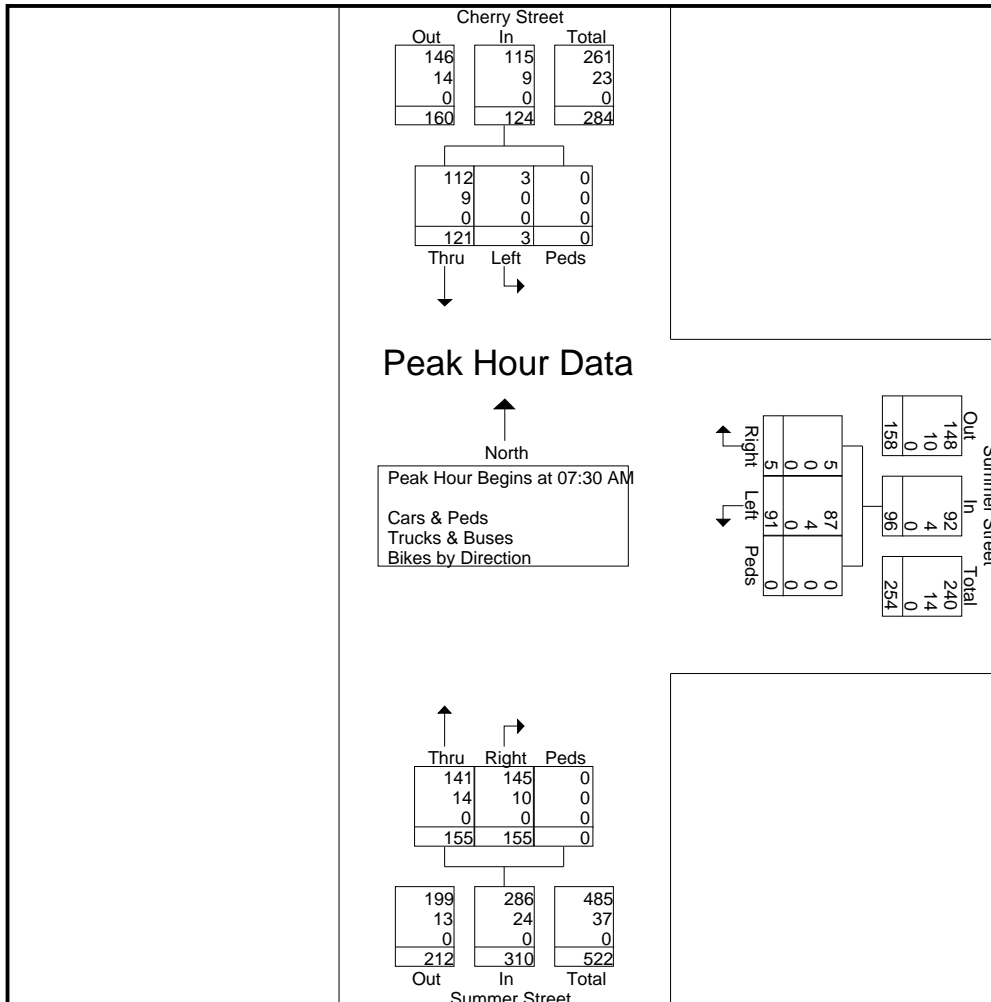
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	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	26	1	0	27	3	22	0	25	33	41	0	74	126
07:45 AM	42	1	0	43	0	29	0	29	31	41	0	72	144
08:00 AM	25	1	0	26	1	18	0	19	43	40	0	83	128
08:15 AM	28	0	0	28	1	22	0	23	48	33	0	81	132
Total Volume	121	3	0	124	5	91	0	96	155	155	0	310	530
% App. Total	97.6	2.4	0		5.2	94.8	0		50	50	0		
PHF	.720	.750	.000	.721	.417	.784	.000	.828	.807	.945	.000	.934	.920
Cars & Peds	112	3	0	115	5	87	0	92	145	141	0	286	493
% Cars & Peds	92.6	100	0	92.7	100	95.6	0	95.8	93.5	91.0	0	92.3	93.0
Trucks & Buses	9	0	0	9	0	4	0	4	10	14	0	24	37
% Trucks & Buses	7.4	0	0	7.3	0	4.4	0	4.2	6.5	9.0	0	7.7	7.0
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0



Transportation Data Corporation

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N/S: Cherry Street/Summer Street
E: Summer Street
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571BB
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Cherry Street From North			Summer Street From East			Summer Street From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
04:00 PM	26	2	0	4	39	0	23	23	0	117
04:15 PM	31	1	0	11	31	0	19	31	0	124
04:30 PM	31	4	0	3	35	0	21	31	0	125
04:45 PM	34	4	0	4	40	0	16	32	0	130
Total	122	11	0	22	145	0	79	117	0	496
05:00 PM	51	1	0	3	42	0	25	28	0	150
05:15 PM	48	4	0	1	57	0	22	21	0	153
05:30 PM	30	4	0	5	37	0	23	26	0	125
05:45 PM	36	4	0	8	45	0	22	24	0	139
Total	165	13	0	17	181	0	92	99	0	567
Grand Total	287	24	0	39	326	0	171	216	0	1063
Apprch %	92.3	7.7	0	10.7	89.3	0	44.2	55.8	0	
Total %	27	2.3	0	3.7	30.7	0	16.1	20.3	0	

Start Time	Cherry Street From North				Summer Street From East				Summer Street From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	51	1	0	52	3	42	0	45	25	28	0	53	150
05:15 PM	48	4	0	52	1	57	0	58	22	21	0	43	153
05:30 PM	30	4	0	34	5	37	0	42	23	26	0	49	125
05:45 PM	36	4	0	40	8	45	0	53	22	24	0	46	139
Total Volume	165	13	0	178	17	181	0	198	92	99	0	191	567
% App. Total	92.7	7.3	0		8.6	91.4	0		48.2	51.8	0		
PHF	.809	.813	.000	.856	.531	.794	.000	.853	.920	.884	.000	.901	.926

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N/S: Cherry Street/Summer Street
E: Summer Street
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571BB
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Trucks & Buses

Start Time	Cherry Street From North			Summer Street From East			Summer Street From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
04:00 PM	1	0	0	0	1	0	1	0	0	3
04:15 PM	1	0	0	0	1	0	1	1	0	4
04:30 PM	0	0	0	0	0	0	0	1	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	2	0	2	2	0	8
05:00 PM	1	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	1	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	0	1	0	0	2
Grand Total	3	0	0	0	2	0	3	2	0	10
Apprch %	100	0	0	0	100	0	60	40	0	
Total %	30	0	0	0	20	0	30	20	0	

Start Time	Cherry Street From North				Summer Street From East				Summer Street From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	1	0	0	1	0	1	0	1	1	0	0	1	3
04:15 PM	1	0	0	1	0	1	0	1	1	1	0	2	4
04:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	2	0	0	2	0	2	0	2	2	2	0	4	8
% App. Total	100	0	0		0	100	0		50	50	0		
PHF	.500	.000	.000	.500	.000	.500	.000	.500	.500	.500	.000	.500	.500

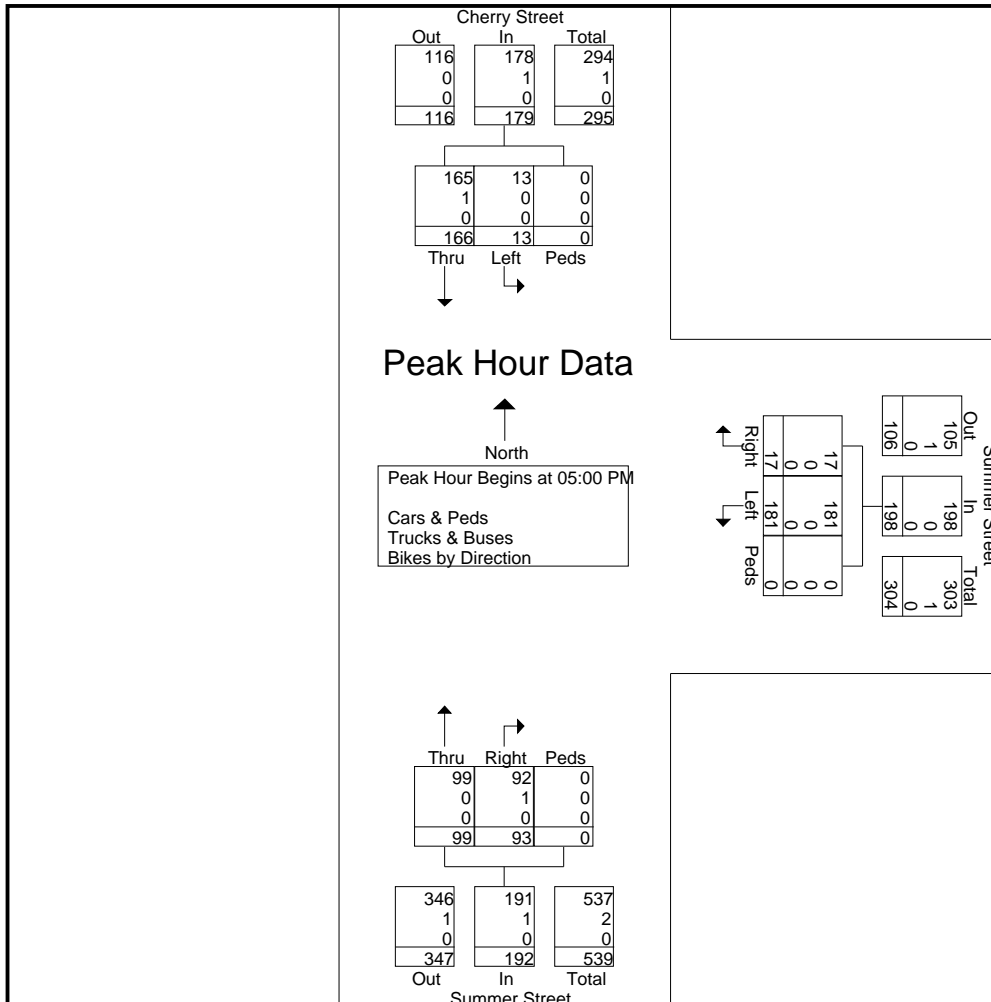
Transportation Data Corporation

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N/S: Cherry Street/Summer Street
E: Summer Street
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571BB
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Start Time	Cherry Street From North				Summer Street From East				Summer Street From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	52	1	0	53	3	42	0	45	25	28	0	53	151
05:15 PM	48	4	0	52	1	57	0	58	22	21	0	43	153
05:30 PM	30	4	0	34	5	37	0	42	24	26	0	50	126
05:45 PM	36	4	0	40	8	45	0	53	22	24	0	46	139
Total Volume	166	13	0	179	17	181	0	198	93	99	0	192	569
% App. Total	92.7	7.3	0		8.6	91.4	0		48.4	51.6	0		
PHF	.798	.813	.000	.844	.531	.794	.000	.853	.930	.884	.000	.906	.930
Cars & Peds	165	13	0	178	17	181	0	198	92	99	0	191	567
% Cars & Peds	99.4	100	0	99.4	100	100	0	100	98.9	100	0	99.5	99.6
Trucks & Buses	1	0	0	1	0	0	0	0	1	0	0	1	2
% Trucks & Buses	0.6	0	0	0.6	0	0	0	0	1.1	0	0	0.5	0.4
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0



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N/S: Walgreens Westerly Dr./Plaza Dr.
 E/W: Union Street (Route 135)
 City, State: Ashland, MA
 Client: McM/L. Young

File Name : 05571C
 Site Code : Y2252211
 Start Date : 6/1/2022
 Page No : 1

Groups Printed- Cars & Peds

Start Time	Walgreens Westerly Driveway From North				Union Street (Route 135) From East				Ashland Square (CVS Plaza Driveway) From South				Union Street (Route 135) From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
06:00 AM	0	0	0	0	0	0	2	0	1	0	1	0	1	0	0	0	5
06:15 AM	0	0	0	0	0	0	2	0	3	0	2	0	6	0	0	0	13
06:30 AM	0	0	0	0	0	0	4	0	2	0	1	0	2	0	0	0	9
06:45 AM	0	0	0	0	0	0	3	0	1	0	1	0	2	0	0	0	7
Total	0	0	0	0	0	0	11	0	7	0	5	0	11	0	0	0	34
07:00 AM	0	0	0	0	0	0	4	0	4	0	2	0	5	0	0	0	15
07:15 AM	0	0	0	0	0	0	3	0	4	0	2	0	4	0	0	0	13
07:30 AM	0	0	0	0	0	0	2	0	4	0	1	0	3	0	0	0	10
07:45 AM	0	0	0	0	0	0	10	0	8	0	7	0	13	0	0	0	38
Total	0	0	0	0	0	0	19	0	20	0	12	0	25	0	0	0	76
08:00 AM	0	0	0	0	0	0	8	0	5	0	4	0	7	0	0	0	24
08:15 AM	0	0	0	0	0	0	8	0	8	0	4	0	13	0	0	0	33
08:30 AM	1	0	0	0	0	0	7	0	13	0	8	0	9	0	0	0	38
08:45 AM	0	0	0	0	0	0	9	0	11	0	9	0	16	0	0	0	45
Total	1	0	0	0	0	0	32	0	37	0	25	0	45	0	0	0	140
Grand Total	1	0	0	0	0	0	62	0	64	0	42	0	81	0	0	0	250
Apprch %	100	0	0	0	0	0	100	0	60.4	0	39.6	0	100	0	0	0	
Total %	0.4	0	0	0	0	0	24.8	0	25.6	0	16.8	0	32.4	0	0	0	

Start Time	Walgreens Westerly Driveway From North				Union Street (Route 135) From East				Ashland Square (CVS Plaza Driveway) From South				Union Street (Route 135) From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
08:00 AM	0	0	0	0	0	0	8	0	5	0	4	0	7	0	0	0	24
08:15 AM	0	0	0	0	0	0	8	0	8	0	4	0	13	0	0	0	33
08:30 AM	1	0	0	0	0	0	7	0	13	0	8	0	9	0	0	0	38
08:45 AM	0	0	0	0	0	0	9	0	11	0	9	0	16	0	0	0	45
Total Volume	1	0	0	0	0	0	32	0	37	0	25	0	45	0	0	0	140
% App. Total	100	0	0	0	0	0	100	0	59.7	0	40.3	0	100	0	0	0	
PHF	.250	.000	.000	.250	.000	.000	.889	.000	.712	.000	.694	.000	.738	.703	.000	.000	.778

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM

Transportation Data Corporation

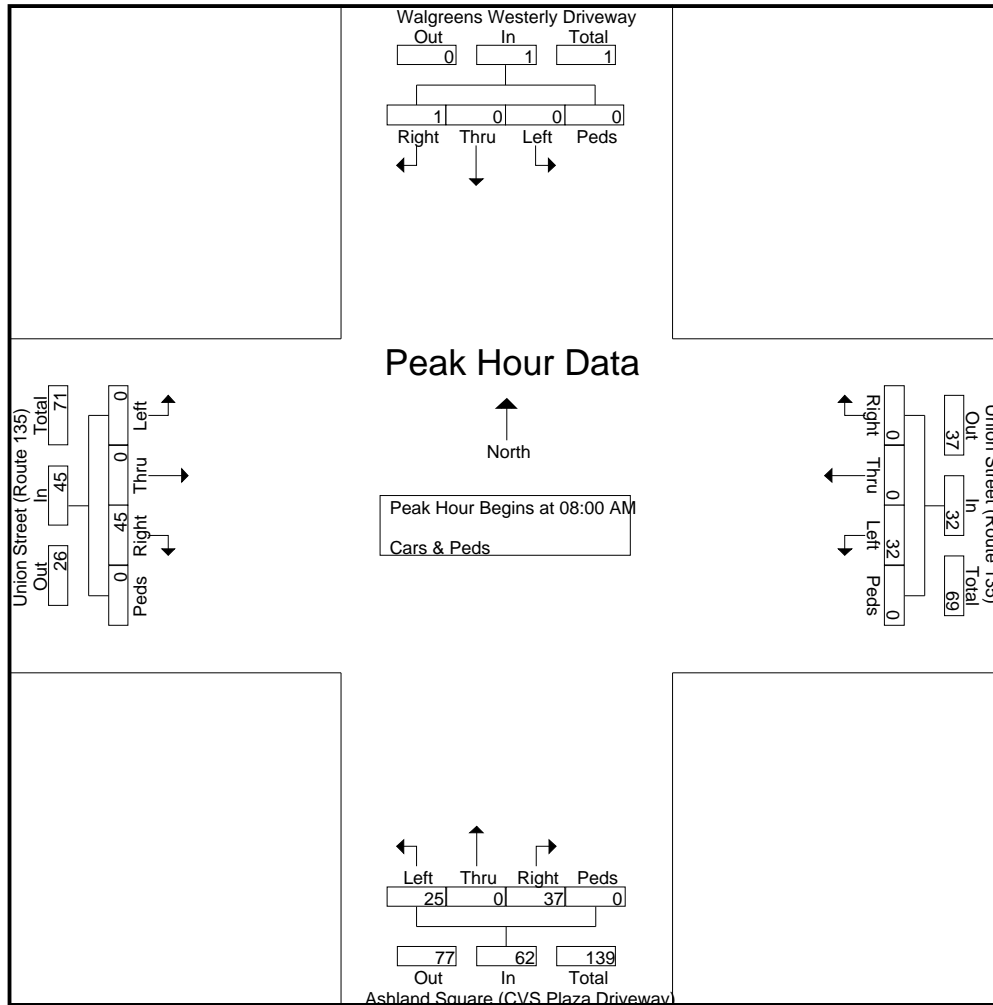
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N/S: Walgreens Westerly Dr./Plaza Dr.
 E/W: Union Street (Route 135)
 City, State: Ashland, MA
 Client: McM/L. Young

File Name : 05571C
 Site Code : Y2252211
 Start Date : 6/1/2022
 Page No : 1

Start Time	Walgreens Westerly Driveway From North					Union Street (Route 135) From East					Ashland Square (CVS Plaza Driveway) From South					Union Street (Route 135) From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	0	0	8	0	8	5	0	4	0	9	7	0	0	0	7	24
08:15 AM	0	0	0	0	0	0	0	8	0	8	8	0	4	0	12	13	0	0	0	13	33
08:30 AM	1	0	0	0	1	0	0	7	0	7	13	0	8	0	21	9	0	0	0	9	38
08:45 AM	0	0	0	0	0	0	0	9	0	9	11	0	9	0	20	16	0	0	0	16	45
Total Volume	1	0	0	0	1	0	0	32	0	32	37	0	25	0	62	45	0	0	0	45	140
% App. Total	100	0	0	0		0	0	100	0		59.7	0	40.3	0		100	0	0	0		
PHF	.250	.000	.000	.000	.250	.000	.000	.889	.000	.889	.712	.000	.694	.000	.738	.703	.000	.000	.000	.703	.778



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N/S: Walgreens Westerly Dr./Plaza Dr.
 E/W: Union Street (Route 135)
 City, State: Ashland, MA
 Client: McM/L. Young

File Name : 05571CC
 Site Code : Y2252211
 Start Date : 6/1/2022
 Page No : 1

Groups Printed- Cars & Peds

Start Time	Walgreens Westerly Driveway From North				Union Street (Route 135) From East				Ashland Square (CVS Plaza Driveway) From South				Union Street (Route 135) From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	3	0	2	0	0	0	19	0	20	0	23	0	16	0	1	0	84
04:15 PM	3	0	0	0	0	0	16	0	24	0	14	0	26	0	1	0	84
04:30 PM	4	0	1	0	0	0	11	0	21	0	8	0	12	0	0	0	57
04:45 PM	1	0	3	0	0	0	21	0	26	0	17	0	21	0	0	0	89
Total	11	0	6	0	0	0	67	0	91	0	62	0	75	0	2	0	314
05:00 PM	2	0	0	0	0	0	8	0	17	0	23	0	19	0	0	0	69
05:15 PM	3	0	0	0	2	0	18	0	22	0	17	0	26	0	0	0	88
05:30 PM	2	0	1	0	0	0	11	0	16	0	13	0	17	0	0	0	60
05:45 PM	1	0	1	0	0	0	11	0	17	0	15	0	18	0	0	0	63
Total	8	0	2	0	2	0	48	0	72	0	68	0	80	0	0	0	280
Grand Total	19	0	8	0	2	0	115	0	163	0	130	0	155	0	2	0	594
Apprch %	70.4	0	29.6	0	1.7	0	98.3	0	55.6	0	44.4	0	98.7	0	1.3	0	
Total %	3.2	0	1.3	0	0.3	0	19.4	0	27.4	0	21.9	0	26.1	0	0.3	0	

Start Time	Walgreens Westerly Driveway From North				Union Street (Route 135) From East				Ashland Square (CVS Plaza Driveway) From South				Union Street (Route 135) From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	3	0	2	0	0	0	19	0	20	0	23	0	16	0	1	0	84
04:15 PM	3	0	0	0	0	0	16	0	24	0	14	0	26	0	1	0	84
04:30 PM	4	0	1	0	0	0	11	0	21	0	8	0	12	0	0	0	57
04:45 PM	1	0	3	0	0	0	21	0	26	0	17	0	21	0	0	0	89
Total Volume	11	0	6	0	0	0	67	0	91	0	62	0	75	0	2	0	314
% App. Total	64.7	0	35.3	0	0	0	100	0	59.5	0	40.5	0	97.4	0	2.6	0	
PHF	.688	.000	.500	.000	.000	.000	.798	.000	.875	.000	.674	.000	.721	.000	.500	.000	.882

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:00 PM

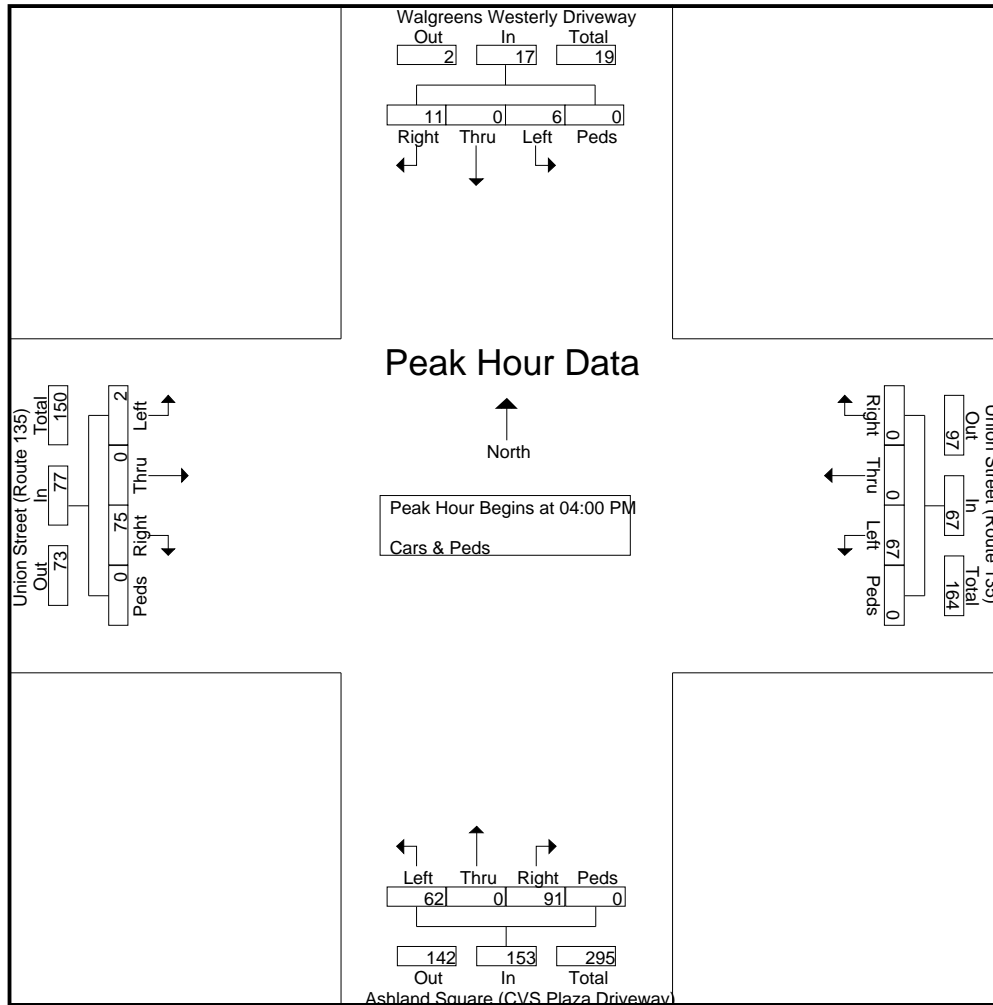
Transportation Data Corporation

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N/S: Walgreens Westerly Dr./Plaza Dr.
E/W: Union Street (Route 135)
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571CC
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Start Time	Walgreens Westerly Driveway From North					Union Street (Route 135) From East					Ashland Square (CVS Plaza Driveway) From South					Union Street (Route 135) From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	3	0	2	0	5	0	0	19	0	19	20	0	23	0	43	16	0	1	0	17	84
04:15 PM	3	0	0	0	3	0	0	16	0	16	24	0	14	0	38	26	0	1	0	27	84
04:30 PM	4	0	1	0	5	0	0	11	0	11	21	0	8	0	29	12	0	0	0	12	57
04:45 PM	1	0	3	0	4	0	0	21	0	21	26	0	17	0	43	21	0	0	0	21	89
Total Volume	11	0	6	0	17	0	0	67	0	67	91	0	62	0	153	75	0	2	0	77	314
% App. Total	64.7	0	35.3	0		0	0	100	0		59.5	0	40.5	0		97.4	0	2.6	0		
PHF	.688	.000	.500	.000	.850	.000	.000	.798	.000	.798	.875	.000	.674	.000	.890	.721	.000	.500	.000	.713	.882



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N: Walgreens Easterly Driveway
E/W: Union Street (Route 135)
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571D
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Walgreens Easterly Driveway From North			Union Street (Route 135) From East			Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
06:00 AM	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	1	0	1
08:30 AM	0	1	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	3	0	0	0	0	0	3
Total	0	1	0	3	0	0	0	1	0	5
Grand Total	0	1	0	3	0	0	0	1	0	5
Apprch %	0	100	0	100	0	0	0	100	0	
Total %	0	20	0	60	0	0	0	20	0	

Start Time	Walgreens Easterly Driveway From North				Union Street (Route 135) From East				Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	0	3	0	0	3	0	0	0	0	3
Total Volume	0	1	0	1	3	0	0	3	0	1	0	1	5
% App. Total	0	100	0		100	0	0		0	100	0		
PHF	.000	.250	.000	.250	.250	.000	.000	.250	.000	.250	.000	.250	.417

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM

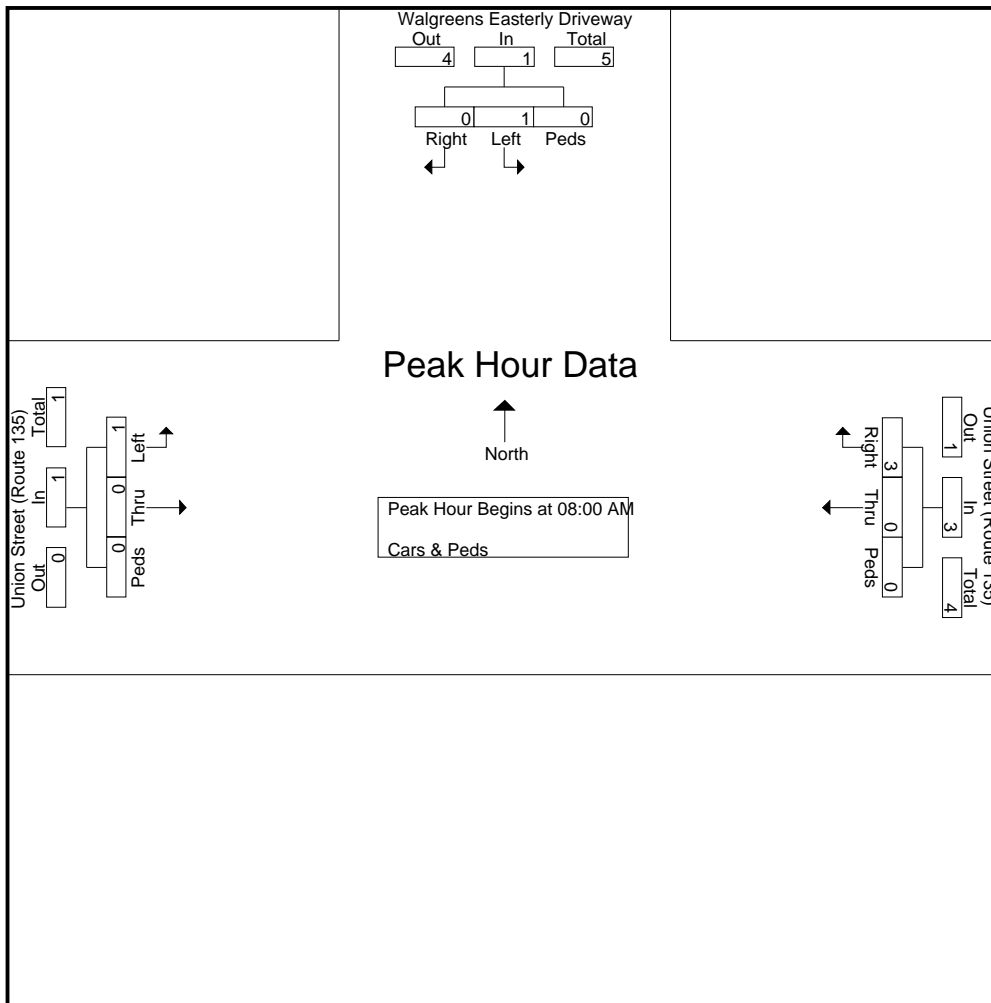
Transportation Data Corporation

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N: Walgreens Easterly Driveway
E/W: Union Street (Route 135)
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571D
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Start Time	Walgreens Easterly Driveway From North				Union Street (Route 135) From East				Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	0	3	0	0	3	0	0	0	0	3
Total Volume	0	1	0	1	3	0	0	3	0	1	0	1	5
% App. Total	0	100	0		100	0	0		0	100	0		
PHF	.000	.250	.000	.250	.250	.000	.000	.250	.000	.250	.000	.250	.417



Transportation Data Corporation

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N: Walgreens Easterly Driveway
E/W: Union Street (Route 135)
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571DD
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Walgreens Easterly Driveway From North			Union Street (Route 135) From East			Union Street (Route 135) From West			Int. Total
	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	
04:00 PM	0	0	0	5	0	0	0	0	0	5
04:15 PM	0	0	0	2	0	0	0	0	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	3	0	0	0	4	0	7
Total	0	0	0	10	0	0	0	4	0	14
05:00 PM	0	1	0	1	0	0	0	0	0	2
05:15 PM	0	0	0	3	0	0	0	1	0	4
05:30 PM	0	0	0	3	0	0	0	0	0	3
05:45 PM	1	0	0	2	0	0	0	2	0	5
Total	1	1	0	9	0	0	0	3	0	14
Grand Total	1	1	0	19	0	0	0	7	0	28
Apprch %	50	50	0	100	0	0	0	100	0	
Total %	3.6	3.6	0	67.9	0	0	0	25	0	

Start Time	Walgreens Easterly Driveway From North				Union Street (Route 135) From East				Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	0	0	0	0	3	0	0	3	0	4	0	4	7
05:00 PM	0	1	0	1	1	0	0	1	0	0	0	0	2
05:15 PM	0	0	0	0	3	0	0	3	0	1	0	1	4
05:30 PM	0	0	0	0	3	0	0	3	0	0	0	0	3
Total Volume	0	1	0	1	10	0	0	10	0	5	0	5	16
% App. Total	0	100	0		100	0	0		0	100	0		
PHF	.000	.250	.000	.250	.833	.000	.000	.833	.000	.313	.000	.313	.571

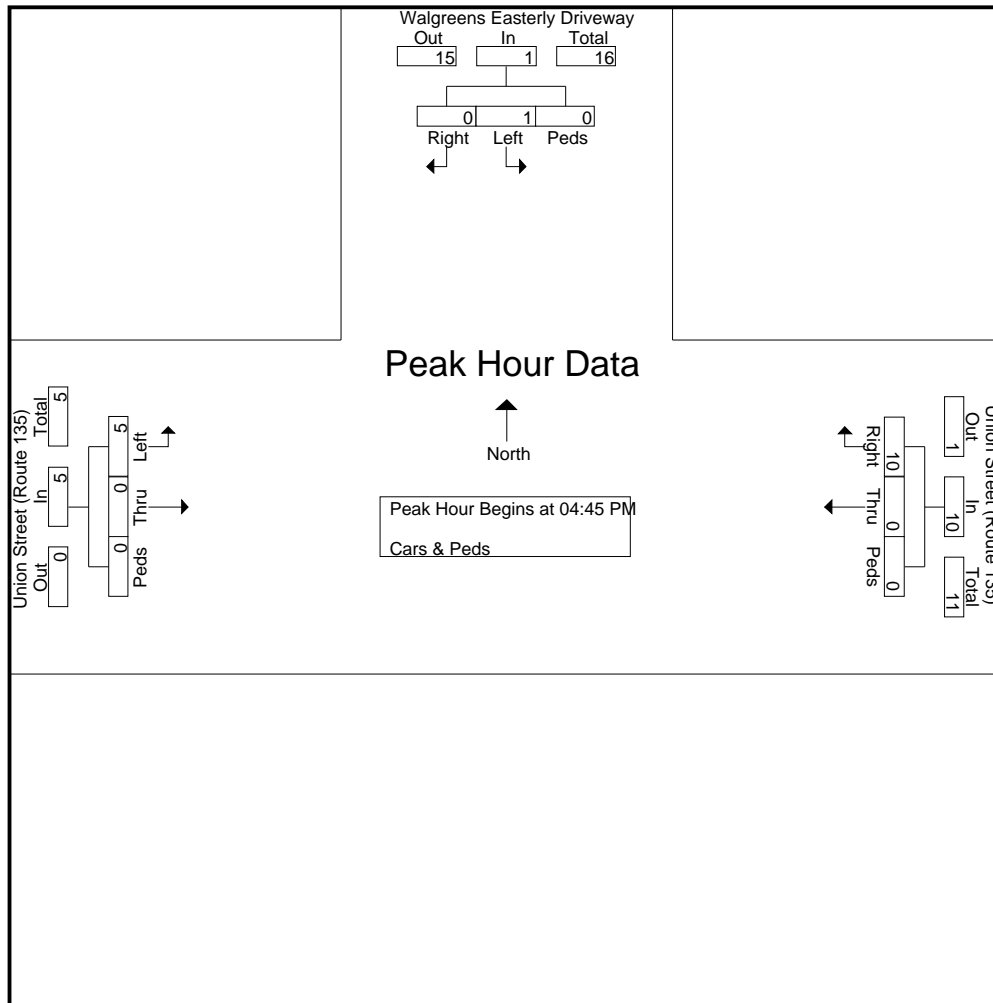
Transportation Data Corporation

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N: Walgreens Easterly Driveway
E/W: Union Street (Route 135)
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571DD
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Start Time	Walgreens Easterly Driveway From North				Union Street (Route 135) From East				Union Street (Route 135) From West				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	0	0	0	0	3	0	0	3	0	4	0	4	7
05:00 PM	0	1	0	1	1	0	0	1	0	0	0	0	2
05:15 PM	0	0	0	0	3	0	0	3	0	1	0	1	4
05:30 PM	0	0	0	0	3	0	0	3	0	0	0	0	3
Total Volume	0	1	0	1	10	0	0	10	0	5	0	5	16
% App. Total	0	100	0		100	0	0		0	100	0		
PHF	.000	.250	.000	.250	.833	.000	.000	.833	.000	.313	.000	.313	.571



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S: Walgreens Driveway
 E/W: Summer Street
 City, State: Ashland, MA
 Client: McM/L. Young

File Name : 05571E
 Site Code : Y2252211
 Start Date : 6/1/2022
 Page No : 1

Groups Printed- Cars & Peds

Start Time	Summer Street From East			Walgreens Driveway From South			Summer Street From West			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
06:00 AM	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	1	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	1
08:00 AM	0	1	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	2	1	0	1	0	0	4
08:30 AM	0	0	0	0	0	0	1	0	0	1
08:45 AM	0	2	0	1	2	0	3	0	0	8
Total	0	3	0	3	3	0	5	0	0	14
Grand Total	0	4	0	3	3	0	5	0	0	15
Apprch %	0	100	0	50	50	0	100	0	0	
Total %	0	26.7	0	20	20	0	33.3	0	0	

Start Time	Summer Street From East				Walgreens Driveway From South				Summer Street From West				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
08:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	2	1	0	3	1	0	0	1	4
08:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
08:45 AM	0	2	0	2	1	2	0	3	3	0	0	3	8
Total Volume	0	3	0	3	3	3	0	6	5	0	0	5	14
% App. Total	0	100	0		50	50	0		100	0	0		
PHF	.000	.375	.000	.375	.375	.375	.000	.500	.417	.000	.000	.417	.438

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM

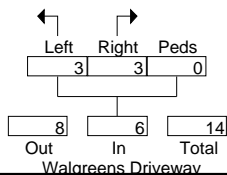
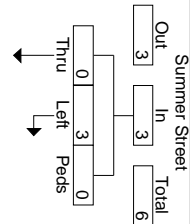
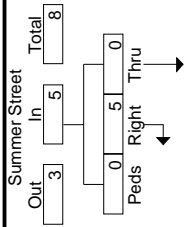
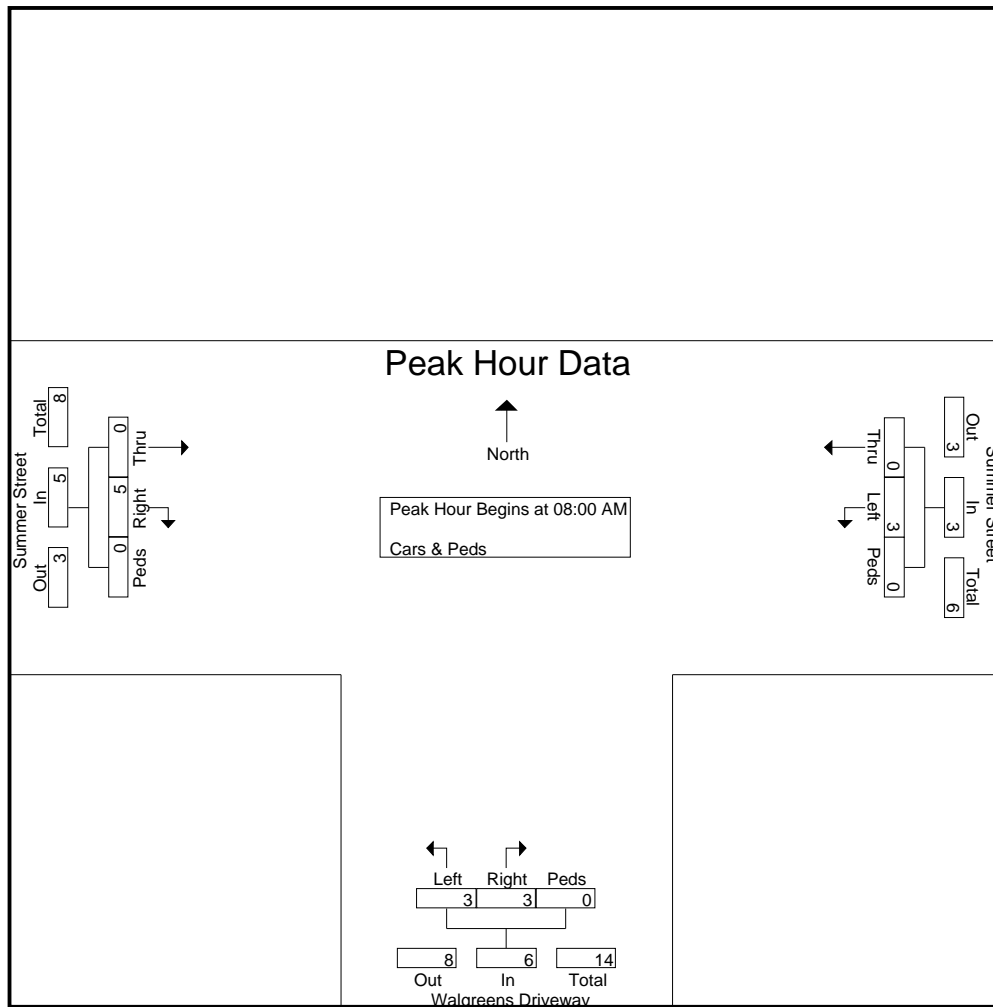
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S: Walgreens Driveway
E/W: Summer Street
City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571E
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Start Time	Summer Street From East				Walgreens Driveway From South				Summer Street From West				Int. Total	
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total		
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 08:00 AM														
08:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	2	1	0	3	1	0	0	1	1	4
08:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1	1
08:45 AM	0	2	0	2	1	2	0	3	3	0	0	3	3	8
Total Volume	0	3	0	3	3	3	0	6	5	0	0	5	5	14
% App. Total	0	100	0		50	50	0		100	0	0			
PHF	.000	.375	.000	.375	.375	.375	.000	.500	.417	.000	.000	.417		.438



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Client: McM/L. Young

File Name : 05571EE
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Groups Printed- Cars & Peds

Start Time	Summer Street From East			Walgreens Driveway From South			Summer Street From West			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
04:00 PM	0	4	0	5	3	0	6	0	0	18
04:15 PM	0	1	0	3	4	0	2	0	0	10
04:30 PM	0	1	0	2	2	0	3	0	0	8
04:45 PM	0	3	0	2	2	0	4	0	0	11
Total	0	9	0	12	11	0	15	0	0	47
05:00 PM	0	0	0	6	3	0	4	0	0	13
05:15 PM	0	0	0	2	2	0	2	0	0	6
05:30 PM	0	1	0	1	1	0	5	0	0	8
05:45 PM	0	1	0	2	4	0	2	0	0	9
Total	0	2	0	11	10	0	13	0	0	36
Grand Total	0	11	0	23	21	0	28	0	0	83
Aprch %	0	100	0	52.3	47.7	0	100	0	0	
Total %	0	13.3	0	27.7	25.3	0	33.7	0	0	

Start Time	Summer Street From East				Walgreens Driveway From South				Summer Street From West				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	4	0	4	5	3	0	8	6	0	0	6	18
04:15 PM	0	1	0	1	3	4	0	7	2	0	0	2	10
04:30 PM	0	1	0	1	2	2	0	4	3	0	0	3	8
04:45 PM	0	3	0	3	2	2	0	4	4	0	0	4	11
Total Volume	0	9	0	9	12	11	0	23	15	0	0	15	47
% App. Total	0	100	0		52.2	47.8	0		100	0	0		
PHF	.000	.563	.000	.563	.600	.688	.000	.719	.625	.000	.000	.625	.653

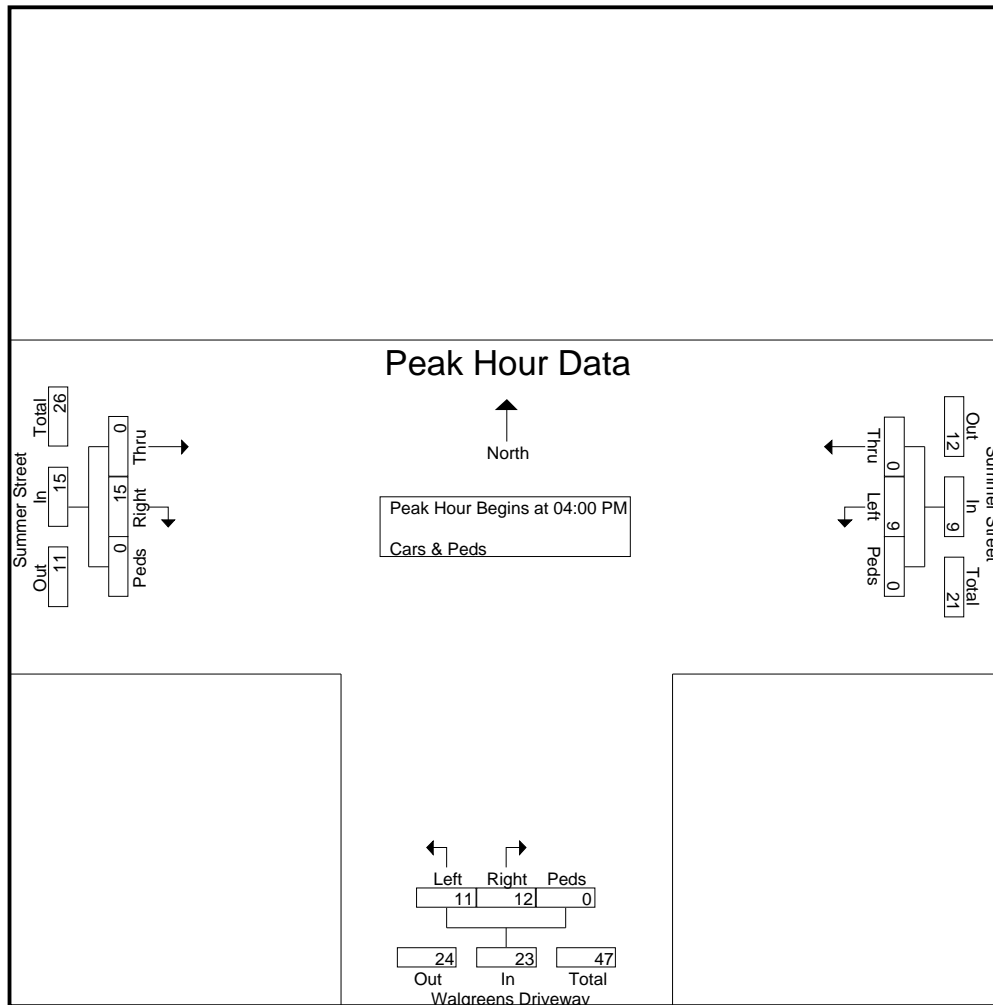
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S: Walgreens Driveway
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City, State: Ashland, MA
Client: McM/L. Young

File Name : 05571EE
Site Code : Y2252211
Start Date : 6/1/2022
Page No : 1

Start Time	Summer Street From East				Walgreens Driveway From South				Summer Street From West				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	4	0	4	5	3	0	8	6	0	0	6	18
04:15 PM	0	1	0	1	3	4	0	7	2	0	0	2	10
04:30 PM	0	1	0	1	2	2	0	4	3	0	0	3	8
04:45 PM	0	3	0	3	2	2	0	4	4	0	0	4	11
Total Volume	0	9	0	9	12	11	0	23	15	0	0	15	47
% App. Total	0	100	0		52.2	47.8	0		100	0	0		
PHF	.000	.563	.000	.563	.600	.688	.000	.719	.625	.000	.000	.625	.653



APPENDIX B
Crash Summary

CRASH SUMMARY

**Proposed Coffee Shop with Drive-Through Window
399 Union Street (Route 135), Ashland, MA**

	West Union Street/Union Street (Route 135) at Summer Street	Summer Street at Cherry Street	Summer Street at North Site Driveway	Union Street (Route 135) at West Site Driveway	Union Street (Route 135) at East Site Driveway	Union Street (Route 135) at Ashland Square Plaza Driveway
Year						
2015	1	0	0	0	1	0
2016	1	0	0	0	0	1
2017	0	0	0	0	1	1
2018	0	1	0	0	1	1
2019	2	2	0	0	1	2
Type						
Angle	2	1	0	0	0	2
Rear-end	1	0	0	0	3	1
Sideswipe	1	0	0	0	0	1
Head-on	0	0	0	0	0	0
Pedestrian	0	0	0	0	0	1
Single Vehicle	0	2	0	0	1	0
Severity						
Property Damage	4	3	0	0	3	4
Personal Injury	0	0	0	0	1	1
Fatality	0	0	0	0	0	0
Weather						
Clear	3	2	0	0	3	3
Cloudy	0	0	0	0	0	0
Rain	0	1	0	0	0	2
Snow	1	0	0	0	0	0
Sleet	0	0	0	0	1	0
Other	0	0	0	0	0	0
Road Surface						
Dry	3	2	0	0	3	3
Wet	0	1	0	0	0	2
Ice	0	0	0	0	1	0
Snow	1	0	0	0	0	0
Time						
7:00 AM to 9:00 AM	1	0	0	0	0	0
9:00 AM to 4:00 PM	0	1	0	0	2	3
4:00 PM to 6:00 PM	2	1	0	0	2	0
6:00 PM to 7:00 AM	1	1	0	0	0	2
Total	4	3	0	0	4	5
Crash Rate	0.13	0.28	0.00	0.00	0.19	0.22
State Average	0.78	0.57	0.57	0.57	0.57	0.57
District 3 Average	0.89	0.61	0.61	0.61	0.61	0.61

Source: MassDOT

APPENDIX C
Traffic Projection Model

TRAFFIC PROJECTION MODEL

Proposed Coffee Shop
Weekday Morning Peak Hour
Ashland, MA

Intersection	Dir.	Turn	2022 Counted Volumes	2022 Existing Volumes	Background Growth 1.00% per year	0 Memorial Drive Development	81 West Union Street Development	2029 No Build Volumes	Redistribution of Pharmacy Trips	ENTER VOL	59	EXIT VOL	54	PASS-BY	2029 Build Volumes	
										New PERCENT ENTER	New Trips ENTER	New PERCENT EXIT	New Trips EXIT	New Trips TOTAL		Pass-By Trips
<u>Union Street (Route 135) at Summer Street</u>	EB	L	284	284	20	4	1	308	1	45%	27			27	21	357
		T	577	577	42	7	3	626	-1						-21	604
	WB	T	411	411	30	4	16	445				25%	14	14	-6	453
		R	26	26	2			28		15%	9			9	16	53
	SB	L	33	33	2			35							10	45
	R	179	179	13	2	8	194				20%	11	11	6	211	
<u>Summer Street at Cherry Street</u>	WB	L	91	91	6	1	4	98				20%	11	11	20	129
		R	5	5	0			5				10%	5	5	5	15
	NB	T	155	155	11	2	1	168							-5	163
		R	155	155	11	2		168	1	60%	36			36	42	247
	SB	L	3	3	0			3		10%	5			5	4	12
	T	121	121	8	2	4	131							-4	127	
<u>Summer Street at North Site Driveway</u>	EB	T	157	157	11	2		170							-5	165
		R	1	1				1	1	70%	41			41	51	94
	WB	L	2	2				2		30%	18			18	5	25
		T	95	95	6	1	4	102							-5	97
	NB	L	1	1				1				30%	16	16	30	47
	R	2	2				2				30%	16	16	5	23	
<u>Union Street (Route 135) at West Site Driveway</u>	EB	T	610	610	44	7	3	661	-1						-11	649
	WB	T	437	437	32	4	16	473		15%	9	5%	3	12		485
	SB	R	0	0				0				20%	11	11	10	21
<u>Union Street (Route 135) at Ashland Square Plaza</u>	EB	T	574	574	44	7	3	625	-1						-11	613
		R	36	36				36								36
	WB	L	28	28				28								28
		T	421	421	32	4	16	457		15%	9	5%	3	12		469
	NB	L	16	16				16								16
	R	25	25				25								25	
<u>Union Street (Route 135) at East Site Driveway</u>	EB	L	1	1				1	-1							0
		T	598	598	44	7	3	649							-11	638
	WB	T	449	449	32	4	16	485		15%	9			9		494
		R	0	0				0								0
	SB	L	0	0				0				15%	8	8	11	19
	R	0	0				0				5%	3	3		3	

Peak Hour: 7:30 AM - 8:30 PM

TRAFFIC PROJECTION MODEL

Proposed Coffee Shop
Weekday Afternoon Peak Hour
Ashland, MA

Intersection	Dir.	Turn	2022 Counted Volumes	2022 Existing Volumes	Background Growth 1.00% per year	0 Memorial Drive Development	81 West Union Street Development	2029 No Build Volumes	Redistribution of Pharmacy Trips	ENTER VOL 23		EXIT VOL 23		PASS-BY		2029 Build Volumes
										New PERCENT ENTER	New Trips ENTER	New PERCENT EXIT	New Trips EXIT	New Trips TOTAL	Pass-By Trips	
<u>Union Street (Route 135) at Summer Street</u>	EB	L	156	156	11	4	10	171	5	45%	10			10	9	195
	T		489	489	35	6	18	530	-5						-9	516
	WB	T	614	614	44	8	13	666				25%	6	6	-4	668
	R		38	38	3			41	10	15%	3			3	12	66
	SB	L	65	65	5			70							3	73
	R	275	275	20	5	7	300				20%	5	5	4	309	
<u>Summer Street at Cherry Street</u>	WB	L	176	176	13	2	3	191				20%	5	5	9	205
	R		13	13	1			14				10%	2	2	2	18
	NB	T	107	107	8	2	5	117							-2	115
	R		87	87	6	2	5	95	15	60%	14			14	23	147
	SB	L	13	13	1			14		10%	2			2	2	18
	T	164	164	12	3	4	179							-2	177	
<u>Summer Street at North Site Driveway</u>	EB	T	85	85	7	2	5	94							-1	93
	R		15	15				15	15	70%	16			16	26	72
	WB	L	4	4				4		30%	7			7	2	13
	T		181	181	14	2	3	197							-2	195
	NB	L	8	8				8				30%	7	7	13	28
	R	11	11				11				30%	7	7	1	19	
<u>Union Street (Route 135) at West Site Driveway</u>	EB	T	554	554	40	6	18	600	-5						-6	589
	WB	T	644	644	47	8	13	699	10	15%	3	5%	1	4		713
	SB	R	8	8				8				20%	5	5	8	21
<u>Union Street (Route 135) at Ashland Square Plaza</u>	EB	T	471	471	40	6	18	517	-5						-6	506
	R		83	83				83								83
	WB	L	58	58				58								58
	T		574	574	47	8	13	629	10	15%	3	5%	1	4		643
	NB	L	70	70				70								70
	R	81	81				81								81	
<u>Union Street (Route 135) at East Site Driveway</u>	EB	L	5	5				5	-5							0
	T		547	547	40	6	18	593							-6	587
	WB	T	632	632	47	8	13	687	10	15%	3			3		700
	R		10	10				10	-10							0
	SB	L	1	1				1				15%	3	3	6	10
	R	0	0				0				5%	1	1	1	1	

Peak Hour: 4:45 PM - 5:45 PM

APPENDIX D
Highway Capacity Manual Methodologies

CAPACITY/LEVEL-OF-SERVICE ANALYSES METHODOLOGY

The detailed capacity/level-of-service analysis contained in this traffic impact study was performed in accordance with the standard techniques contained in the *Highway Capacity Manual*.⁽¹⁾ By definition, capacity represents “the maximum rate of flow that can reasonably be expected to pass a point on a uniform section of a lane or roadway under prevailing roadway, traffic, and control conditions.” The level of functioning of an intersection or a uniform section of a lane or roadway can be expressed in terms of levels of service. Level of service (LOS) is defined as “a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers”. Such measures include “speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.”

At unsignalized intersections, a methodology for evaluating the relative functioning of intersections controlled by stop or yield signs has been developed, and is based on several assumptions, including:

- Major street flows are not affected by the minor (stop-sign controlled) street movements.
- Left turns from the major street to the minor street are influenced only by opposing major street through flow.
- Minor street left turns are impeded by all major street traffic plus opposing minor street traffic.
- Minor street through traffic is impeded by all major street traffic.
- Minor street right turns are impeded only by the major street traffic coming from the left.

The concept of stop-controlled or yield-controlled intersection analysis is based on the estimate of average total delay on minor streets. The methodology of analysis relies on three elements: the size and distribution of gaps in the major traffic stream, the usefulness of these gaps to the minor stream drivers, and the relative priority of the various traffic streams at the intersection. The results of the analysis provide an estimate of average total delay for the various critical movements at the unsignalized intersections. Correlation between average total delay and the respective levels of service are provided for unsignalized intersections as follows:

(1) *Transportation Research Board, Highway Capacity Manual, 6th Edition, published by the Transportation Research Board, Washington, DC, 2016.*

Unsignalized Intersections

Level of Service	Control Delay Per Vehicle (seconds)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F	> 50

At signalized intersections, an additional element must be considered: time allocation. Level of service is based on the average control delay per vehicle for various movements within the intersection. Volume/capacity relationships also affect the operations of signalized intersections. Thus, both volume/capacity and delay must be considered to evaluate the overall operation of a signalized intersection. Correlation between average delay per vehicle and the respective levels of service are provided for signalized intersections as follows:

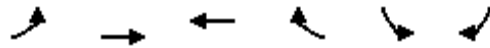
Signalized Intersections

Level of Service	Control Delay Per Vehicle (seconds)
A	≤ 10
B	>10 – 20
C	>20 – 35
D	>35 – 55
E	>55 – 80
F	> 80

APPENDIX E
2022 Existing Capacity/Level-of-Service Analysis

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

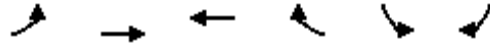
Weekday Morning
Timing Plan: 2022 Existing



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	284	577	411	26	33	179	
Future Volume (vph)	284	577	411	26	33	179	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	175			0	0	0	
Storage Lanes	1			0	1	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1687	1845	1778	0	1703	1524	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1683	1845	1778	0	1703	1524	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)			2			224	
Link Speed (mph)		35	30		30		
Link Distance (ft)		510	151		124		
Travel Time (s)		9.9	3.4		2.8		
Confl. Peds. (#/hr)	2			2			
Peak Hour Factor	0.91	0.91	0.87	0.87	0.80	0.80	
Heavy Vehicles (%)	7%	3%	5%	19%	6%	6%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	312	634	502	0	41	224	
Turn Type	Prot	NA	NA		Prot	pt+ov	
Protected Phases	5	2	6		4	4 5	9
Permitted Phases							
Detector Phase	5	2	6		4	4 5	
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	5.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	24.0	
Total Split (s)	35.0	74.0	39.0		29.0	24.0	
Total Split (%)	27.6%	58.3%	30.7%		22.8%	19%	
Yellow Time (s)	4.0	4.0	4.0		4.0	2.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	5.0	5.0	5.0		5.0		
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
Recall Mode	None	Min	Min		None	None	
Act Effct Green (s)	19.4	59.6	35.0		7.2	31.0	
Actuated g/C Ratio	0.24	0.74	0.43		0.09	0.39	
v/c Ratio	0.77	0.46	0.65		0.27	0.31	
Control Delay	43.1	7.2	26.6		43.7	3.1	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	43.1	7.2	26.6		43.7	3.1	
LOS	D	A	C		D	A	
Approach Delay		19.0	26.6		9.4		
Approach LOS		B	C		A		
Queue Length 50th (ft)	131	70	165		18	0	
Queue Length 95th (ft)	307	357	#531		57	18	
Internal Link Dist (ft)		430	71		44		
Turn Bay Length (ft)	175						

Proposed Coffee Shop
 4: Union St (Rt 135) & Summer St

Weekday Morning
 Timing Plan: 2022 Existing



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Base Capacity (vph)	649	1627	777		524	944	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.48	0.39	0.65		0.08	0.24	

Intersection Summary

Area Type: Other

Cycle Length: 127

Actuated Cycle Length: 80.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.77

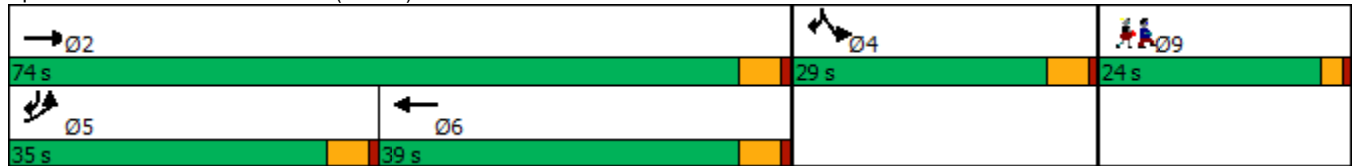
Intersection Signal Delay: 19.8 Intersection LOS: B

Intersection Capacity Utilization 56.5% ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: Union St (Rt 135) & Summer St



Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	157	1	2	95	1	2
Future Vol, veh/h	157	1	2	95	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	84	84	80	80
Heavy Vehicles, %	6	0	0	4	0	0
Mvmt Flow	191	1	2	113	1	3

Major/Minor	Major1	Major2	Minor1	Minor2		
Conflicting Flow All	0	0	192	0	309	192
Stage 1	-	-	-	-	192	-
Stage 2	-	-	-	-	117	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1394	-	687	855
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	913	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1394	-	686	855
Mov Cap-2 Maneuver	-	-	-	-	686	-
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	911	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	790	-	-	1394	-
HCM Lane V/C Ratio	0.005	-	-	0.002	-
HCM Control Delay (s)	9.6	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Proposed Coffee Shop
9: Union St (Rt 135) & West Site Driveway

Weekday Morning
Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	610	437	0	0	0
Future Vol, veh/h	0	610	437	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	87	87	92	92
Heavy Vehicles, %	0	4	6	0	0	0
Mvmt Flow	0	649	502	0	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	0
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	-

Proposed Coffee Shop
11: Ashland Square Plaza & Union St (Rt 135)

Weekday Morning
Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔	↑	↔	
Traffic Vol, veh/h	574	36	28	421	16	25
Future Vol, veh/h	574	36	28	421	16	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	87	87	80	80
Heavy Vehicles, %	4	0	0	6	0	0
Mvmt Flow	611	38	32	484	20	31

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	649	0	1178
Stage 1	-	-	-	-	630
Stage 2	-	-	-	-	548
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	947	-	213
Stage 1	-	-	-	-	535
Stage 2	-	-	-	-	583
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	947	-	206
Mov Cap-2 Maneuver	-	-	-	-	206
Stage 1	-	-	-	-	535
Stage 2	-	-	-	-	563

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	18.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	317	-	-	947	-
HCM Lane V/C Ratio	0.162	-	-	0.034	-
HCM Control Delay (s)	18.5	-	-	8.9	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

Proposed Coffee Shop
13: Union St (Rt 135) & East Site Driveway

Weekday Morning
Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Traffic Vol, veh/h	1	598	449	0	0	0
Future Vol, veh/h	1	598	449	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	87	87	92	92
Heavy Vehicles, %	0	4	5	0	2	2
Mvmt Flow	1	643	516	0	0	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	516	0	-	0	1161 516
Stage 1	-	-	-	-	516 -
Stage 2	-	-	-	-	645 -
Critical Hdwy	4.1	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.2	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1060	-	-	-	216 559
Stage 1	-	-	-	-	599 -
Stage 2	-	-	-	-	522 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1060	-	-	-	216 559
Mov Cap-2 Maneuver	-	-	-	-	216 -
Stage 1	-	-	-	-	598 -
Stage 2	-	-	-	-	522 -

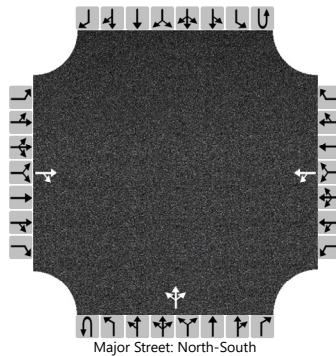
Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1060	-	-	-	-	-
HCM Lane V/C Ratio	0.001	-	-	-	-	-
HCM Control Delay (s)	8.4	0	-	-	0	0
HCM Lane LOS	A	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	-	-

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EKB/LCY			Intersection	Summer St at Cherry St		
Agency/Co.	McMahon			Jurisdiction	Ashland		
Date Performed	6/7/2022			East/West Street	Cherry St/Summer St		
Analysis Year	2022			North/South Street	Summer St		
Time Analyzed	Weekday AM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	1.00		
Project Description	Ashland Starbucks						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			3	121		91	5			155	0	155				
Percent Heavy Vehicles (%)			0	7		4	0			9						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

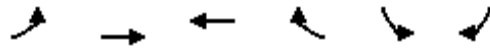
Base Critical Headway (sec)			7.1	6.5		7.1	6.2			4.1						
Critical Headway (sec)			7.10	6.57		7.14	6.20			4.19						
Base Follow-Up Headway (sec)			4.0	3.3		3.5	4.0			2.2						
Follow-Up Headway (sec)			4.00	3.36		3.54	4.00			2.28						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				135		104				168						
Capacity, c (veh/h)				1026		429				1578						
v/c Ratio				0.13		0.24				0.11						
95% Queue Length, Q ₉₅ (veh)				0.5		1.0				0.4						
Control Delay (s/veh)				9.0		16.1				7.6						
Level of Service (LOS)				A		C				A						
Approach Delay (s/veh)	9.0				16.1				4.2							
Approach LOS	A				C											

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

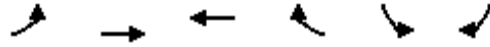
Weekday Afternoon
Timing Plan: 2022 Existing



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	156	489	614	38	65	275	
Future Volume (vph)	156	489	614	38	65	275	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	175			0	0	0	
Storage Lanes	1			0	1	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1787	1881	1867	0	1805	1599	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1881	1867	0	1805	1599	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)			2			340	
Link Speed (mph)		35	30		30		
Link Distance (ft)		510	151		124		
Travel Time (s)		9.9	3.4		2.8		
Peak Hour Factor	0.98	0.98	0.94	0.94	0.81	0.81	
Heavy Vehicles (%)	1%	1%	1%	0%	0%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	159	499	693	0	80	340	
Turn Type	Prot	NA	NA		Prot	pt+ov	
Protected Phases	5	2	6		4	4 5	9
Permitted Phases							
Detector Phase	5	2	6		4	4 5	
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	5.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	24.0	
Total Split (s)	45.0	94.0	49.0		29.0	24.0	
Total Split (%)	30.6%	63.9%	33.3%		19.7%	16%	
Yellow Time (s)	4.0	4.0	4.0		4.0	2.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	5.0	5.0	5.0		5.0		
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
Recall Mode	None	Min	Min		None	None	
Act Effct Green (s)	12.1	62.6	45.3		8.5	25.1	
Actuated g/C Ratio	0.14	0.74	0.53		0.10	0.30	
v/c Ratio	0.62	0.36	0.70		0.44	0.48	
Control Delay	47.2	6.7	23.0		47.1	4.5	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	47.2	6.7	23.0		47.1	4.5	
LOS	D	A	C		D	A	
Approach Delay		16.5	23.0		12.6		
Approach LOS		B	C		B		
Queue Length 50th (ft)	74	57	218		37	0	
Queue Length 95th (ft)	180	274	#761		95	25	
Internal Link Dist (ft)		430	71		44		
Turn Bay Length (ft)	175						
Base Capacity (vph)	866	1793	996		525	1166	

Proposed Coffee Shop
 4: Union St (Rt 135) & Summer St

Weekday Afternoon
 Timing Plan: 2022 Existing



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.18	0.28	0.70		0.15	0.29	

Intersection Summary

Area Type: Other
 Cycle Length: 147
 Actuated Cycle Length: 84.9
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.70
 Intersection Signal Delay: 18.1
 Intersection LOS: B
 Intersection Capacity Utilization 60.8%
 ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: Union St (Rt 135) & Summer St



Proposed Coffee Shop
7: North Site Driveway & Summer St

Weekday Afternoon
Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	0.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	15	4	181	8	11
Future Vol, veh/h	85	15	4	181	8	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	83	83	80	80
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	96	17	5	218	10	14

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	113	0	333
Stage 1	-	-	-	-	105
Stage 2	-	-	-	-	228
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1489	-	666
Stage 1	-	-	-	-	924
Stage 2	-	-	-	-	815
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1489	-	663
Mov Cap-2 Maneuver	-	-	-	-	663
Stage 1	-	-	-	-	924
Stage 2	-	-	-	-	812

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	806	-	-	1489	-
HCM Lane V/C Ratio	0.029	-	-	0.003	-
HCM Control Delay (s)	9.6	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Proposed Coffee Shop
9: Union St (Rt 135) & West Site Driveway

Weekday Afternoon
Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	554	644	0	0	8
Future Vol, veh/h	0	554	644	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	93	93	80	80
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	565	692	0	0	10

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	447
HCM Lane V/C Ratio	-	-	0.022
HCM Control Delay (s)	-	-	13.2
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

Proposed Coffee Shop
 11: Ashland Square Plaza & Union St (Rt 135)

Weekday Afternoon
 Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	4.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	471	83	58	574	70	81
Future Vol, veh/h	471	83	58	574	70	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	93	93	88	88
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	481	85	62	617	80	92
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	566	0	1265	524
Stage 1	-	-	-	-	524	-
Stage 2	-	-	-	-	741	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1016	-	189	557
Stage 1	-	-	-	-	598	-
Stage 2	-	-	-	-	475	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1016	-	177	557
Mov Cap-2 Maneuver	-	-	-	-	177	-
Stage 1	-	-	-	-	598	-
Stage 2	-	-	-	-	446	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.8		36.5	
HCM LOS					E	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	279	-	-	1016	-	
HCM Lane V/C Ratio	0.615	-	-	0.061	-	
HCM Control Delay (s)	36.5	-	-	8.8	-	
HCM Lane LOS	E	-	-	A	-	
HCM 95th %tile Q(veh)	3.7	-	-	0.2	-	

Proposed Coffee Shop
13: Union St (Rt 135) & East Site Driveway

Weekday Afternoon
Timing Plan: 2022 Existing

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	↕
Traffic Vol, veh/h	5	547	632	10	1	0
Future Vol, veh/h	5	547	632	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	80	80
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	5	588	680	11	1	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	691	0	-	0	1284 686
Stage 1	-	-	-	-	686 -
Stage 2	-	-	-	-	598 -
Critical Hdwy	4.1	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.2	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	913	-	-	-	184 451
Stage 1	-	-	-	-	504 -
Stage 2	-	-	-	-	553 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	913	-	-	-	183 451
Mov Cap-2 Maneuver	-	-	-	-	183 -
Stage 1	-	-	-	-	500 -
Stage 2	-	-	-	-	553 -

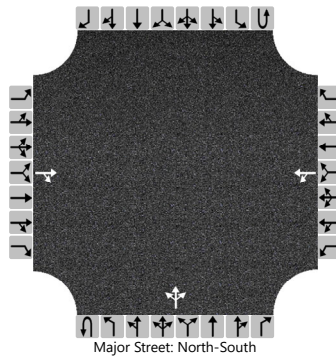
Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	24.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	913	-	-	-	183	-
HCM Lane V/C Ratio	0.006	-	-	-	0.007	-
HCM Control Delay (s)	9	0	-	-	24.8	0
HCM Lane LOS	A	A	-	-	C	A
HCM 95th %tile Q(veh)	0	-	-	-	0	-

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EKB/LCY			Intersection	Summer St at Cherry St		
Agency/Co.	McMahon			Jurisdiction	Ashland		
Date Performed	6/7/2022			East/West Street	Cherry St/Summer St		
Analysis Year	2022			North/South Street	Summer St		
Time Analyzed	Weekday PM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	1.00		
Project Description	Ashland Starbucks						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
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	0		0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			13	164		176	13			107	0	87				
Percent Heavy Vehicles (%)			0	1		0	0			0						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)			7.1	6.5		7.1	6.2			4.1						
Critical Headway (sec)			7.10	6.51		7.10	6.20			4.10						
Base Follow-Up Headway (sec)			4.0	3.3		3.5	4.0			2.2						
Follow-Up Headway (sec)			4.00	3.31		3.50	4.00			2.20						

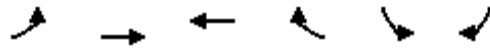
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				192		205				116						
Capacity, c (veh/h)				1007		527				1636						
v/c Ratio				0.19		0.39				0.07						
95% Queue Length, Q ₉₅ (veh)				0.7		1.9				0.2						
Control Delay (s/veh)				9.4		16.2				7.4						
Level of Service (LOS)				A		C				A						
Approach Delay (s/veh)	9.4				16.2				4.3							
Approach LOS	A				C											

APPENDIX F
2029 No Build Capacity/Level-of-Service Analysis

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

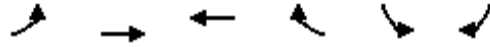
Weekday Morning
Timing Plan: 2029 No Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	308	626	445	28	35	194	
Future Volume (vph)	308	626	445	28	35	194	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	175			0	0	0	
Storage Lanes	1			0	1	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1687	1845	1779	0	1703	1524	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1684	1845	1779	0	1703	1524	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)			2			243	
Link Speed (mph)		35	30		30		
Link Distance (ft)		510	151		124		
Travel Time (s)		9.9	3.4		2.8		
Confl. Peds. (#/hr)	2			2			
Peak Hour Factor	0.91	0.91	0.87	0.87	0.80	0.80	
Heavy Vehicles (%)	7%	3%	5%	19%	6%	6%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	338	688	543	0	44	243	
Turn Type	Prot	NA	NA		Prot	pt+ov	
Protected Phases	5	2	6		4	4 5	9
Permitted Phases							
Detector Phase	5	2	6		4	4 5	
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	5.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	24.0	
Total Split (s)	35.0	74.0	39.0		29.0	24.0	
Total Split (%)	27.6%	58.3%	30.7%		22.8%	19%	
Yellow Time (s)	4.0	4.0	4.0		4.0	2.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	5.0	5.0	5.0		5.0		
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
Recall Mode	None	Min	Min		None	None	
Act Effct Green (s)	21.3	61.4	35.0		7.3	33.0	
Actuated g/C Ratio	0.26	0.74	0.42		0.09	0.40	
v/c Ratio	0.78	0.50	0.72		0.30	0.32	
Control Delay	43.1	7.7	29.7		44.9	3.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	43.1	7.7	29.7		44.9	3.0	
LOS	D	A	C		D	A	
Approach Delay		19.4	29.7		9.4		
Approach LOS		B	C		A		
Queue Length 50th (ft)	146	81	198		20	0	
Queue Length 95th (ft)	#355	409	#598		60	19	
Internal Link Dist (ft)		430	71		44		
Turn Bay Length (ft)	175						

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

Weekday Morning
Timing Plan: 2029 No Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Base Capacity (vph)	631	1589	756		510	935	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.54	0.43	0.72		0.09	0.26	

Intersection Summary

Area Type:	Other
Cycle Length:	127
Actuated Cycle Length:	82.5
Natural Cycle:	90
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.78
Intersection Signal Delay:	20.9
Intersection LOS:	C
Intersection Capacity Utilization	59.7%
ICU Level of Service	B
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 4: Union St (Rt 135) & Summer St

Ø2	Ø4	Ø9
74 s	29 s	24 s
Ø5	Ø6	
35 s	39 s	

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	170	1	2	102	1	2
Future Vol, veh/h	170	1	2	102	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	84	84	80	80
Heavy Vehicles, %	6	0	0	4	0	0
Mvmt Flow	207	1	2	121	1	3

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	208	0	333
Stage 1	-	-	-	-	208
Stage 2	-	-	-	-	125
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1375	-	666
Stage 1	-	-	-	-	832
Stage 2	-	-	-	-	906
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1375	-	665
Mov Cap-2 Maneuver	-	-	-	-	665
Stage 1	-	-	-	-	832
Stage 2	-	-	-	-	904

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	771	-	-	1375	-
HCM Lane V/C Ratio	0.005	-	-	0.002	-
HCM Control Delay (s)	9.7	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Proposed Coffee Shop
9: Union St (Rt 135) & West Site Driveway

Weekday Morning
Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	661	473	0	0	0
Future Vol, veh/h	0	661	473	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	87	87	92	92
Heavy Vehicles, %	0	4	6	0	0	0
Mvmt Flow	0	703	544	0	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	0
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	-

Proposed Coffee Shop
 11: Ashland Square Plaza & Union St (Rt 135)

Weekday Morning
 Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶		↷	↶	↷	
Traffic Vol, veh/h	625	36	28	457	16	25
Future Vol, veh/h	625	36	28	457	16	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	87	87	80	80
Heavy Vehicles, %	4	0	0	6	0	0
Mvmt Flow	665	38	32	525	20	31

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	703	0	1273
Stage 1	-	-	-	-	684
Stage 2	-	-	-	-	589
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	904	-	187
Stage 1	-	-	-	-	505
Stage 2	-	-	-	-	558
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	904	-	180
Mov Cap-2 Maneuver	-	-	-	-	180
Stage 1	-	-	-	-	505
Stage 2	-	-	-	-	538

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	284	-	-	904	-
HCM Lane V/C Ratio	0.18	-	-	0.036	-
HCM Control Delay (s)	20.4	-	-	9.1	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

Proposed Coffee Shop
13: Union St (Rt 135) & East Site Driveway

Weekday Morning
Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	↕
Traffic Vol, veh/h	1	649	485	0	0	0
Future Vol, veh/h	1	649	485	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	87	87	92	92
Heavy Vehicles, %	0	4	5	0	2	2
Mvmt Flow	1	698	557	0	0	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	557	0	-	0	1257 557
Stage 1	-	-	-	-	557 -
Stage 2	-	-	-	-	700 -
Critical Hdwy	4.1	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.2	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1024	-	-	-	189 530
Stage 1	-	-	-	-	574 -
Stage 2	-	-	-	-	493 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1024	-	-	-	189 530
Mov Cap-2 Maneuver	-	-	-	-	189 -
Stage 1	-	-	-	-	573 -
Stage 2	-	-	-	-	493 -

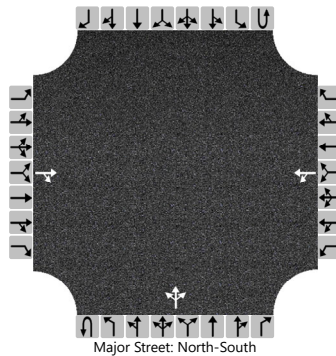
Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1024	-	-	-	-	-
HCM Lane V/C Ratio	0.001	-	-	-	-	-
HCM Control Delay (s)	8.5	0	-	-	0	0
HCM Lane LOS	A	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	-	-

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EKB/LCY			Intersection	Summer St at Cherry St		
Agency/Co.	McMahon			Jurisdiction	Ashland		
Date Performed	6/7/2022			East/West Street	Cherry St/Summer St		
Analysis Year	2029			North/South Street	Summer St		
Time Analyzed	Weekday AM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	1.00		
Project Description	Ashland Starbucks						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			3	131		98	5			168	0	168				
Percent Heavy Vehicles (%)			0	7		4	0			9						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

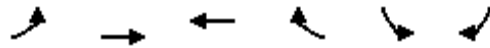
Base Critical Headway (sec)			7.1	6.5		7.1	6.2			4.1						
Critical Headway (sec)			7.10	6.57		7.14	6.20			4.19						
Base Follow-Up Headway (sec)			4.0	3.3		3.5	4.0			2.2						
Follow-Up Headway (sec)			4.00	3.36		3.54	4.00			2.28						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				146		112				183						
Capacity, c (veh/h)				1024		398				1578						
v/c Ratio				0.14		0.28				0.12						
95% Queue Length, Q ₉₅ (veh)				0.5		1.2				0.4						
Control Delay (s/veh)				9.1		17.6				7.6						
Level of Service (LOS)				A		C				A						
Approach Delay (s/veh)	9.1				17.6				4.3							
Approach LOS	A				C											

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

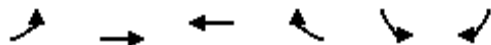
Weekday Afternoon
Timing Plan: 2029 No Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	171	530	666	41	70	300	
Future Volume (vph)	171	530	666	41	70	300	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	175			0	0	0	
Storage Lanes	1			0	1	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1787	1881	1867	0	1805	1599	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1881	1867	0	1805	1599	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)			2			370	
Link Speed (mph)		35	30		30		
Link Distance (ft)		510	151		124		
Travel Time (s)		9.9	3.4		2.8		
Peak Hour Factor	0.98	0.98	0.94	0.94	0.81	0.81	
Heavy Vehicles (%)	1%	1%	1%	0%	0%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	174	541	753	0	86	370	
Turn Type	Prot	NA	NA		Prot	pt+ov	
Protected Phases	5	2	6		4	4 5	9
Permitted Phases							
Detector Phase	5	2	6		4	4 5	
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	5.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	24.0	
Total Split (s)	45.0	94.0	49.0		29.0	24.0	
Total Split (%)	30.6%	63.9%	33.3%		19.7%	16%	
Yellow Time (s)	4.0	4.0	4.0		4.0	2.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	5.0	5.0	5.0		5.0		
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
Recall Mode	None	Min	Min		None	None	
Act Effct Green (s)	13.0	63.5	45.3		8.8	26.2	
Actuated g/C Ratio	0.15	0.74	0.53		0.10	0.30	
v/c Ratio	0.65	0.39	0.77		0.46	0.50	
Control Delay	47.8	7.1	26.1		48.0	4.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	47.8	7.1	26.1		48.0	4.4	
LOS	D	A	C		D	A	
Approach Delay		17.0	26.1		12.6		
Approach LOS		B	C		B		
Queue Length 50th (ft)	82	65	258		41	0	
Queue Length 95th (ft)	196	308	#886		102	25	
Internal Link Dist (ft)		430	71		44		
Turn Bay Length (ft)	175						
Base Capacity (vph)	855	1787	984		518	1168	

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

Weekday Afternoon
Timing Plan: 2029 No Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.20	0.30	0.77		0.17	0.32	

Intersection Summary

Area Type: Other
 Cycle Length: 147
 Actuated Cycle Length: 86.1
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 19.5
 Intersection LOS: B
 Intersection Capacity Utilization 64.5%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: Union St (Rt 135) & Summer St

→ Ø2 94 s	↙ Ø4 29 s	↘ Ø9 24 s
↗ Ø5 45 s	← Ø6 49 s	

Proposed Coffee Shop
7: North Site Driveway & Summer St

Weekday Afternoon
Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	94	15	4	197	8	11
Future Vol, veh/h	94	15	4	197	8	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	83	83	80	80
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	106	17	5	237	10	14

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	123	0	362
Stage 1	-	-	-	-	115
Stage 2	-	-	-	-	247
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1477	-	641
Stage 1	-	-	-	-	915
Stage 2	-	-	-	-	799
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1477	-	638
Mov Cap-2 Maneuver	-	-	-	-	638
Stage 1	-	-	-	-	915
Stage 2	-	-	-	-	796

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	785	-	-	1477	-
HCM Lane V/C Ratio	0.03	-	-	0.003	-
HCM Control Delay (s)	9.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Proposed Coffee Shop
9: Union St (Rt 135) & West Site Driveway

Weekday Afternoon
Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	600	699	0	0	8
Future Vol, veh/h	0	600	699	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	93	93	80	80
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	612	752	0	0	10

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.9
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	413
HCM Lane V/C Ratio	-	-	0.024
HCM Control Delay (s)	-	-	13.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

Proposed Coffee Shop
 11: Ashland Square Plaza & Union St (Rt 135)

Weekday Afternoon
 Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	5.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶		↷	↶	↷	
Traffic Vol, veh/h	517	83	58	629	70	81
Future Vol, veh/h	517	83	58	629	70	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	93	93	88	88
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	528	85	62	676	80	92

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	613	0	1371 571
Stage 1	-	-	-	-	571 -
Stage 2	-	-	-	-	800 -
Critical Hdwy	-	-	4.1	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	976	-	163 524
Stage 1	-	-	-	-	569 -
Stage 2	-	-	-	-	446 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	976	-	153 524
Mov Cap-2 Maneuver	-	-	-	-	153 -
Stage 1	-	-	-	-	569 -
Stage 2	-	-	-	-	417 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	47.2
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	247	-	-	976	-
HCM Lane V/C Ratio	0.695	-	-	0.064	-
HCM Control Delay (s)	47.2	-	-	8.9	-
HCM Lane LOS	E	-	-	A	-
HCM 95th %tile Q(veh)	4.6	-	-	0.2	-

Proposed Coffee Shop
13: Union St (Rt 135) & East Site Driveway

Weekday Afternoon
Timing Plan: 2029 No Build

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Vol, veh/h	5	593	687	10	1	0
Future Vol, veh/h	5	593	687	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	80	80
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	5	638	739	11	1	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	750	0	-	0	1393 745
Stage 1	-	-	-	-	745 -
Stage 2	-	-	-	-	648 -
Critical Hdwy	4.1	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.2	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	868	-	-	-	158 417
Stage 1	-	-	-	-	473 -
Stage 2	-	-	-	-	524 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	868	-	-	-	157 417
Mov Cap-2 Maneuver	-	-	-	-	157 -
Stage 1	-	-	-	-	469 -
Stage 2	-	-	-	-	524 -

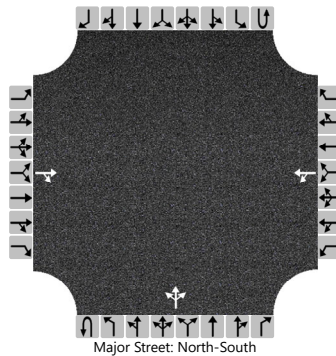
Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	28.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	868	-	-	-	157	-
HCM Lane V/C Ratio	0.006	-	-	-	0.008	-
HCM Control Delay (s)	9.2	0	-	-	28.1	0
HCM Lane LOS	A	A	-	-	D	A
HCM 95th %tile Q(veh)	0	-	-	-	0	-

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EKB/LCY			Intersection	Summer St at Cherry St		
Agency/Co.	McMahon			Jurisdiction	Ashland		
Date Performed	6/7/2029			East/West Street	Cherry St/Summer St		
Analysis Year	2022			North/South Street	Summer St		
Time Analyzed	Weekday PM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	1.00		
Project Description	Ashland Starbucks						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
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	0	1	0	0	0	0	0
Configuration				TR	LT						LTR					
Volume (veh/h)			14	179	191	14				117	0	95				
Percent Heavy Vehicles (%)			0	1	0	0				0						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)			7.1	6.5		7.1	6.2			4.1						
Critical Headway (sec)			7.10	6.51		7.10	6.20			4.10						
Base Follow-Up Headway (sec)			4.0	3.3		3.5	4.0			2.2						
Follow-Up Headway (sec)			4.00	3.31		3.50	4.00			2.20						

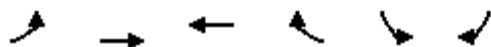
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				210		223				127						
Capacity, c (veh/h)				1001		493				1636						
v/c Ratio				0.21		0.45				0.08						
95% Queue Length, Q ₉₅ (veh)				0.8		2.4				0.3						
Control Delay (s/veh)				9.6		18.3				7.4						
Level of Service (LOS)				A		C				A						
Approach Delay (s/veh)	9.6				18.3				4.4							
Approach LOS	A				C											

APPENDIX G
2029 Build Capacity/Level-of-Service Analysis

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

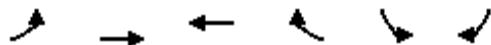
Weekday Morning
2029 Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	357	604	453	53	45	211	
Future Volume (vph)	357	604	453	53	45	211	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	175			0	0	0	
Storage Lanes	1			0	1	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1687	1845	1755	0	1703	1524	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1684	1845	1755	0	1703	1524	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)			5			264	
Link Speed (mph)		35	30		30		
Link Distance (ft)		510	151		124		
Travel Time (s)		9.9	3.4		2.8		
Confl. Peds. (#/hr)	2			2			
Peak Hour Factor	0.91	0.91	0.87	0.87	0.80	0.80	
Heavy Vehicles (%)	7%	3%	5%	19%	6%	6%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	392	664	582	0	56	264	
Turn Type	Prot	NA	NA		Prot	pt+ov	
Protected Phases	5	2	6		4	4 5	9
Permitted Phases							
Detector Phase	5	2	6		4	4 5	
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	5.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	24.0	
Total Split (s)	35.0	74.0	39.0		29.0	24.0	
Total Split (%)	27.6%	58.3%	30.7%		22.8%	19%	
Maximum Green (s)	30.0	69.0	34.0		24.0	21.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	2.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	5.0	5.0	5.0		5.0		
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	Min	Min		None	None	
Walk Time (s)						7.0	
Flash Dont Walk (s)						14.0	
Pedestrian Calls (#/hr)						2	
Act Effct Green (s)	28.3	67.9	34.6		7.7	40.3	
Actuated g/C Ratio	0.32	0.76	0.39		0.09	0.45	
v/c Ratio	0.74	0.47	0.86		0.38	0.32	
Control Delay	38.8	7.5	41.1		49.2	2.7	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	38.8	7.5	41.1		49.2	2.7	
LOS	D	A	D		D	A	
Approach Delay		19.1	41.1		10.8		

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

Weekday Morning
2029 Build

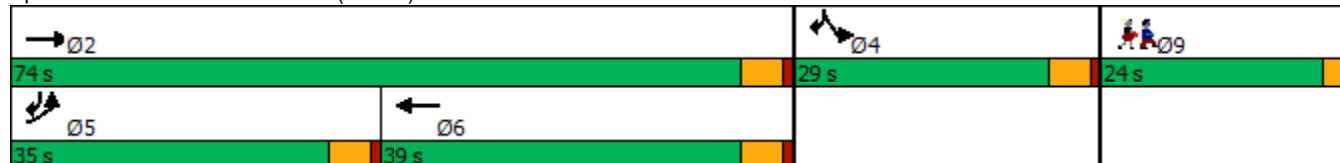


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Approach LOS		B	D		B		
Queue Length 50th (ft)	178	81	266		29	0	
Queue Length 95th (ft)	#456	398	#674		72	19	
Internal Link Dist (ft)		430	71		44		
Turn Bay Length (ft)	175						
Base Capacity (vph)	574	1445	680		463	890	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.68	0.46	0.86		0.12	0.30	

Intersection Summary

Area Type: Other
 Cycle Length: 127
 Actuated Cycle Length: 89.6
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 24.3
 Intersection LOS: C
 Intersection Capacity Utilization 64.4%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: Union St (Rt 135) & Summer St



Intersection						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	165	94	24	97	47	23
Future Vol, veh/h	165	94	24	97	47	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	84	84	80	80
Heavy Vehicles, %	6	0	0	4	0	0
Mvmt Flow	201	115	29	115	59	29

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	316	0	432 259
Stage 1	-	-	-	-	259 -
Stage 2	-	-	-	-	173 -
Critical Hdwy	-	-	4.1	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	1256	-	584 785
Stage 1	-	-	-	-	789 -
Stage 2	-	-	-	-	862 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1256	-	569 785
Mov Cap-2 Maneuver	-	-	-	-	569 -
Stage 1	-	-	-	-	789 -
Stage 2	-	-	-	-	840 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	626	-	-	1256	-
HCM Lane V/C Ratio	0.14	-	-	0.023	-
HCM Control Delay (s)	11.7	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	649	485	0	0	21
Future Vol, veh/h	0	649	485	0	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	87	87	92	92
Heavy Vehicles, %	0	4	6	0	0	0
Mvmt Flow	0	690	557	0	0	23

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	534
HCM Lane V/C Ratio	-	-	0.043
HCM Control Delay (s)	-	-	12
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

Proposed Coffee Shop
 11: Ashland Square Plaza & Union St (Rt 135)

Weekday Morning
 2029 Build

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	613	36	28	469	16	25
Future Vol, veh/h	613	36	28	469	16	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	87	87	80	80
Heavy Vehicles, %	4	0	0	6	0	0
Mvmt Flow	652	38	32	539	20	31

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	690	0	1274 671
Stage 1	-	-	-	-	671 -
Stage 2	-	-	-	-	603 -
Critical Hdwy	-	-	4.1	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	914	-	186 460
Stage 1	-	-	-	-	512 -
Stage 2	-	-	-	-	550 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	914	-	179 460
Mov Cap-2 Maneuver	-	-	-	-	179 -
Stage 1	-	-	-	-	512 -
Stage 2	-	-	-	-	531 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	285	-	-	914	-
HCM Lane V/C Ratio	0.18	-	-	0.035	-
HCM Control Delay (s)	20.4	-	-	9.1	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	
Traffic Vol, veh/h	0	638	494	0	19	3
Future Vol, veh/h	0	638	494	0	19	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	87	87	92	92
Heavy Vehicles, %	0	4	5	0	0	0
Mvmt Flow	0	686	568	0	21	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	1254 568
Stage 1	-	-	-	-	568 -
Stage 2	-	-	-	-	686 -
Critical Hdwy	-	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	0	-	-	0	192 526
Stage 1	0	-	-	0	571 -
Stage 2	0	-	-	0	504 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	192 526
Mov Cap-2 Maneuver	-	-	-	-	192 -
Stage 1	-	-	-	-	571 -
Stage 2	-	-	-	-	504 -

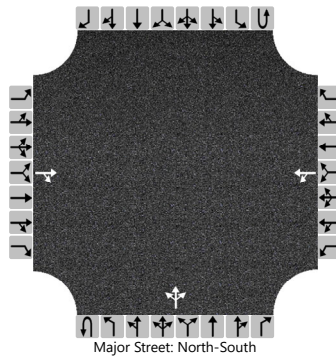
Approach	EB	WB	SB
HCM Control Delay, s	0	0	24.3
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	210
HCM Lane V/C Ratio	-	-	0.114
HCM Control Delay (s)	-	-	24.3
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	0.4

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EKB/LCY			Intersection	Summer St at Cherry St		
Agency/Co.	McMahon			Jurisdiction	Ashland		
Date Performed	6/7/2022			East/West Street	Cherry St/Summer St		
Analysis Year	2029			North/South Street	Summer St		
Time Analyzed	Weekday AM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	1.00		
Project Description	Ashland Starbucks						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			12	127		129	15			163	0	247				
Percent Heavy Vehicles (%)			0	7		4	0			9						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

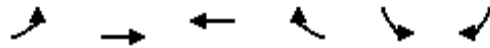
Base Critical Headway (sec)			7.1	6.5		7.1	6.2			4.1						
Critical Headway (sec)			7.10	6.57		7.14	6.20			4.19						
Base Follow-Up Headway (sec)			4.0	3.3		3.5	4.0			2.2						
Follow-Up Headway (sec)			4.00	3.36		3.54	4.00			2.28						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			151	157					177							
Capacity, c (veh/h)			887	374					1578							
v/c Ratio			0.17	0.42					0.11							
95% Queue Length, Q ₉₅ (veh)			0.6	2.1					0.4							
Control Delay (s/veh)			9.9	21.5					7.6							
Level of Service (LOS)			A	C					A							
Approach Delay (s/veh)	9.9				21.5				3.6							
Approach LOS	A				C											

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

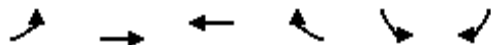
Weekday Afternoon
Timing Plan: 2029 Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	195	516	668	66	73	309	
Future Volume (vph)	195	516	668	66	73	309	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	175			0	0	0	
Storage Lanes	1			0	1	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1787	1881	1860	0	1805	1599	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1787	1881	1860	0	1805	1599	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)			3			381	
Link Speed (mph)		35	30		30		
Link Distance (ft)		510	151		124		
Travel Time (s)		9.9	3.4		2.8		
Peak Hour Factor	0.98	0.98	0.94	0.94	0.81	0.81	
Heavy Vehicles (%)	1%	1%	1%	0%	0%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	199	527	781	0	90	381	
Turn Type	Prot	NA	NA		Prot	pt+ov	
Protected Phases	5	2	6		4	4 5	9
Permitted Phases							
Detector Phase	5	2	6		4	4 5	
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	5.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	24.0	
Total Split (s)	45.0	94.0	49.0		29.0	24.0	
Total Split (%)	30.6%	63.9%	33.3%		19.7%	16%	
Yellow Time (s)	4.0	4.0	4.0		4.0	2.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	5.0	5.0	5.0		5.0		
Lead/Lag	Lead		Lag				
Lead-Lag Optimize?	Yes		Yes				
Recall Mode	None	Min	Min		None	None	
Act Effct Green (s)	14.5	65.1	45.4		9.1	28.1	
Actuated g/C Ratio	0.16	0.74	0.52		0.10	0.32	
v/c Ratio	0.68	0.38	0.81		0.48	0.50	
Control Delay	48.1	6.9	29.4		49.4	4.2	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	48.1	6.9	29.4		49.4	4.2	
LOS	D	A	C		D	A	
Approach Delay		18.2	29.4		12.8		
Approach LOS		B	C		B		
Queue Length 50th (ft)	96	64	290		44	0	
Queue Length 95th (ft)	223	300	#980		109	24	
Internal Link Dist (ft)		430	71		44		
Turn Bay Length (ft)	175						
Base Capacity (vph)	838	1778	961		508	1159	

Proposed Coffee Shop
4: Union St (Rt 135) & Summer St

Weekday Afternoon
Timing Plan: 2029 Build



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.24	0.30	0.81		0.18	0.33	

Intersection Summary

Area Type: Other

Cycle Length: 147

Actuated Cycle Length: 88

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 67.5%

ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: Union St (Rt 135) & Summer St

→ Ø2	↖ Ø4	🚶 Ø9
94 s	29 s	24 s
↙ Ø5	← Ø6	
45 s	49 s	

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	93	71	13	195	28	19
Future Vol, veh/h	93	71	13	195	28	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	83	83	80	80
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	104	80	16	235	35	24

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	0	0	184	411
Stage 1	-	-	-	144
Stage 2	-	-	-	267
Critical Hdwy	-	-	4.1	6.4
Critical Hdwy Stg 1	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	3.5
Pot Cap-1 Maneuver	-	-	1403	601
Stage 1	-	-	-	888
Stage 2	-	-	-	782
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	1403	593
Mov Cap-2 Maneuver	-	-	-	593
Stage 1	-	-	-	888
Stage 2	-	-	-	772

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	690	-	-	1403	-
HCM Lane V/C Ratio	0.085	-	-	0.011	-
HCM Control Delay (s)	10.7	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Proposed Coffee Shop
9: Union St (Rt 135) & West Site Driveway

Weekday Afternoon
Timing Plan: 2029 Build

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	589	714	0	0	21
Future Vol, veh/h	0	589	714	0	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	93	93	80	80
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	601	768	0	0	26

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.5
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	405
HCM Lane V/C Ratio	-	-	0.065
HCM Control Delay (s)	-	-	14.5
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.2

Proposed Coffee Shop
 11: Ashland Square Plaza & Union St (Rt 135)

Weekday Afternoon
 Timing Plan: 2029 Build

Intersection						
Int Delay, s/veh	5.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶		↷	↶	↷	
Traffic Vol, veh/h	506	83	58	644	70	81
Future Vol, veh/h	506	83	58	644	70	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	93	93	88	88
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	516	85	62	692	80	92

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	601	0	1375 559
Stage 1	-	-	-	-	559 -
Stage 2	-	-	-	-	816 -
Critical Hdwy	-	-	4.1	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	986	-	162 532
Stage 1	-	-	-	-	576 -
Stage 2	-	-	-	-	438 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	986	-	152 532
Mov Cap-2 Maneuver	-	-	-	-	152 -
Stage 1	-	-	-	-	576 -
Stage 2	-	-	-	-	410 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	47.6
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	246	-	-	986	-
HCM Lane V/C Ratio	0.698	-	-	0.063	-
HCM Control Delay (s)	47.6	-	-	8.9	-
HCM Lane LOS	E	-	-	A	-
HCM 95th %tile Q(veh)	4.6	-	-	0.2	-

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	
Traffic Vol, veh/h	0	587	700	0	10	2
Future Vol, veh/h	0	587	700	0	10	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	80	80
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	631	753	0	13	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	1384 753
Stage 1	-	-	-	-	753 -
Stage 2	-	-	-	-	631 -
Critical Hdwy	-	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	0	-	-	0	160 413
Stage 1	0	-	-	0	469 -
Stage 2	0	-	-	0	534 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	160 413
Mov Cap-2 Maneuver	-	-	-	-	160 -
Stage 1	-	-	-	-	469 -
Stage 2	-	-	-	-	534 -

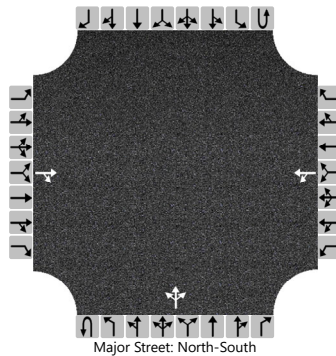
Approach	EB	WB	SB
HCM Control Delay, s	0	0	27.1
HCM LOS			D

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	178
HCM Lane V/C Ratio	-	-	0.084
HCM Control Delay (s)	-	-	27.1
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	0.3

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EKB/LCY			Intersection	Summer St at Cherry St		
Agency/Co.	McMahon			Jurisdiction	Ashland		
Date Performed	6/7/2022			East/West Street	Cherry St/Summer St		
Analysis Year	2029			North/South Street	Summer St		
Time Analyzed	Weekday PM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	1.00		
Project Description	Ashland Starbucks						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			18	177		205	18			115	0	147				
Percent Heavy Vehicles (%)			0	1		0	0			0						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)			7.1	6.5		7.1	6.2			4.1						
Critical Headway (sec)			7.10	6.51		7.10	6.20			4.10						
Base Follow-Up Headway (sec)			4.0	3.3		3.5	4.0			2.2						
Follow-Up Headway (sec)			4.00	3.31		3.50	4.00			2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				212		242				125						
Capacity, c (veh/h)				965		473				1636						
v/c Ratio				0.22		0.51				0.08						
95% Queue Length, Q ₉₅ (veh)				0.8		3.1				0.2						
Control Delay (s/veh)				9.8		20.5				7.4						
Level of Service (LOS)				A		C				A						
Approach Delay (s/veh)	9.8				20.5				3.6							
Approach LOS	A				C											

APPENDIX H
Capacity/Level-of-Service Analysis Summary

CAPACITY ANALYSIS SUMMARY

**Weekday Morning Peak Hour
Proposed Coffee Shop with Drive-Through Window
399 Union Street (Route 135), Ashland, MA**

Intersection	Movement	2022 Existing			2029 No Build			2029 Build		
		LOS ¹	Delay ²	V/C ³	LOS	Delay	V/C	LOS	Delay	V/C
Union Street (Route 135) at Summer Street	EB L	D	43.1	0.77	D	43.1	0.78	D	38.8	0.74
	T	A	7.2	0.46	A	7.7	0.50	A	7.5	0.47
	WB TR	C	26.6	0.65	C	29.7	0.72	D	41.1	0.86
	SB L	D	43.7	0.27	D	44.9	0.30	D	49.2	0.38
	R	A	3.1	0.31	A	3.0	0.32	A	2.7	0.32
<i>Overall</i>		<i>B</i>	<i>19.8</i>	<i>0.57</i>	<i>C</i>	<i>20.9</i>	<i>0.60</i>	<i>C</i>	<i>24.3</i>	<i>0.64</i>
Summer Street at Cherry Street	WB LR	C	16.1	0.24	C	17.6	0.28	C	21.5	0.42
	NB TR	A	4.2	0.11	A	4.3	0.12	A	3.6	0.11
	SB LT	A	9.0	0.13	A	9.1	0.14	A	9.9	0.17
Summer Street at North Site Driveway	EB TR	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB LT	A	0.2	0.00	A	0.1	0.00	A	1.6	0.02
	NB LR	A	9.6	0.01	A	9.7	0.01	B	11.7	0.14
Union Street (Route 135) at West Site Driveway	EB T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	SB R	A	0.0	0.00	A	0.0	0.00	B	12.0	0.05
Union Street (Route 135) at Ashland Square Plaza Driveway	EB TR	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB L	A	8.9	0.03	A	9.1	0.04	A	9.1	0.04
	T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	NB LR	C	18.5	0.16	C	20.4	0.18	C	20.4	0.18
Union Street (Route 135) at East Site Driveway	EB LT/T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB TR/T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	SB LR	A	0.0	0.00	A	0.0	0.00	C	24.3	0.11

1 Level-of-Service

2 Average vehicle delay in seconds

3 Volume to capacity ratio

n/a Not Applicable

QUEUE SUMMARY

**Weekday Morning Peak Hour
Proposed Coffee Shop with Drive-Through Window
399 Union Street (Route 135), Ashland, MA**

Intersection	Movement	2022 Existing		2029 No Build		2029 Build	
		50th Queue ¹	95th Queue ²	50th Queue	95th Queue	50th Queue	95th Queue
Union Street (Route 135) at Summer Street	EB L	131	307	146	355	178	456
	T	70	357	81	409	81	398
	WB TR	165	531	198	598	266	674
	SB L	18	57	20	60	29	72
	R	0	18	0	19	0	19
Summer Street at Cherry Street	WB LR	n/a	25	n/a	30	n/a	53
	NB TR	n/a	10	n/a	10	n/a	10
	SB LT	n/a	13	n/a	13	n/a	15
Union Street (Route 135) at North Site Driveway	EB TR	n/a	0	n/a	0	n/a	0
	WB LT	n/a	0	n/a	0	n/a	3
	NB LR	n/a	0	n/a	0	n/a	13
Union Street (Route 135) at West Site Driveway	EB T	n/a	0	n/a	0	n/a	0
	WB T	n/a	0	n/a	0	n/a	0
	SB R	n/a	0	n/a	0	n/a	3
Union Street (Route 135) at Ashland Square Plaza Driveway	EB TR	n/a	0	n/a	0	n/a	0
	WB L	n/a	3	n/a	3	n/a	3
	T	n/a	0	n/a	0	n/a	0
	NB LR	n/a	15	n/a	15	n/a	15
Union Street (Route 135) at East Site Driveway	EB LT/T	n/a	0	n/a	0	n/a	0
	WB TR/T	n/a	0	n/a	0	n/a	0
	SB LR	n/a	0	n/a	0	n/a	10

¹ 50th Percentile Queue Length, in feet

² 95th Percentile Queue Length, in feet

n/a Not Applicable

CAPACITY ANALYSIS SUMMARY

**Weekday Afternoon Peak Hour
Proposed Coffee Shop with Drive-Through Window
399 Union Street (Route 135), Ashland, MA**

Intersection	Movement	2022 Existing			2029 No Build			2029 Build		
		LOS ¹	Delay ²	V/C ³	LOS	Delay	V/C	LOS	Delay	V/C
Union Street (Route 135) at Summer Street	EB L	D	47.2	0.62	D	47.8	0.65	D	48.1	0.68
	T	A	6.7	0.36	A	7.1	0.39	A	6.9	0.38
	WB TR	C	23.0	0.70	C	26.1	0.77	D	29.4	0.81
	SB L	D	47.1	0.44	D	48.0	0.46	D	49.4	0.48
	R	A	4.5	0.48	A	4.4	0.50	A	4.2	0.49
<i>Overall</i>	<i>B</i>	<i>18.1</i>	<i>0.61</i>	<i>B</i>	<i>19.5</i>	<i>0.65</i>	<i>C</i>	<i>21.3</i>	<i>0.67</i>	
Summer Street at Cherry Street	WB LR	C	16.2	0.39	C	18.3	0.45	C	20.5	0.51
	NB TR	A	4.3	0.07	A	4.4	0.08	A	3.6	0.08
	SB LT	A	9.4	0.19	A	9.6	0.21	A	9.8	0.22
Summer Street at North Site Driveway	EB TR	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB LT	A	0.2	0.00	A	0.1	0.00	A	0.5	0.01
	NB LR	A	9.6	0.03	A	9.7	0.03	B	10.7	0.08
Union Street (Route 135) at West Site Driveway	EB T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	SB R	B	13.2	0.02	B	13.9	0.02	B	14.5	0.06
Union Street (Route 135) at Ashland Square Plaza Driveway	EB TR	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	WB L	A	8.8	0.06	A	8.9	0.06	A	8.9	0.06
	T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	NB LR	E	36.5	0.62	E	47.2	0.70	E	47.6	0.70
Union Street (Route 135) at East Site Driveway	EB LT/T	A	0.1	0.01	A	0.1	0.01	A	0.2	0.00
	WB TR/T	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	SB LR	C	24.8	0.01	D	28.1	0.01	D	27.1	0.08

1 Level-of-Service

2 Average vehicle delay in seconds

3 Volume to capacity ratio

n/a Not Applicable

QUEUE SUMMARY

Weekday Afternoon Peak Hour
Proposed Coffee Shop with Drive-Through Window
399 Union Street (Route 135), Ashland, MA

Intersection	Movement	2022 Existing		2029 No Build		2029 Build	
		50th Queue ¹	95th Queue ²	50th Queue	95th Queue	50th Queue	95th Queue
Union Street (Route 135) at Summer Street	EB L	74	180	82	196	96	223
	T	57	274	65	308	64	300
	WB TR	218	761	258	886	290	980
	SB L	37	95	41	102	44	109
	R	0	25	0	25	0	24
Summer Street at Cherry Street	WB LR	n/a	48	n/a	60	n/a	78
	NB TR	n/a	5	n/a	8	n/a	5
	SB LT	n/a	18	n/a	20	n/a	20
Union Street (Route 135) at North Site Driveway	EB TR	n/a	0	n/a	0	n/a	0
	WB LT	n/a	0	n/a	0	n/a	0
	NB LR	n/a	3	n/a	3	n/a	8
Union Street (Route 135) at West Site Driveway	EB T	n/a	0	n/a	0	n/a	0
	WB T	n/a	0	n/a	0	n/a	0
	SB R	n/a	3	n/a	3	n/a	5
Union Street (Route 135) at Ashland Square Plaza Driveway	EB TR	n/a	0	n/a	0	n/a	0
	WB L	n/a	5	n/a	5	n/a	5
	T	n/a	0	n/a	0	n/a	0
	NB LR	n/a	93	n/a	115	n/a	115
Union Street (Route 135) at East Site Driveway	EB LT/T	n/a	0	n/a	0	n/a	0
	WB TR/T	n/a	0	n/a	0	n/a	0
	SB LR	n/a	0	n/a	0	n/a	8

¹ 50th Percentile Queue Length, in feet

² 95th Percentile Queue Length, in feet

n/a Not Applicable