

# **APPENDIX A**

## **Public Participation**

## Seth Asante

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**From:** Campbell, Alolade (DOT)  
**Sent:** Thursday, February 19, 2015 9:28 AM  
**To:** 'sasante@ctps.org'  
**Cc:** Sullivan, Ann (DOT); Frawley, Joseph (DOT)  
**Subject:** Medway Road/Kmart Driveway Intersection in Milford Review Comments

Dear Seth,

MassDOT District 3 has reviewed all the five alternatives that are developed and analyzed to improve the safety and traffic operation in the Town of Milford at the intersections of Medway Road (Route 109) at Driveways for Kmart and McDonald's Restaurant and Medway Road at Beaver Street. The alternatives are categorized into two classes; short term and long term. The short term alternatives are Alternatives 1-3 while Alternatives 4-5 are considered to be Long term.

### Short Term

- **Alternative 1: Convert Kmart driveway to right-in-right-out channelization with forced turn island**

This does not address the angle crash for the Medway Road EB Left Turn Movements into Mobil Gas Station and as well as the Medway Road WB Left Turn Movements into McDonalds and Shell Gas Station. Therefore we do not recommend this alternative.

- **Alternative 2: Alternative 1 and Conversion of Medway Road eastbound left lane into a two-way left-turn lane**

This seems to be the best short term alternative provided that the eastbound left turn bay on Medway Road is at least 160 feet, to accommodate queuing.

- **Alternative 3: Alternative 2 and Installation of a raised median in the vicinity of the driveway to Kmart and McDonald to prohibit left turns.**

This alternative tries to prohibit the Medway Road WB Left Turn Movements into McDonalds however it does not prevent motorist heading to McDonalds from making a U- turn immediately after the raised median. Therefore we do not recommend this alternative.

### Long Term

- **Alternative 4: Installation of a traffic signal at the intersection of Medway Road and Kmart/McDonalds driveways.**

This long term alternative is not recommended because of the short distance between the proposed traffic signal and the Medway Road / Beaver Street intersection. Secondly, the signal warrants might not be met given the low traffic volumes exiting the business driveways.

- **Alternative 5: Multilane Roundabout at Medway Road at Beaver Street.**

This long term alternative seems to be better alternative but should be evaluated further by the Town. The District recommends that the roundabout be further analyzed using Sidra and Vissim Traffic Software.

If you have any questions regarding these comments please contact Alolade Campbell (508) 929-3887 or Joseph Frawley, Traffic Operation Engineer P.E., (508) 929-3916.

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**From:** Frawley, Joseph (DOT)  
**Sent:** Tuesday, February 03, 2015 4:27 PM  
**To:** Campbell, Alolade (DOT)  
**Subject:** Fwd: Medway Road/Kmart Driveway Intersection in Milford

Lola,

Please review the attached technical memo from CTPS. We can discuss this before comments are submitted. The location is on Route 109 in Milford, but is not State Highway.

Thanks,  
Joe

Sent from my Verizon Wireless 4G LTE smartphone

----- Original message -----

**From:** Seth Asante  
**Date:** 01/30/2015 4:24 PM (GMT-05:00)  
**To:** "Frawley, Joseph (DOT)"  
**Cc:** "Sullivan, Ann (DOT)"  
**Subject:** Medway Road/Kmart Driveway Intersection in Milford

Hello Joe,

Would you please review the attached CTPS memo about safety and operations analyses for the intersection of Medway Road (Route 109) and Kmart/McDonald's Restaurant driveways in Milford? The study was conducted for the Town of Milford and I would appreciate it if you would let me have your comments by February 13, 2015.

Thank you,  
Seth

**Seth A. Asante** | Chief Transportation Planner  
CENTRAL TRANSPORTATION PLANNING STAFF  
857.702.3644 | [sasante@ctps.org](mailto:sasante@ctps.org)



# **APPENDIX 6**

## **Turning-Movement Count Data**

Central Transportation Planning Staff  
 Medway Road and Kmart/McDonalds Driveways  
 03/7/2014

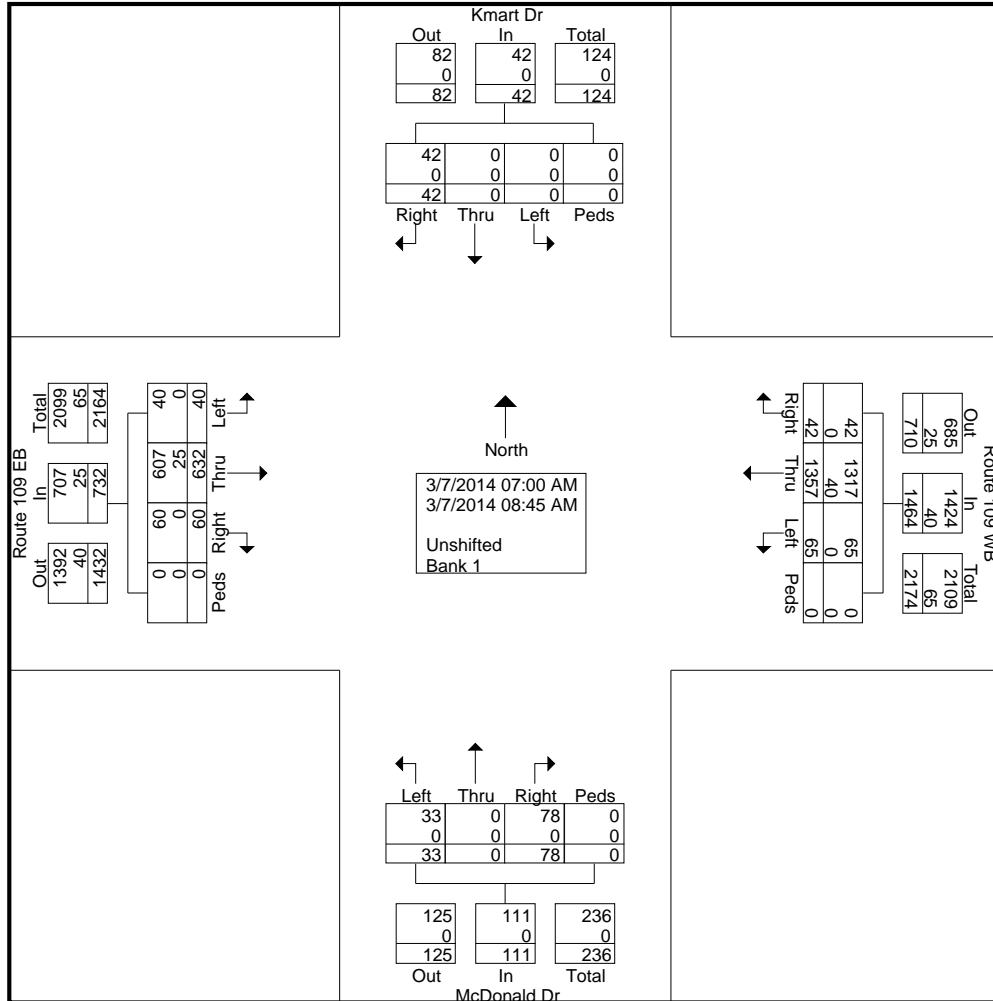
File Name : mcdkmart am  
 Site Code : 03071402  
 Start Date : 3/7/2014  
 Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Kmart Dr From North					Route 109 WB From East					McDonald Dr From South					Route 109 EB 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	
07:00 AM	4	0	0	0	4	6	114	9	0	129	9	0	6	0	15	8	65	4	0	77	225
07:15 AM	4	0	0	0	4	4	129	9	0	142	11	0	2	0	13	7	77	7	0	91	250
07:30 AM	7	0	0	0	7	6	154	7	0	167	8	0	4	0	12	6	88	5	0	99	285
07:45 AM	5	0	0	0	5	5	158	9	0	172	12	0	4	0	16	8	86	3	0	97	290
Total	20	0	0	0	20	21	555	34	0	610	40	0	16	0	56	29	316	19	0	364	1050
08:00 AM	5	0	0	0	5	4	208	8	0	220	10	0	3	0	13	7	73	5	0	85	323
08:15 AM	6	0	0	0	6	5	207	7	0	219	13	0	5	0	18	9	77	6	0	92	335
08:30 AM	4	0	0	0	4	6	223	5	0	234	7	0	6	0	13	8	84	4	0	96	347
08:45 AM	7	0	0	0	7	6	164	11	0	181	8	0	3	0	11	7	82	6	0	95	294
Total	22	0	0	0	22	21	802	31	0	854	38	0	17	0	55	31	316	21	0	368	1299
Grand Total	42	0	0	0	42	42	1357	65	0	1464	78	0	33	0	111	60	632	40	0	732	2349
Apprch %	100	0	0	0		2.9	92.7	4.4	0		70.3	0	29.7	0		8.2	86.3	5.5	0		
Total %	1.8	0	0	0	1.8	1.8	57.8	2.8	0	62.3	3.3	0	1.4	0	4.7	2.6	26.9	1.7	0	31.2	
Unshifted	42	0	0	0	42	42	1317	65	0	1424	78	0	33	0	111	60	607	40	0	707	2284
% Unshifted	100	0	0	0	100	100	97.1	100	0	97.3	100	0	100	0	100	100	96	100	0	96.6	97.2
Bank 1	0	0	0	0	0	0	40	0	0	40	0	0	0	0	0	0	25	0	0	25	65
% Bank 1	0	0	0	0	0	0	2.9	0	0	2.7	0	0	0	0	0	0	4	0	0	3.4	2.8

Central Transportation Planning Staff  
 Medway Road and Kmart/McDonalds Driveways  
 03/7/2014

File Name : mcdkmart am  
 Site Code : 03071402  
 Start Date : 3/7/2014  
 Page No : 2



Central Transportation Planning Staff  
 Medway Road and Kmart/McDonalds Driveways  
 03/7/2014

File Name : mcdkmart am  
 Site Code : 03071402  
 Start Date : 3/7/2014  
 Page No : 3

Start Time	Kmart Dr From North					Route 109 WB From East					McDonald Dr From South					Route 109 EB 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 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	5	0	0	0	5	4	208	8	0	220	10	0	3	0	13	7	73	5	0	85	323
08:15 AM	6	0	0	0	6	5	207	7	0	219	<b>13</b>	0	5	0	<b>18</b>	<b>9</b>	<b>77</b>	<b>6</b>	0	92	335
08:30 AM	4	0	0	0	4	<b>6</b>	<b>223</b>	5	0	<b>234</b>	7	0	<b>6</b>	0	13	8	<b>84</b>	4	0	<b>96</b>	<b>347</b>
08:45 AM	<b>7</b>	0	0	0	<b>7</b>	6	164	<b>11</b>	0	181	8	0	3	0	11	7	82	6	0	95	294
Total Volume	22	0	0	0	22	21	802	31	0	854	38	0	17	0	55	31	316	21	0	368	1299
% App. Total	100	0	0	0		2.5	93.9	3.6	0		69.1	0	30.9	0		8.4	85.9	5.7	0		
PHF	.786	.000	.000	.000	.786	.875	.899	.705	.000	.912	.731	.000	.708	.000	.764	.861	.940	.875	.000	.958	.936

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:30 AM					08:00 AM					07:45 AM					07:30 AM				
+0 mins.	<b>7</b>	0	0	0	<b>7</b>	4	208	8	0	220	12	0	4	0	16	6	<b>88</b>	5	0	<b>99</b>
+15 mins.	5	0	0	0	5	5	207	7	0	219	10	0	3	0	13	8	86	3	0	97
+30 mins.	5	0	0	0	5	<b>6</b>	<b>223</b>	5	0	<b>234</b>	<b>13</b>	0	5	0	<b>18</b>	7	73	5	0	85
+45 mins.	6	0	0	0	6	6	164	<b>11</b>	0	181	7	0	<b>6</b>	0	13	<b>9</b>	<b>77</b>	<b>6</b>	0	92
Total Volume	23	0	0	0	23	21	802	31	0	854	42	0	18	0	60	30	324	19	0	373
% App. Total	100	0	0	0		2.5	93.9	3.6	0		70	0	30	0		8	86.9	5.1	0	
PHF	.821	.000	.000	.000	.821	.875	.899	.705	.000	.912	.808	.000	.750	.000	.833	.833	.920	.792	.000	.942



Central Transportation Planning Staff  
 Medway Road and Kmart/McDonalds Driveways  
 03/7/2014

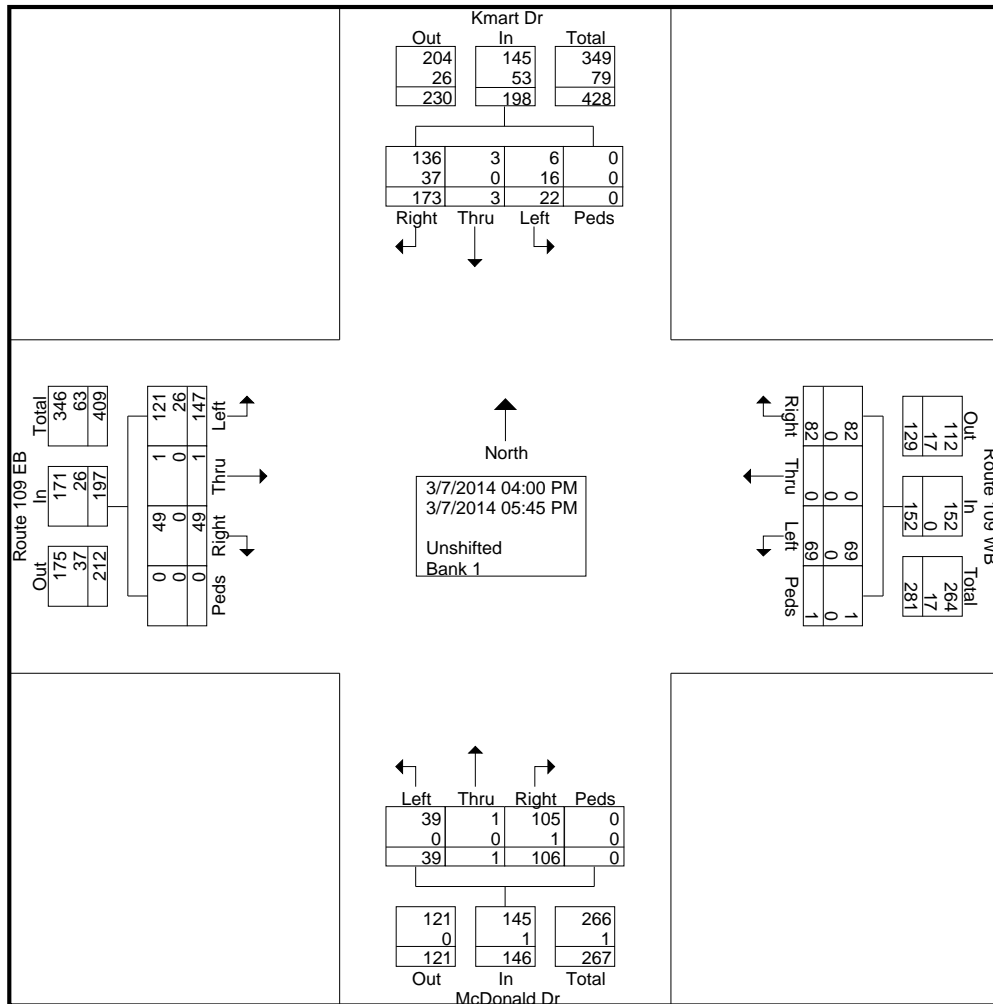
File Name : McDKmart  
 Site Code : 03071401  
 Start Date : 3/7/2014  
 Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Kmart Dr From North					Route 109 WB From East					McDonald Dr From South					Route 109 EB 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	
04:00 PM	22	2	1	0	25	9	0	7	0	16	11	1	1	0	13	7	1	13	0	21	75
04:15 PM	25	0	6	0	31	4	0	11	0	15	15	0	5	0	20	0	0	27	0	27	93
04:30 PM	25	0	5	0	30	4	0	9	0	13	16	0	4	0	20	7	0	25	0	32	95
04:45 PM	21	1	0	0	22	14	0	12	0	26	11	0	9	0	20	5	0	16	0	21	89
Total	93	3	12	0	108	31	0	39	0	70	53	1	19	0	73	19	1	81	0	101	352
05:00 PM	23	0	2	0	25	14	0	3	1	18	8	0	6	0	14	14	0	20	0	34	91
05:15 PM	20	0	5	0	25	9	0	7	0	16	12	0	6	0	18	7	0	8	0	15	74
05:30 PM	17	0	1	0	18	15	0	11	0	26	13	0	4	0	17	3	0	20	0	23	84
05:45 PM	20	0	2	0	22	13	0	9	0	22	20	0	4	0	24	6	0	18	0	24	92
Total	80	0	10	0	90	51	0	30	1	82	53	0	20	0	73	30	0	66	0	96	341
Grand Total	173	3	22	0	198	82	0	69	1	152	106	1	39	0	146	49	1	147	0	197	693
Apprch %	87.4	1.5	11.1	0		53.9	0	45.4	0.7		72.6	0.7	26.7	0		24.9	0.5	74.6	0		
Total %	25	0.4	3.2	0	28.6	11.8	0	10	0.1	21.9	15.3	0.1	5.6	0	21.1	7.1	0.1	21.2	0	28.4	
Unshifted	136	3	6	0	145	82	0	69	1	152	105	1	39	0	145	49	1	121	0	171	613
% Unshifted	78.6	100	27.3	0	73.2	100	0	100	100	100	99.1	100	100	0	99.3	100	100	82.3	0	86.8	88.5
Bank 1	37	0	16	0	53	0	0	0	0	0	1	0	0	0	1	0	0	26	0	26	80
% Bank 1	21.4	0	72.7	0	26.8	0	0	0	0	0	0.9	0	0	0	0.7	0	0	17.7	0	13.2	11.5

Central Transportation Planning Staff  
 Medway Road and Kmart/McDonalds Driveways  
 03/7/2014

File Name : McDKmart  
 Site Code : 03071401  
 Start Date : 3/7/2014  
 Page No : 2



Central Transportation Planning Staff  
 Medway Road and Kmart/McDonalds Driveways  
 03/7/2014

File Name : McDKmart  
 Site Code : 03071401  
 Start Date : 3/7/2014  
 Page No : 3

Start Time	Kmart Dr From North					Route 109 WB From East					McDonald Dr From South					Route 109 EB 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 04:15 PM																					
04:15 PM	25	0	6	0	31	4	0	11	0	15	15	0	5	0	20	0	0	27	0	27	93
04:30 PM	25	0	5	0	30	4	0	9	0	13	16	0	4	0	20	7	0	25	0	32	95
04:45 PM	21	1	0	0	22	14	0	12	0	26	11	0	9	0	20	5	0	16	0	21	89
05:00 PM	23	0	2	0	25	14	0	3	1	18	8	0	6	0	14	14	0	20	0	34	91
Total Volume	94	1	13	0	108	36	0	35	1	72	50	0	24	0	74	26	0	88	0	114	368
% App. Total	87	0.9	12	0		50	0	48.6	1.4		67.6	0	32.4	0		22.8	0	77.2	0		
PHF	.940	.250	.542	.000	.871	.643	.000	.729	.250	.692	.781	.000	.667	.000	.925	.464	.000	.815	.000	.838	.968

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

Peak Hour for Each Approach Begins at:

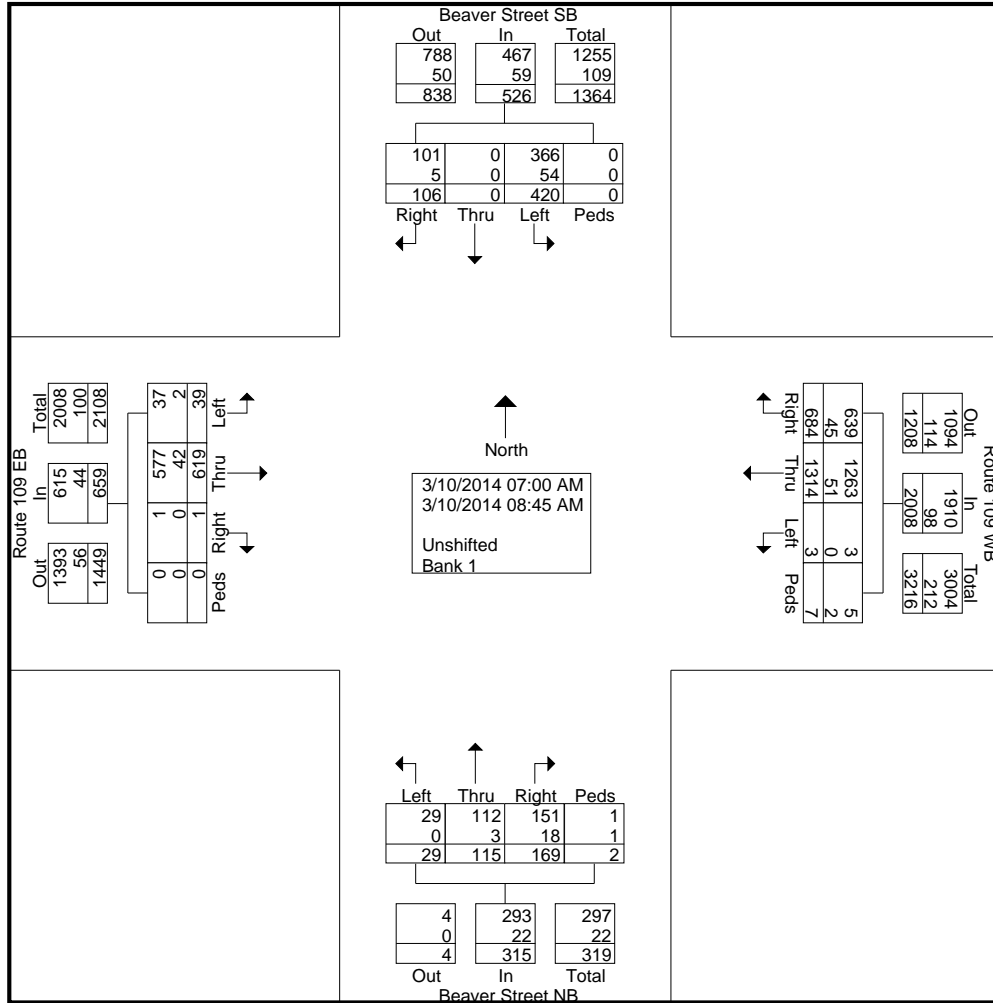
	04:00 PM					04:45 PM					04:15 PM					04:15 PM					
+0 mins.	22	2	1	0	25	14	0	12	0	26	15	0	5	0	20	0	0	27	0	27	
+15 mins.	25	0	6	0	31	14	0	3	1	18	16	0	4	0	20	7	0	25	0	32	
+30 mins.	25	0	5	0	30	9	0	7	0	16	11	0	9	0	20	5	0	16	0	21	
+45 mins.	21	1	0	0	22	15	0	11	0	26	8	0	6	0	14	14	0	20	0	34	
Total Volume	93	3	12	0	108	52	0	33	1	86	50	0	24	0	74	26	0	88	0	114	
% App. Total	86.1	2.8	11.1	0		60.5	0	38.4	1.2		67.6	0	32.4	0		22.8	0	77.2	0		
PHF	.930	.375	.500	.000	.871	.867	.000	.688	.250	.827	.781	.000	.667	.000	.925	.464	.000	.815	.000	.838	

Central Transportation Planning Staff  
 Medway Road and Beaver Street  
 3/10/14

File Name : Rte109Beaver am  
 Site Code : 03101401  
 Start Date : 3/10/2014  
 Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Beaver Street SB From North					Route 109 WB From East					Beaver Street NB From South					Route 109 EB 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	
07:00 AM	12	0	51	0	63	80	105	0	0	185	18	11	5	0	34	0	60	2	0	62	344
07:15 AM	12	0	57	0	69	64	122	0	1	187	21	8	1	1	31	0	75	3	0	78	365
07:30 AM	14	0	46	0	60	78	146	0	1	225	32	11	2	0	45	0	81	7	0	88	418
07:45 AM	16	0	70	0	86	93	150	0	1	244	35	18	5	0	58	1	91	3	0	95	483
Total	54	0	224	0	278	315	523	0	3	841	106	48	13	1	168	1	307	15	0	323	1610
08:00 AM	13	0	55	0	68	105	205	0	1	311	27	22	2	0	51	0	72	4	0	76	506
08:15 AM	14	0	43	0	57	92	199	0	0	291	19	22	4	0	45	0	82	3	0	85	478
08:30 AM	10	0	49	0	59	83	220	0	0	303	9	10	5	1	25	0	89	5	0	94	481
08:45 AM	15	0	49	0	64	89	167	3	3	262	8	13	5	0	26	0	69	12	0	81	433
Total	52	0	196	0	248	369	791	3	4	1167	63	67	16	1	147	0	312	24	0	336	1898
Grand Total	106	0	420	0	526	684	1314	3	7	2008	169	115	29	2	315	1	619	39	0	659	3508
Apprch %	20.2	0	79.8	0		34.1	65.4	0.1	0.3		53.7	36.5	9.2	0.6		0.2	93.9	5.9	0		
Total %	3	0	12	0	15	19.5	37.5	0.1	0.2	57.2	4.8	3.3	0.8	0.1	9	0	17.6	1.1	0	18.8	
Unshifted	101	0	366	0	467	639	1263	3	5	1910	151	112	29	1	293	1	577	37	0	615	3285
% Unshifted	95.3	0	87.1	0	88.8	93.4	96.1	100	71.4	95.1	89.3	97.4	100	50	93	100	93.2	94.9	0	93.3	93.6
Bank 1	5	0	54	0	59	45	51	0	2	98	18	3	0	1	22	0	42	2	0	44	223
% Bank 1	4.7	0	12.9	0	11.2	6.6	3.9	0	28.6	4.9	10.7	2.6	0	50	7	0	6.8	5.1	0	6.7	6.4



Central Transportation Planning Staff  
 Medway Road and Beaver Street  
 3/10/14

File Name : Rte109Beaver am  
 Site Code : 03101401  
 Start Date : 3/10/2014  
 Page No : 3

Start Time	Beaver Street SB From North					Route 109 WB From East					Beaver Street NB From South					Route 109 EB 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 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	16	0	70	0	86	93	150	0	1	244	35	18	5	0	58	1	91	3	0	95	483
08:00 AM	13	0	55	0	68	105	205	0	1	311	27	22	2	0	51	0	72	4	0	76	506
08:15 AM	14	0	43	0	57	92	199	0	0	291	19	22	4	0	45	0	82	3	0	85	478
08:30 AM	10	0	49	0	59	83	220	0	0	303	9	10	5	1	25	0	89	5	0	94	481
Total Volume	53	0	217	0	270	373	774	0	2	1149	90	72	16	1	179	1	334	15	0	350	1948
% App. Total	19.6	0	80.4	0		32.5	67.4	0	0.2		50.3	40.2	8.9	0.6		0.3	95.4	4.3	0		
PHF	.828	.000	.775	.000	.785	.888	.880	.000	.500	.924	.643	.818	.800	.250	.772	.250	.918	.750	.000	.921	.962

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:15 AM					08:00 AM					07:30 AM					07:45 AM				
+0 mins.	12	0	57	0	69	105	205	0	1	311	32	11	2	0	45	1	91	3	0	95
+15 mins.	14	0	46	0	60	92	199	0	0	291	35	18	5	0	58	0	72	4	0	76
+30 mins.	16	0	70	0	86	83	220	0	0	303	27	22	2	0	51	0	82	3	0	85
+45 mins.	13	0	55	0	68	89	167	3	3	262	19	22	4	0	45	0	89	5	0	94
Total Volume	55	0	228	0	283	369	791	3	4	1167	113	73	13	0	199	1	334	15	0	350
% App. Total	19.4	0	80.6	0		31.6	67.8	0.3	0.3		56.8	36.7	6.5	0		0.3	95.4	4.3	0	
PHF	.859	.000	.814	.000	.823	.879	.899	.250	.333	.938	.807	.830	.650	.000	.858	.250	.918	.750	.000	.921

Central Transportation Planning Staff  
 Medway Road and Beaver Street  
 3/10/14

Default Comments  
 Change These in The Preferences Window  
 Select File/Preference in the Main Scree  
 Then Click the Comments Tab

File Name : rte109beaver pm  
 Site Code : 03201401  
 Start Date : 3/20/2014  
 Page No : 1

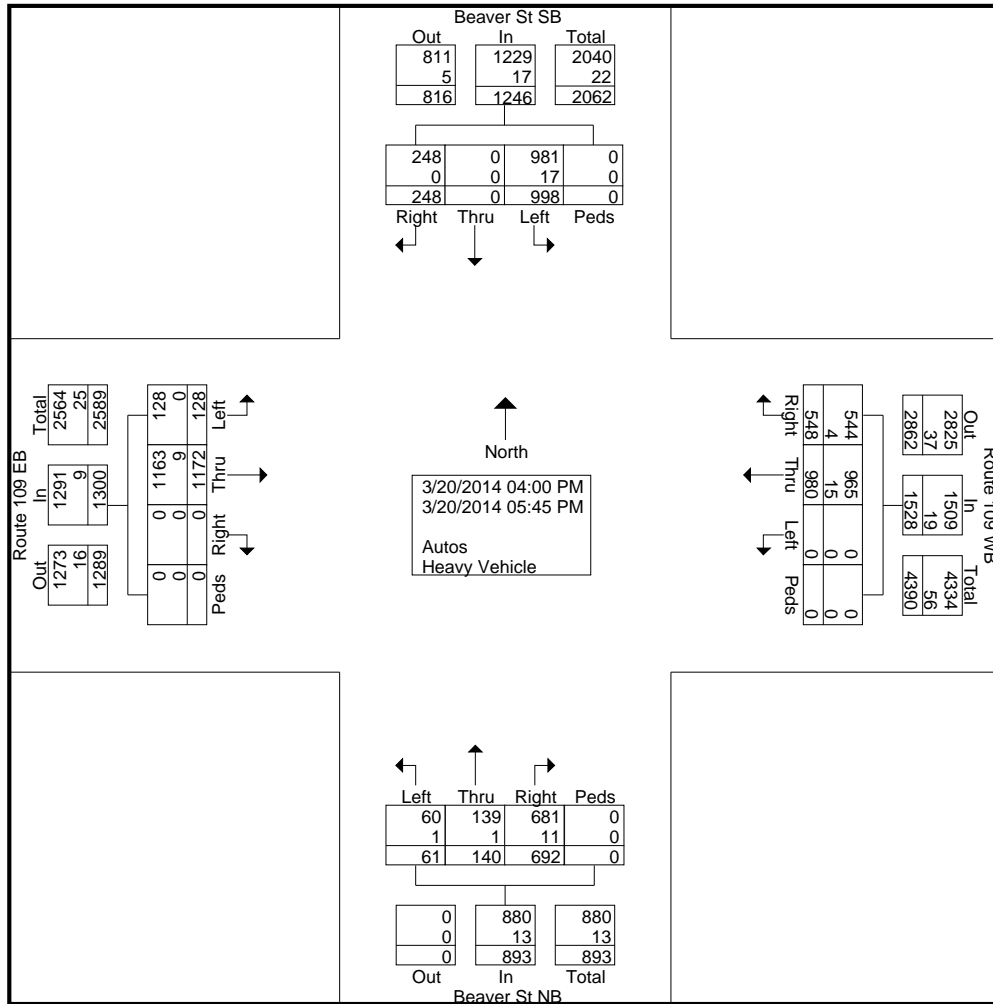
Groups Printed- Autos - Heavy Vehicle

Start Time	Beaver St SB From North					Route 109 WB From East					Beaver St NB From South					Route 109 EB 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	
04:00 PM	30	0	125	0	155	60	93	0	0	153	92	16	8	0	116	0	135	16	0	151	575
04:15 PM	32	0	114	0	146	69	97	0	0	166	90	18	6	0	114	0	139	18	0	157	583
04:30 PM	29	0	136	0	165	66	101	0	0	167	114	14	8	0	136	0	149	23	0	172	640
04:45 PM	36	0	96	0	132	65	106	0	0	171	85	16	6	0	107	0	137	15	0	152	562
Total	127	0	471	0	598	260	397	0	0	657	381	64	28	0	473	0	560	72	0	632	2360
05:00 PM	26	0	149	0	175	61	149	0	0	210	89	22	6	0	117	0	180	15	0	195	697
05:15 PM	26	0	129	0	155	74	152	0	0	226	96	20	13	0	129	0	159	14	0	173	683
05:30 PM	36	0	141	0	177	80	150	0	0	230	74	21	9	0	104	0	119	15	0	134	645
05:45 PM	33	0	108	0	141	73	132	0	0	205	52	13	5	0	70	0	154	12	0	166	582
Total	121	0	527	0	648	288	583	0	0	871	311	76	33	0	420	0	612	56	0	668	2607
Grand Total	248	0	998	0	1246	548	980	0	0	1528	692	140	61	0	893	0	1172	128	0	1300	4967
Apprch %	19.9	0	80.1	0		35.9	64.1	0	0		77.5	15.7	6.8	0		0	90.2	9.8	0		
Total %	5	0	20.1	0	25.1	11	19.7	0	0	30.8	13.9	2.8	1.2	0	18	0	23.6	2.6	0	26.2	
Autos	248	0	981	0	1229	544	965	0	0	1509	681	139	60	0	880	0	1163	128	0	1291	4909
% Autos	100	0	98.3	0	98.6	99.3	98.5	0	0	98.8	98.4	99.3	98.4	0	98.5	0	99.2	100	0	99.3	98.8
Heavy Vehicle	0	0	17	0	17	4	15	0	0	19	11	1	1	0	13	0	9	0	0	9	58
% Heavy Vehicle	0	0	1.7	0	1.4	0.7	1.5	0	0	1.2	1.6	0.7	1.6	0	1.5	0	0.8	0	0	0.7	1.2

Central Transportation Planning Staff  
 Medway Road and Beaver Street  
 3/10/14

Default Comments  
 Change These in The Preferences Window  
 Select File/Preference in the Main Scree  
 Then Click the Comments Tab

File Name : rte109beaver pm  
 Site Code : 03201401  
 Start Date : 3/20/2014  
 Page No : 2





Central Transportation Planning Staff  
 Medway Road and Beaver Street  
 3/10/14

Default Comments  
 Change These in The Preferences Window  
 Select File/Preference in the Main Scree  
 Then Click the Comments Tab

File Name : rte109beaver pm  
 Site Code : 03201401  
 Start Date : 3/20/2014  
 Page No : 3

	Beaver St SB From North					Route 109 WB From East					Beaver St NB From South					Route 109 EB From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	29	0	136	0	165	66	101	0	0	167	<b>114</b>	14	8	0	<b>136</b>	0	149	<b>23</b>	0	172	640
04:45 PM	<b>36</b>	0	96	0	132	65	106	0	0	171	85	16	6	0	107	0	137	15	0	152	562
05:00 PM	26	0	<b>149</b>	0	<b>175</b>	61	149	0	0	210	89	<b>22</b>	6	0	117	0	<b>180</b>	15	0	<b>195</b>	<b>697</b>
05:15 PM	26	0	129	0	155	<b>74</b>	<b>152</b>	0	0	<b>226</b>	96	20	<b>13</b>	0	129	0	159	14	0	173	683
Total Volume	117	0	510	0	627	266	508	0	0	774	384	72	33	0	489	0	625	67	0	692	2582
% App. Total	18.7	0	81.3	0		34.4	65.6	0	0		78.5	14.7	6.7	0		0	90.3	9.7	0		
PHF	.813	.000	.856	.000	.896	.899	.836	.000	.000	.856	.842	.818	.635	.000	.899	.000	.868	.728	.000	.887	.926

Peak Hour Analysis From 04:00 PM to 05:15 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	04:30 PM					04:30 PM					04:30 PM					04:30 PM					
+0 mins.	29	0	136	0	165	66	101	0	0	167	<b>114</b>	14	8	0	<b>136</b>	0	149	<b>23</b>	0	172	
+15 mins.	<b>36</b>	0	96	0	132	65	106	0	0	171	85	16	6	0	107	0	137	15	0	152	
+30 mins.	26	0	<b>149</b>	0	<b>175</b>	61	149	0	0	210	89	<b>22</b>	6	0	117	0	<b>180</b>	15	0	<b>195</b>	
+45 mins.	26	0	129	0	155	<b>74</b>	<b>152</b>	0	0	<b>226</b>	96	20	<b>13</b>	0	129	0	159	14	0	173	
Total Volume	117	0	510	0	627	266	508	0	0	774	384	72	33	0	489	0	625	67	0	692	
% App. Total	18.7	0	81.3	0		34.4	65.6	0	0		78.5	14.7	6.7	0		0	90.3	9.7	0		
PHF	.813	.000	.856	.000	.896	.899	.836	.000	.000	.856	.842	.818	.635	.000	.899	.000	.868	.728	.000	.887	



# **APPENDIX 7**

## **Crash Data**

## 2010-2012\_Rte109-KmartShell

OBJECT ID	Crash Number	Crash Year	Crash Time	Date	Crash Severity	Manner of Collision	Vehicle Traveled Direction	Road Surface Condition	Ambient Light Conditions	Weather Condition
1	2830430	2010	6:44 AM	26-Nov-2010	Property damage only (none ir	Angle	V1:Northbound / V2:Westbound	Wet	Daylight	Rain
2	2604379	2010	2:11 PM	15-Apr-2010	Non-fatal injury	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
3	2604390	2010	5:04 PM	18-Apr-2010	Property damage only (none ir	Angle	V1:Westbound / V2:Eastbound	Dry	Daylight	Cloudy
4	2604392	2010	10:54 AM	19-Apr-2010	Property damage only (none ir	Angle	V1:Southbound / V2:Northbound	Dry	Daylight	Cloudy
5	2605402	2010	6:11 PM	17-May-2010	Not Reported	Angle	V1:Southbound / V2:Eastbound	Dry	Daylight	Clear
6	2605404	2010	12:30 PM	18-May-2010	Not Reported	Angle	V1:Not reported	Dry	Daylight	Cloudy
7	2829994	2010	6:46 PM	05-Aug-2010	Property damage only (none ir	Angle	V1:Not reported / V2:Westbound	Dry	Daylight	Clear
8	2614039	2010	8:58 AM	23-Jun-2010	Property damage only (none ir	Head-on	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
9	2614044	2010	1:40 PM	27-Jun-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
10	2829951	2010	6:59 PM	07-Jul-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear
11	2830336	2010	3:03 PM	07-Oct-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Southbound	Dry	Daylight	Clear
12	2830354	2010	1:26 PM	14-Oct-2010	Non-fatal injury	Angle	V1:Eastbound / V2:Westbound / V3:S	Dry	Daylight	Clear
13	2830167	2010	5:09 PM	30-Oct-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Southbound	Dry	Daylight	Clear
14	2830395	2010	10:38 AM	03-Dec-2010	Property damage only (none ir	Rear-to-rear	V1:Westbound / V2:Eastbound	Dry	Daylight	Clear
15	2830398	2010	4:07 PM	04-Dec-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Northbound	Dry	Dusk	Clear
16	2830410	2010	2:41 PM	11-Dec-2010	Property damage only (none ir	Angle	V1:Westbound / V2:Eastbound	Dry	Daylight	Cloudy
17	2830824	2011	3:46 PM	27-Jan-2011	Not Reported	Unknown	V1:Southbound / V2:Southbound	Snow	Daylight	Clear
18	2831011	2011	10:02 AM	12-Feb-2011	Not Reported	Unknown	V1:Not reported	Dry	Daylight	Clear
19	2831047	2011	1:42 PM	25-Feb-2011	Not Reported	Unknown	V1:Not reported	Wet	Daylight	Rain
20	2830921	2011	3:00 PM	05-Apr-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Wet	Daylight	Rain
21	2831373	2011	7:29 PM	07-Jun-2011	Property damage only (none ir	Angle	V1:Northbound / V2:Eastbound	Dry	Daylight	Clear
22	2830504	2011	12:40 PM	21-Jun-2011	Property damage only (none ir	Rear-end	V1:Westbound / V2:Westbound	Dry	Daylight	Clear
23	2830535	2011	1:03 PM	24-Jun-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear/Cloudy
24	2830538	2011	11:53 AM	26-Jun-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
25	2830560	2011	7:31 AM	07-Jul-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
26	2830526	2011	5:21 PM	31-Jul-2011	Not Reported	Unknown	V1:Eastbound	Dry	Daylight	Clear
27	2830787	2011	1:02 PM	22-Aug-2011	Not Reported	Rear-end	V1:Not reported	Dry	Daylight	Clear
28	2830788	2011	1:07 PM	22-Aug-2011	Property damage only (none ir	Angle	V1:Southbound / V2:Westbound	Dry	Daylight	Clear
29	2830846	2011	3:53 PM	13-Sep-2011	Non-fatal injury	Single vehicle cr	V1:Northbound	Dry	Daylight	Clear
30	2830677	2011	6:12 PM	22-Sep-2011	Property damage only (none ir	Rear-to-rear	V1:Northbound / V2:Not reported	Wet	Daylight	Cloudy/Rain
31	2832221	2011	1:11 PM	08-Oct-2011	Non-fatal injury	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
32	2830947	2011	4:38 PM	18-Oct-2011	Property damage only (none ir	Sideswipe, oppo	V1:Westbound / V2:Eastbound	Dry	Daylight	Clear
33	2843447	2011	7:55 PM	13-Dec-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Northbound	Dry	Other	Clear
34	2891149	2012	11:20 AM	06-Jan-2012	Property damage only (none ir	Angle	V1:Westbound / V2:Eastbound	Dry	Daylight	Cloudy
35	2891177	2012	1:26 AM	17-Jan-2012	Property damage only (none ir	Angle	V1:Southbound / V2:Not reported	Snow	Dark - lighted rc	Snow
36	2892011	2012	2:18 PM	20-Jan-2012	Property damage only (none ir	Angle	V1:Northbound / V2:Westbound	Dry	Daylight	Clear
37	2933907	2012	5:05 PM	08-Feb-2012	Property damage only (none ir	Angle	V1:Westbound / V2:Southbound	Dry	Dusk	Clear

## 2010-2012\_Rte109-KmartShell

OBJECT ID	Crash Number	Crash Year	Crash Time	Date	Crash Severity	Manner of Collision	Vehicle Traveled Direction	Road Surface Condition	Ambient Light Conditions	Weather Condition
38	3004232	2012	10:51 AM	24-Mar-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Cloudy
39	3117913	2012	10:00 PM	03-May-2012	Non-fatal injury	Angle	V1:Northbound / V2:Eastbound	Dry	Dark - lighted rc	Clear
40	3223737	2012	6:51 AM	19-Jul-2012	Property damage only (none ir	Angle	V1:Northbound / V2:Eastbound	Dry	Daylight	Cloudy
41	3156426	2012	11:13 AM	24-Jun-2012	Not Reported	Angle	V1:Westbound	Dry	Daylight	Clear
42	3223674	2012	6:43 PM	05-Jul-2012	Property damage only (none ir	Single vehicle cr	V1:Eastbound	Dry	Daylight	Clear
43	3223747	2012	8:21 PM	25-Jul-2012	Not Reported	Angle	V1:Not reported	Dry	Dark - lighted rc	Clear
44	3265272	2012	5:51 PM	18-Sep-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Southbound	Wet	Daylight	Rain
45	3299674	2012	2:55 PM	29-Nov-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
46	3323475	2012	5:31 PM	07-Dec-2012	Non-fatal injury	Angle	V1:Westbound / V2:Eastbound	Wet	Dark - lighted rc	Rain
47	3323520	2012	2:37 PM	19-Dec-2012	Property damage only (none ir	Angle	V1:Westbound / V2:Eastbound	Dry	Daylight	Cloudy
48	3323542	2012	12:14 PM	29-Dec-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Cloudy
49	3323545	2012	11:38 AM	30-Dec-2012	Not Reported	Unknown	V1:Not reported	Snow	Daylight	Cloudy

## 2010-2012Rte109-Beaver

Object ID	Crash Number	Crash Year	Crash Time	Date	Crash Severity	Manner of Collision	Vehicle Traveled Direction	Road		Weather Conditions
								Surface Condition	Ambient Light Conditions	
1	2730746	2010	3:30 PM	09-Jan-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Southbound	Dry	Daylight	Clear
2	2593041	2010	5:23 PM	20-Jan-2010	Property damage only (none ir	Rear-end	V1:Westbound / V2:Westbound / V3:	Dry	Dark - lighted roadway	Clear
3	2602728	2010	1:01 PM	03-Feb-2010	Property damage only (none ir	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Cloudy
4	2602745	2010	5:53 PM	11-Feb-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Dark - lighted roadway	Clear
5	2604377	2010	6:25 PM	14-Apr-2010	Property damage only (none ir	Head-on	V1:Westbound / V2:Eastbound	Dry	Daylight	Clear
6	2604611	2010	10:10 PM	17-Apr-2010	Property damage only (none ir	Head-on	V1:Westbound / V2:Eastbound	Wet	Dark - lighted roadway	Rain
7	2605390	2010	7:14 AM	12-May-2010	Non-fatal injury	Angle	V1:Northbound / V2:Southbound	Dry	Daylight	Clear
8	2605740	2010	5:13 PM	26-May-2010	Property damage only (none ir	Angle	V1:Southbound / V2:Eastbound	Dry	Daylight	Clear
9	2829980	2010	5:17 PM	30-Jul-2010	Property damage only (none ir	Angle	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear
10	2829968	2010	9:26 PM	24-Jul-2010	Non-fatal injury	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Dark - lighted roadway	Clear
11	2830016	2010	12:56 PM	15-Aug-2010	Unknown	Angle	V1:Not reported / V2:Southbound	Dry	Daylight	Clear
12	2830235	2010	10:43 AM	23-Aug-2010	Property damage only (none ir	Angle	V1:Southbound / V2:Eastbound	Wet	Daylight	Rain
13	2830281	2010	5:01 PM	10-Sep-2010	Property damage only (none ir	Angle	V1:Westbound / V2:Southbound	Dry	Daylight	Clear
14	2830329	2010	8:20 AM	05-Oct-2010	Property damage only (none ir	Angle	V1:Northbound / V2:Eastbound	Wet	Daylight	Rain
15	2831066	2011	3:52 PM	03-Mar-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear
16	2830736	2011	5:10 PM	03-Jan-2011	Property damage only (none ir	Angle	V1:Westbound / V2:Eastbound / V3:E	Dry	Dark - lighted roadway	Clear
17	2831090	2011	11:07 AM	09-Jan-2011	Property damage only (none ir	Sideswipe, same di	V1:Northbound / V2:Southbound	Dry	Daylight	Clear
18	2831263	2011	2:57 PM	13-Jan-2011	Property damage only (none ir	Sideswipe, same di	V1:Southbound	Dry	Daylight	Clear
19	2830556	2011	3:49 PM	20-Jan-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Northbound	Dry	Daylight	Clear
20	2831138	2011	11:12 AM	19-Apr-2011	Property damage only (none ir	Angle	V1:Southbound / V2:Westbound	Dry	Daylight	Cloudy
21	2831285	2011	3:32 PM	06-May-2011	Property damage only (none ir	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear
22	2830509	2011	12:40 PM	24-Jun-2011	Property damage only (none ir	Angle	V1:Not reported / V2:Eastbound	Unknown	Daylight	Unknown
23	2830540	2011	11:02 AM	28-Jun-2011	Property damage only (none ir	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear
24	2830760	2011	7:56 AM	15-Aug-2011	Non-fatal injury	Angle	V1:Southbound / V2:Eastbound	Wet	Daylight	Rain
25	2830821	2011	2:36 PM	01-Sep-2011	Property damage only (none ir	Angle	V1:Westbound / V2:Westbound	Dry	Daylight	Clear
26	3324518	2011	9:35 AM	22-Nov-2011	Property damage only (none ir	Sideswipe, same di	V1:Westbound / V2:Westbound / V3:	Dry	Daylight	Clear
27	3324650	2011	1:55 PM	02-Dec-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Northbound	Dry	Daylight	Clear
28	3324652	2011	7:29 PM	02-Dec-2011	Not Reported	Angle	V1:Not reported	Dry	Dark - lighted roadway	Clear
29	3324657	2011	2:43 PM	07-Dec-2011	Property damage only (none ir	Rear-end	V1:Eastbound / V2:Eastbound	Wet	Daylight	Rain
30	2843369	2011	12:34 PM	28-Dec-2011	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
31	3156389	2012	3:03 PM	08-Jun-2012	Property damage only (none ir	Angle	V1:Westbound / V2:Southbound	Dry	Daylight	Clear
32	2891146	2012	5:51 PM	05-Jan-2012	Property damage only (none ir	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Dark - lighted roadway	Clear
33	2892003	2012	6:41 AM	18-Jan-2012	Property damage only (none ir	Angle	V1:Southbound / V2:Westbound	Dry	Dawn	Clear
34	2892017	2012	9:04 AM	23-Jan-2012	Property damage only (none ir	Rear-end	V1:Westbound	Dry	Daylight	Clear
35	2892027	2012	3:00 PM	26-Jan-2012	Property damage only (none ir	Angle	V1:Eastbound	Wet	Daylight	Rain
36	2933918	2012	5:40 PM	17-Feb-2012	Property damage only (none ir	Rear-end	V1:Southbound / V2:Eastbound	Dry	Dark - lighted roadway	Clear
37	2933929	2012	3:15 PM	28-Feb-2012	Property damage only (none ir	Angle	V1:Northbound / V2:Southbound	Dry	Daylight	Clear
38	3004212	2012	12:35 PM	15-Mar-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Northbound	Dry	Daylight	Cloudy
39	3057051	2012	5:55 PM	01-Apr-2012	Property damage only (none ir	Rear-end	V1:Southbound / V2:Southbound	Wet	Daylight	Rain
40	3117781	2012	9:33 AM	12-May-2012	Non-fatal injury	Angle	V1:Southbound / V2:Westbound	Dry	Daylight	Clear
41	3117871	2012	5:25 PM	18-May-2012	Property damage only (none ir	Angle	V1:Southbound / V2:Southbound	Dry	Daylight	Clear

2010-2012Rte109-Beaver

Object ID	Crash Number	Crash Year	Crash Time	Date	Crash Severity	Manner of Collision	Vehicle Traveled Direction	Road		Weather Conditions
								Surface Condition	Ambient Light Conditions	
42	3117880	2012	5:09 PM	23-May-2012	Property damage only (none ir	Rear-end	V1:Westbound / V2:Westbound	Dry	Daylight	Clear
43	3156371	2012	2:43 PM	04-Jun-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Wet	Daylight	Rain
44	3223751	2012	6:55 AM	30-Jul-2012	Property damage only (none ir	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear
45	3247974	2012	1:12 PM	18-Aug-2012	Property damage only (none ir	Single vehicle crast	V1:Northbound	Dry	Daylight	Cloudy
46	3248003	2012	9:21 AM	30-Aug-2012	Property damage only (none ir	Angle	V1:Westbound / V2:Eastbound	Dry	Daylight	Clear
47	3265247	2012	2:22 PM	04-Sep-2012	Property damage only (none ir	Sideswipe, same di	V1:Eastbound / V2:Eastbound	Wet	Daylight	Rain/Cloudy
48	3265261	2012	9:47 AM	14-Sep-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Westbound	Dry	Daylight	Clear
49	3285588	2012	5:59 PM	10-Oct-2012	Property damage only (none ir	Sideswipe, same di	V1:Southbound / V2:Southbound / V3	Wet	Daylight	Cloudy
50	3299785	2012	2:15 PM	10-Nov-2012	Property damage only (none ir	Angle	V1:Eastbound / V2:Northbound	Dry	Daylight	Clear

## INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Milford COUNTY : DA DATE : 3/10/2014

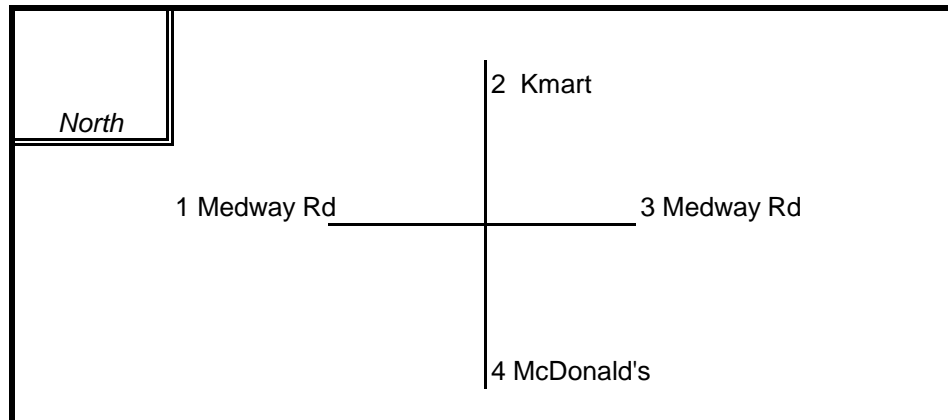
DISTRICT : 3 UNSIGNALIZED :  SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Medway Road

MINOR STREET(S) : Kmart/ McDonald's Driveways

**INTERSECTION  
 DIAGRAM  
 (Label Approaches)**



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	SB	WB	NB		
PEAK HOURLY VOLUMES (AM/PM) :	689	108	508	74		1,379

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

**CRASH RATE CALCULATION :**

**2.92**

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : High-crash location, ranks 34th on the 2012 Top-200 Intersection Crash List

Project Title & Date: Safety and Operations Analysis at Selected Intersections



## INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Milford COUNTY : 3/10/2014

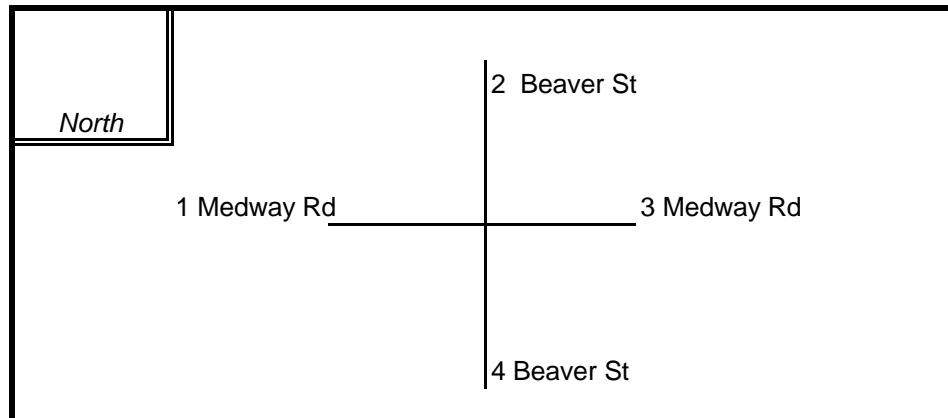
DISTRICT : 3 UNSIGNALIZED :  SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Medway Road

MINOR STREET(S) : Beaver St

**INTERSECTION  
 DIAGRAM  
 (Label Approaches)**



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	SB	WB	NB		
PEAK HOURLY VOLUMES (AM/PM) :	692	627	774	489		<b>2,582</b>

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

**CRASH RATE CALCULATION :**  RATE =  $\frac{(A * 1,000,000)}{(V * 365)}$

Comments : \_\_\_\_\_

Project Title & Date: Safety and Operations Analysis at Selected Intersections

Crash Data for Collision Diagram (2011 to 2013)

Collision ID	Crash Year	Crash Time	Crash Date1	Crash Severity	Manner of Collision	Road Surface	Ambient Light	Weather Condition	Vehicle Action	Vehicle Composition
1	2011	2:43 PM	07-Dec-2011	Property damage only (n	Rear-end	Wet	Daylight	Rain	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	
2	2011	1:07 PM	22-Aug-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Entering traffic lane / V2:Travelling st	V1: Passenger car / V2:Passenger car
3	2011	7:31 AM	07-Jul-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight ah	V1: Passenger car / V2:Passenger car
4	2011	4:23 PM	30-Dec-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Entering traffic lane / V2: Traveling straight ahead	
5	2012	5:47 PM	08-Dec-2012	Property damage only (n	Angle	Wet	Daylight	Cloudy	V1: Entering traffic lane / V2: Travelling straight ahead	
6	2013	2:47 PM	03-Sep-2013	Non-fatal injury	Angle	Dry	Daylight	Cloudy	V1: Turning left / V2:Travelling straight ahead	
7	2013	3:48 PM	15-Aug-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Turning left	
8	2012	6:41 AM	18-Jan-2012	Property damage only (n	Angle	Dry	Dawn	Clear	V1: Turning left / V2:Travelling straight ahead	
9	2013	5:39 PM	12-Feb-2013	Property damage only (n	Rear-end	Dry	Dark - lighted rc	Clear	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	
10	2013	1:53 PM	28-Mar-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Entering traffic lane / V2: Travelling straight ahead	
11	2013	1:22 PM	24-Mar-2013	Property damage only (n	Rear-end	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3: Traveling straight ahead	
12	2013	10:48 AM	19-Mar-2013	Non-fatal injury	Angle	Wet	Daylight	Freezing rain	V1: Travelling straight ahead / V2:Turning left	
13	2013	1:58 PM	03-Mar-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Turning left	
14	2013	4:30 PM	13-Mar_2013	Property damage only (n	Rear-end	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3: Traveling straight ahead	
15	2013	6:25 AM	22-May-2013	Property damage only (n	Angle	Wet	Daylight	Cloudy	V1: Travelling straight ahead / V2:Turning right	
16	2013	5:12 PM	30-May-2013	Property damage only (n	Sideswipe, same	Dry	Daylight	Clear	V1: Changing traffic lane / V2 Traveling straight ahead	
17	2013	6:31 PM	02-Aug-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight ahead	
18	2013	4:07 PM	17-Nov-2013	Property damage only (n	Angle	Wet	Daylight	Rain	V1: Turning left / V2:Travelling straight ahead	
19	2013	8:34 PM	29-Nov-2013	Property damage only (n	Angle	Dry	Dark - lighted rc	Clear	V1: Travelling straight ahead / V2:Entering traffic lane	
20	2013	1:53 PM	05-Dec-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Entering traffic lane / V2: Travelling straight ahead	
21	2011	3:49 PM	20-Jan-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Turning left	
22	2011	5:10 PM	03-Jan-2011	Property damage only (n	Angle	Dry	Dark - lighted rc	Clear	V1: Turning left / V2:Travelling straight ahead / V3:Parked	
23	2011	3:00 PM	05-Apr-2011	Property damage only (n	Angle	Wet	Daylight	Rain	V1: Travelling straight ahead / V2:Turning	V1: Passenger car / V2:Passenger car
24	2011	7:56 AM	15-Aug-2011	Non-fatal injury	Angle	Wet	Daylight	Rain	V1: Turning left / V2:Travelling straight ahead	
25	2011	1:55 PM	02-Dec-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Turning left	
26	2012	5:40 PM	17-Feb-2012	Property damage only (n	Rear-end	Dry	Dark - lighted rc	Clear	V1: Travelling straight ahead / V2:Stopped in traffic	
27	2012	12:35 PM	15-Mar-2012	Property damage only (n	Angle	Dry	Daylight	Cloudy	V1: Travelling straight ahead / V2:Entering traffic lane	
28	2012	2:43 PM	04-Jun-2012	Property damage only (n	Angle	Wet	Daylight	Rain	V1: Travelling straight ahead / V2:Entering traffic lane	
29	2012	6:55 AM	30-Jun-2012	Property damage only (n	Rear-end	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Stopped in traffic	
30	2012	6:51 AM	19-Jul-2012	Property damage only (n	Angle	Dry	Daylight	Wet	V1: Travelling straight ahead / V2:Entering traffic lane	
31	2012	9:21 AM	30-Aug-2012	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Turning left	
32	2012	2:15 PM	10-Nov-2012	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Entering traffic lane	
33	2011	11:07 AM	09-Jan-2011	Property damage only (n	Sideswipe, same	Dry	Daylight	Clear	V1: Turning right / V2:Turning left	
34	2012	9:04 PM	23-Jan-2012	Property damage only (n	Rear-end	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Traveling straight ahead	
35	2011	2:57 PM	13-Jan-2011	Property damage only (n	Sideswipe, same	Dry	Daylight	Clear	V1: Turning left	
36	2012	6:41 PM	17-Feb-2012	Property damage only (n	Rear-end	Dry	Dark - lighted rc	Clear	V1:Travelling straight ahead / V2:Slowing or stopped in traffic / V3: Slowing or stopped in traff	
37	2012	5:02 PM	02-Feb-2012	Property damage only (n	Angle	Wet	Dark - lighted rc	Rain	V1: Travelling straight ahead / V2:Turning left	
38	2013	3:10 PM	30-Mar-2013	Non-fatal injury	Rear-end	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Traveling straight ahead	
39	2011	3:52 PM	03-Mar-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning right / V2:Turning left	
40	2012	5:55 PM	01-Apr-2012	Property damage only (n	Rear-end	Wet	Daylight	Rain	V1: Slowing or stopped in traffic / V2:Traveling straight ahead	
41	2013	12:30 PM	31-May-2013	Non-fatal injury	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight ahead	
42	2011	3:32 PM	06-May-2011	Property damage only (n	Rear-end	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	
43	2012	9:33 AM	12-May-2012	Non-fatal injury	Angle	Dry	Daylight	Clear	V1: Turning right / V2:Traveleling straight ahead	
44	2013	6:04 PM	14-Jun-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning right / V2:Traveleling straight ahead	
45	2011	11:02 AM	28-Jun-2011	Property damage only (n	Rear-end	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	

Crash Data for Collision Diagram (2011 to 2013)

Collision ID	Crash Year	Crash Time	Crash Date1	Crash Severity	Manner of Collision	Road Surface	Ambient Light	Weather Condition	Vehicle Action	Vehicle Composition
46	2012	3:03 PM	08-Jun-2012	Property damage only (n	Angle	Dry	Daylight	Clear	V1:Traveleing straight ahead / V2: Turning right	
47	2011	2:36 PM	01-Sep-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning right / V2:Turning right	
48	2012	9:47 AM	14-Sep-2012	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight ahead	
51	2011	11:53 AM	26-Jun-2011	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight at	V1: Passenger car / V2:Passenger car
52	2011	1:03 PM	24-Jun-2011	Property damage only (n	Angle	Dry	Daylight	Clear/Cloudy	V1: Turning left / V2:Travelling straight at	V1: Passenger car / V2:Passenger car
54	2011	1:11 PM	08-Oct-2011	Non-fatal injury	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight at	V1: Truck/trailer / V2:Passenger car
55	2011	4:38 PM	18-Oct-2011	Property damage only (n	Sideswipe, oppo	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight at	V1: Passenger car / V2:Passenger car
56	2012	11:20 AM	06-Jan-2012	Property damage only (n	Angle	Dry	Daylight	Cloudy	V1: Travelling straight ahead / V2:Turning	V1: Passenger car / V2:Passenger car
57	2012	10:51 AM	24-Mar-2012	Property damage only (n	Angle	Dry	Daylight	Cloudy	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Passenger car
58	2012	10:00 PM	03-May-2012	Non-fatal injury	Angle	Dry	Dark - lighted rc	Clear	V1: Travelling straight ahead / V2:Turning	V1: Passenger car / V2:Passenger car
59	2012	7:52 AM	02-May-2012	Non-fatal injury	Sideswipe, same	Dry	Daylight	Cloudy	V1: Travelling straight ahead / V2:Travelli	V1: Passenger car / V2:Passenger car
60	2012	2:55 PM	29-Nov-2012	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight at	V1: Passenger car / V2:Light truck(van, mini-van, pan
61	2012	12:14 PM	29-Dec-2012	Property damage only (n	Angle	Dry	Daylight	Cloudy	V1: Slowing or stopped in traffic / V2:Tra	V1: Passenger car / V2:Tractor and semi-trailor
62	2012	2:37 PM	19-Dec-2012	Property damage only (n	Angle	Dry	Daylight	Cloudy	V1: Travelling straight ahead / V2:Turning	V1: Passenger car / V2:Passenger car
63	2012	5:31 PM	07-Dec-2012	Property damage only (n	Angle	Wet	Dark - lighted rc	Rain	V1: Travelling straight ahead / V2:Turning	V1: Passenger car / V2:Passenger car
64	2013	12:11 PM	04-Jan-2013	Non-fatal injury	Angle	Dry	Dark - lighted rc	Clear	V1: Turning left / V2:Travelling straight at	V1: Passenger car / V2:Passenger car
65	2013	6:43 PM	13-Apr-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Slowing or stopped in traffic / V2:Unk	V1: Passenger car / V2:Unknown
66	2013	12:30 PM	22-Jul-2013	Property damage only (n	Angle	Dry	Daylight	Clear	V1: Turning left / V2:Travelling straight at	V1: Passenger car / V2:Passenger car
67	2013	11:50 PM	02-Aug-2013	Non-fatal injury	Sideswipes	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Travelli	V1:Other / V2: Passenger car
68	2013	3:17 PM	14-Aug-2013	Non-fatal injury	Angle	Dry	Daylight	Clear	V1: Travelling straight ahead / V2:Turning	V1: Passenger car / V2:Passenger car



# **APPENDIX 8**

## **Level of Service Analysis**

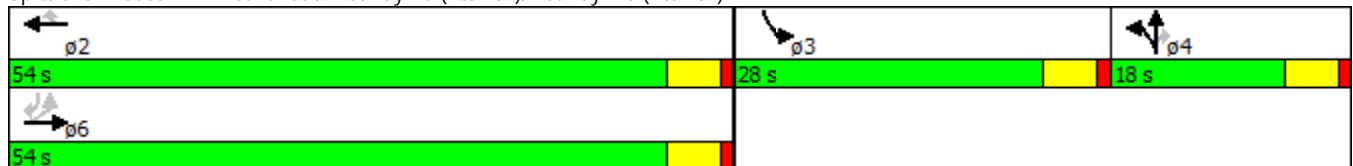
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	340	0	0	775	375	20	75	90	220	0	55
Satd. Flow (prot)	0	3399	0	0	3406	1524	1703	1792	1524	3303	0	1524
Flt Permitted		0.913					0.950			0.950		
Satd. Flow (perm)	0	3109	0	0	3406	1524	1703	1792	1524	3303	0	1524
Satd. Flow (RTOR)						391			94			76
Adj. Flow (vph)	16	354	0	0	807	391	21	78	94	229	0	57
Lane Group Flow (vph)	0	370	0	0	807	391	21	78	94	229	0	57
Turn Type	Perm	NA			NA	Perm	Split	NA	Perm	Prot		Perm
Protected Phases		6			2		4	4		3		
Permitted Phases	6					2			4			6
Total Split (s)	54.0	54.0			54.0	54.0	18.0	18.0	18.0	28.0		54.0
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	5.0	5.0		5.0
Act Effct Green (s)		49.3			49.3	49.3	9.2	9.2	9.2	16.1		49.3
Actuated g/C Ratio		0.57			0.57	0.57	0.11	0.11	0.11	0.18		0.57
v/c Ratio		0.21			0.42	0.38	0.12	0.41	0.39	0.38		0.06
Control Delay		10.6			12.5	2.4	37.3	44.2	13.2	34.4		1.8
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay		10.6			12.5	2.4	37.3	44.2	13.2	34.4		1.8
LOS		B			B	A	D	D	B	C		A
Approach Delay		10.6			9.2			28.3				
Approach LOS		B			A			C				
Queue Length 50th (ft)		52			132	0	11	42	0	59		0
Queue Length 95th (ft)		84			192	42	33	85	43	97		12
Internal Link Dist (ft)		266			400			487			431	
Turn Bay Length (ft)						200	150		150	200		200
Base Capacity (vph)		1759			1927	1032	255	269	308	877		895
Starvation Cap Reductn		0			0	0	0	0	0	0		0
Spillback Cap Reductn		0			0	0	0	0	0	0		0
Storage Cap Reductn		0			0	0	0	0	0	0		0
Reduced v/c Ratio		0.21			0.42	0.38	0.08	0.29	0.31	0.26		0.06

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 87.1  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.42  
 Intersection Signal Delay: 13.9  
 Intersection Capacity Utilization 53.0%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 1: Beaver St & Medway Rd (Rte 109)/Medway Rd (Rte 109)

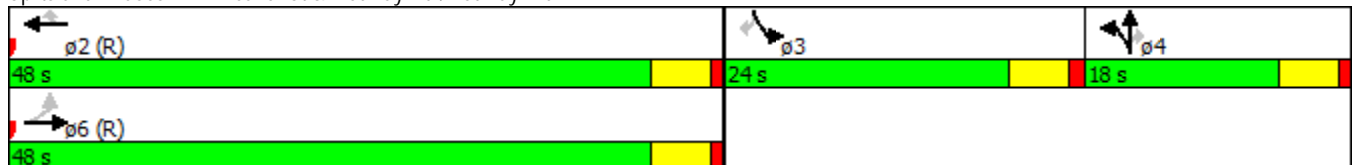


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	625	0	0	510	270	35	75	385	510	0	120
Satd. Flow (prot)	0	3522	0	0	3539	1583	1770	1863	1583	3433	0	1583
Flt Permitted		0.828					0.950			0.950		
Satd. Flow (perm)	0	2930	0	0	3539	1583	1770	1863	1583	3433	0	1583
Satd. Flow (RTOR)						293			127			130
Adj. Flow (vph)	76	679	0	0	554	293	38	82	418	554	0	130
Lane Group Flow (vph)	0	755	0	0	554	293	38	82	418	554	0	130
Turn Type	Perm	NA			NA	Perm	Split	NA	Perm	Prot		Perm
Protected Phases		6			2		4	4		3		
Permitted Phases	6					2			4			3
Total Split (s)	48.0	48.0			48.0	48.0	18.0	18.0	18.0	24.0		24.0
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	5.0	5.0		5.0
Act Effct Green (s)		43.0			43.0	43.0	13.9	13.9	13.9	18.1		18.1
Actuated g/C Ratio		0.48			0.48	0.48	0.15	0.15	0.15	0.20		0.20
v/c Ratio		0.54			0.33	0.32	0.14	0.29	1.19	0.80		0.31
Control Delay		18.3			15.2	2.7	35.1	37.3	137.2	44.0		7.8
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay		18.3			15.2	2.7	35.1	37.3	137.2	44.0		7.8
LOS		B			B	A	D	D	F	D		A
Approach Delay		18.3			10.9			114.8				
Approach LOS		B			B			F				
Queue Length 50th (ft)		152			98	0	19	42	-232	153		0
Queue Length 95th (ft)		206			135	41	48	85	#416	211		45
Internal Link Dist (ft)		266			400			491			640	
Turn Bay Length (ft)							200			200		200
Base Capacity (vph)		1399			1690	909	272	287	351	724		436
Starvation Cap Reductn		0			0	0	0	0	0	0		0
Spillback Cap Reductn		0			0	0	0	0	0	0		0
Storage Cap Reductn		0			0	0	0	0	0	0		0
Reduced v/c Ratio		0.54			0.33	0.32	0.14	0.29	1.19	0.77		0.30

**Intersection Summary**

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.19  
 Intersection Signal Delay: 39.0  
 Intersection LOS: D  
 Intersection Capacity Utilization 69.4%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Beaver St & Medway Rd /Medway Rd



Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	20	315	30	35	800	20	0	0	0	0	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	6	6	6	6	6	6	2	2	2	2	2	2
Mvmt Flow	21	328	31	36	833	21	0	0	0	0	0	21
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	854	0	0	359	0	0	1123	1318	427			
Stage 1	-	-	-	-	-	-	917	917	-			
Stage 2	-	-	-	-	-	-	206	401	-			
Critical Hdwy	4.22	-	-	4.22	-	-	6.84	6.54	6.94			
Critical Hdwy Stg 1	-	-	-	-	-	-	5.84	5.54	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	5.84	5.54	-			
Follow-up Hdwy	2.26	-	-	2.26	-	-	3.52	4.02	3.32			
Pot Cap-1 Maneuver	756	-	-	1168	-	-	199	156	576			
Stage 1	-	-	-	-	-	-	350	349	-			
Stage 2	-	-	-	-	-	-	808	599	-			
Platoon blocked, %	-	-	-	-	-	-	-	-	-			
Mov Cap-1 Maneuver	756	-	-	1168	-	-	181	0	576			
Mov Cap-2 Maneuver	-	-	-	-	-	-	181	0	-			
Stage 1	-	-	-	-	-	-	329	0	-			
Stage 2	-	-	-	-	-	-	780	0	-			
Approach	EB			WB			SB					
HCM Control Delay, s	0.7			0.5			11.5					
HCM LOS							B					
Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	756	-	-	1168	-	-	576					
HCM Lane V/C Ratio	0.028	-	-	0.031	-	-	0.036					
HCM Control Delay (s)	9.9	0.2	-	8.2	0.2	-	11.5					
HCM Lane LOS	A	A	-	A	A	-	B					
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0.1					



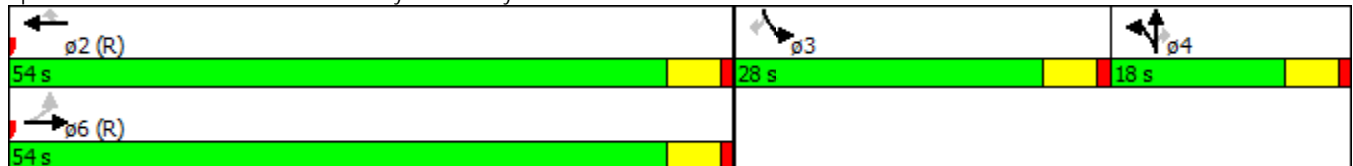
Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	90	645	30	35	595	40	0	0	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	98	701	33	38	647	43	0	0	0	0	0	120
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	690	0	0	734	0	0	1291	1674	345			
Stage 1	-	-	-	-	-	-	745	745	-			
Stage 2	-	-	-	-	-	-	546	929	-			
Critical Hdwy	4.14	-	-	4.14	-	-	6.84	6.54	6.94			
Critical Hdwy Stg 1	-	-	-	-	-	-	5.84	5.54	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	5.84	5.54	-			
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32			
Pot Cap-1 Maneuver	900	-	-	867	-	-	155	95	651			
Stage 1	-	-	-	-	-	-	430	419	-			
Stage 2	-	-	-	-	-	-	544	344	-			
Platoon blocked, %	-	-	-	-	-	-						
Mov Cap-1 Maneuver	900	-	-	867	-	-	117	0	651			
Mov Cap-2 Maneuver	-	-	-	-	-	-	117	0	-			
Stage 1	-	-	-	-	-	-	399	0	-			
Stage 2	-	-	-	-	-	-	443	0	-			
Approach	EB			WB			SB					
HCM Control Delay, s	1.7			0.8			11.8					
HCM LOS							B					
Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	900	-	-	867	-	-	651					
HCM Lane V/C Ratio	0.109	-	-	0.044	-	-	0.184					
HCM Control Delay (s)	9.5	0.7	-	9.3	0.3	-	11.8					
HCM Lane LOS	A	A	-	A	A	-	B					
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-	-	0.7					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	340	0	0	775	375	20	75	90	220	0	55
Satd. Flow (prot)	1703	1792	0	0	3406	1524	1703	1792	1524	3303	0	1524
Flt Permitted	0.292						0.950			0.950		
Satd. Flow (perm)	523	1792	0	0	3406	1524	1703	1792	1524	3303	0	1524
Satd. Flow (RTOR)						402			97			76
Adj. Flow (vph)	38	365	0	0	832	402	21	80	97	236	0	59
Lane Group Flow (vph)	38	365	0	0	832	402	21	80	97	236	0	59
Turn Type	Perm	NA			NA	Perm	Split	NA	Perm	Prot		Perm
Protected Phases		6			2		4	4		3		
Permitted Phases	6					2			4			3
Total Split (s)	54.0	54.0			54.0	54.0	18.0	18.0	18.0	28.0		28.0
Total Lost Time (s)	5.0	5.0			5.0	5.0	5.0	5.0	5.0	5.0		5.0
Act Effct Green (s)	59.2	59.2			59.2	59.2	9.8	9.8	9.8	16.0		16.0
Actuated g/C Ratio	0.59	0.59			0.59	0.59	0.10	0.10	0.10	0.16		0.16
v/c Ratio	0.12	0.34			0.41	0.38	0.13	0.46	0.41	0.45		0.19
Control Delay	11.2	12.1			12.2	2.2	41.3	50.3	14.0	41.1		7.4
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	11.2	12.1			12.2	2.2	41.3	50.3	14.0	41.1		7.4
LOS	B	B			B	A	D	D	B	D		A
Approach Delay		12.0			8.9			31.5				
Approach LOS		B			A			C				
Queue Length 50th (ft)	10	111			140	0	12	49	0	71		0
Queue Length 95th (ft)	29	185			200	41	34	92	46	108		26
Internal Link Dist (ft)		266			400			491			431	
Turn Bay Length (ft)	50						200			200		200
Base Capacity (vph)	309	1060			2017	1066	223	234	283	759		409
Starvation Cap Reductn	0	0			0	0	0	0	0	0		0
Spillback Cap Reductn	0	0			0	0	0	0	0	0		0
Storage Cap Reductn	0	0			0	0	0	0	0	0		0
Reduced v/c Ratio	0.12	0.34			0.41	0.38	0.09	0.34	0.34	0.31		0.14

**Intersection Summary**

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.46  
 Intersection Signal Delay: 15.1  
 Intersection Capacity Utilization 53.8%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 1: Beaver St & Medway Rd/Medway Rd





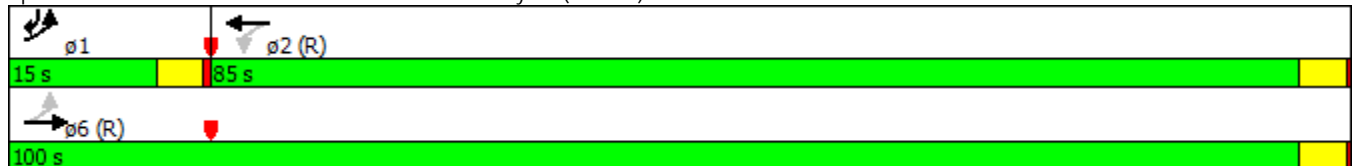


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	315	30	35	800	20	0	0	0	0	0	25
Satd. Flow (prot)	0	3355	0	0	3389	0	0	0	0	0	0	1611
Flt Permitted		0.895			0.923							
Satd. Flow (perm)	0	3011	0	0	3134	0	0	0	0	0	0	1611
Satd. Flow (RTOR)					9							275
Adj. Flow (vph)	21	338	32	38	858	21	0	0	0	0	0	27
Lane Group Flow (vph)	0	391	0	0	917	0	0	0	0	0	0	27
Turn Type	pm+pt	NA		Perm	NA							Over
Protected Phases	1	6			2							1
Permitted Phases	6			2								
Total Split (s)	15.0	100.0		85.0	85.0							15.0
Total Lost Time (s)		4.0			4.0							4.0
Act Effct Green (s)		97.6			91.9							5.5
Actuated g/C Ratio		0.98			0.92							0.06
v/c Ratio		0.13			0.32							0.08
Control Delay		0.2			0.9							0.4
Queue Delay		0.0			0.1							0.0
Total Delay		0.2			1.0							0.4
LOS		A			A							A
Approach Delay		0.2			1.0							
Approach LOS		A			A							
Queue Length 50th (ft)		0			10							0
Queue Length 95th (ft)		0			10							0
Internal Link Dist (ft)		398			266			104				26
Turn Bay Length (ft)												
Base Capacity (vph)		2950			2881							421
Starvation Cap Reductn		0			736							0
Spillback Cap Reductn		0			0							0
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.13			0.43							0.06

**Intersection Summary**

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.32  
 Intersection Signal Delay: 0.7  
 Intersection Capacity Utilization 41.7%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 2: McDonalds Dr/Kmart Dr & Medway Rd (Rte 109)







# LANE SUMMARY

## Site: Medway Road and Beaver Street AM

Long-Term Alternative  
 Roundabout  
 Design Life Analysis (Practical Capacity): Results for 10 years

Lane Use and Performance													
	Demand Flows			Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	Total veh/h	HV %	Cap. veh/h					Veh	Dist ft				
South: Beaver Street													
Lane 1 <sup>d</sup>	102	6.0	668	0.153	100	7.1	LOS A	0.4	10.1	Full	1600	0.0	0.0
Lane 2	97	6.0	646	0.150	98 <sup>5</sup>	7.3	LOS A	0.4	10.4	Full	1600	0.0	0.0
Approach	199	6.0		0.153		7.2	LOS A	0.4	10.4				
East: Medway Road													
Lane 1	616	6.0	954	0.646	100	13.6	LOS B	3.5	91.0	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	621	6.0	961	0.646	100	13.6	LOS B	3.3	85.9	Full	1600	0.0	0.0
Approach	1237	6.0		0.646		13.6	LOS B	3.5	91.0				
North: Beaver Street													
Lane 1	145	6.0	540	0.268	100	10.4	LOS B	0.8	19.7	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	151	6.0	565	0.268	100	10.0	LOS B	0.7	18.9	Full	1600	0.0	0.0
Approach	296	6.0		0.268		10.2	LOS B	0.8	19.7				
West: Medway Road													
Lane 1	199	6.0	732	0.272	100	8.1	LOS A	0.8	21.0	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	204	6.0	750	0.272	100	7.9	LOS A	0.8	20.0	Full	1600	0.0	0.0
Approach	404	6.0		0.272		8.0	LOS A	0.8	21.0				
Intersection	2136	6.0		0.646		11.5	LOS B	3.5	91.0				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>5</sup> Lane under-utilisation found by the program

<sup>d</sup> Dominant lane on roundabout approach



# LANE SUMMARY

## Site: Medway Road and Beaver Street PM

Long-Term Alternative  
 Roundabout  
 Design Life Analysis (Practical Capacity): Results for 10 years

Lane Use and Performance													
	Demand Flows			Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	Total veh/h	HV %	Cap. veh/h					Veh	Dist ft				
South: Beaver Street													
Lane 1	268	2.0	364	0.735	100	36.5	LOS E	3.2	81.8	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	288	2.0	392	0.735	100	34.4	LOS D	3.2	80.3	Full	1600	0.0	0.0
Approach	556	2.0		0.735		35.4	LOS E	3.2	81.8				
East: Medway Road													
Lane 1	435	2.0	879	0.495	100	10.5	LOS B	2.2	54.6	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	441	2.0	892	0.495	100	10.4	LOS B	2.0	51.8	Full	1600	0.0	0.0
Approach	876	2.0		0.495		10.5	LOS B	2.2	54.6				
North: Beaver Street													
Lane 1	348	2.0	694	0.502	100	12.8	LOS B	2.1	53.3	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	359	2.0	716	0.502	100	12.5	LOS B	2.0	51.0	Full	1600	0.0	0.0
Approach	707	2.0		0.502		12.7	LOS B	2.1	53.3				
West: Medway Road													
Lane 1	459	2.0	607	0.757	100	25.8	LOS D	4.5	115.1	Full	1600	0.0	0.0
Lane 2 <sup>d</sup>	478	2.0	632	0.757	100	25.0	LOS C	4.4	111.4	Full	1600	0.0	0.0
Approach	938	2.0		0.757		25.4	LOS D	4.5	115.1				
Intersection	3077	2.0		0.757		20.0	LOS C	4.5	115.1				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach



# **APPENDIX 9**

## **Roundabout Proposal**



## MEMORANDUM

**DATE:** June 17, 2009

**TO:** Mr. Larry L. Dunkin, AICP – Town Planner

**FROM:** Douglas C. Prentiss, P.E., PTOE/Sarah E. Weimer

**SUBJECT:** Beaver Street Round-About Feasibility Study- Milford, Massachusetts

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## INTRODUCTION

Fay Spofford & Thorndike (FST) has been contracted by the Town of Milford to conduct a Feasibility Study for assessing the roadway network for a proposed roundabout at the Medway Street (Route 109)/Beaver Street signalized intersection in Milford, Massachusetts. The intent of this circulation change is to provide direct access to the Bear Hill Industrial Area from Medway Street in the I-495 area. Presently Beaver Street is one-way northbound at this intersection, so only egress is provided from the Bear Hill Industrial Area at this location. All other legs at this intersection are two-way. Access and egress to the Bear Hill Industrial Area is provided via the signalized intersection of Medway Street (Route 109)/Birch Street. This intersection is approximately ½ mile west of the Beaver Street location, thus a significant number of drivers destined for the Bear Hill Industrial Area who travel on this section of Medway Street, could otherwise enter the Industrial Area via Beaver Street.

To gain insight with the vehicle operations in the area, a field reconnaissance was conducted of the area on May 14, 2009 to collect signal timing and phasing information, roadway and lane widths, identify traffic control features and area land uses.

Documents available to us for this study that have been completed in the area, include:

- *Technical Memorandum- South Central Estates II*; Gillon Associates; February 8, 2000;
- *Traffic Impact & Access Study-Proposed Quarry Place*; MS transportation Systems, Inc. May 2003;
- *Traffic Impact Assessment-; Proposed Housing Subdivision on Beaver Street*; Gillon Associates; November, 2004

## EXISTING CONDITIONS

### *Medway Street (Route 109)/Beaver Street*

The Medway Street (Route 109)/Beaver Street intersection is presently signalized and operates with split phasing for the north and southbound approaches. Land use in the area consists of vacant land in the southeast quadrant, a McDonalds restaurant on the southwest quadrant, a Mobil gas station on the northwest corner and a Burger King on the northeast corner of the intersection. Pedestrian accommodations are provided at this intersection.

*Medway Street (Route 109)/I-495 Southbound Ramps*

This signalized intersection is approximately 450 feet east of the Medway Street/Beaver Street intersection, and provides access to/from the southbound ramps. Land use is vacant in all quadrants at the intersection. The lane configuration at these intersections is shown in Table 1.

Table 1 – Intersection Configurations				
Intersection	Intersection Approaches			
	Northbound	Southbound	Eastbound	Westbound
Medway/Beaver	- One left turn lane -One through lane -One right turn lane	-Two left turn lanes -One right turn lane	-One through lane -One shared through/left turn lane	-One right turn lane -Two through lanes
Medway/I-495 SB Ramps	NA	-Two left turn lanes -One free right turn lane under yield control	-Two through lanes - -One free right turn lane to I-495 southbound, not under the signal system	-One left turn lane -Two through lanes

NA = not applicable. Departure lanes only

**PROPOSED CONDITIONS**

The configuration of the intersection of Medway Street (Route 109)/I-495 Southbound Ramps will remain unchanged. However the Medway Street (Route 109)/Beaver Street will be considered for a two-lane roundabout. This proposed scheme can be seen in Figure 1. The alignment of the roundabout is shifted to the south so that a portion of the vacant land in the southeast quadrant is utilized, as well as a portion of the McDonald’s parcel, which is under re-development. All approaches to the roundabout are proposed to be two-lane.

**ANALYSIS**

For the analysis to follow, it should be pointed out that AM and PM traffic data for this assessment was derived from the traffic studies noted above to create the 2009 Existing Conditions.

To analyze the 2009 Existing Conditions and the 2009 Build Conditions with roundabout, traffic analysis was conducted using procedures outlined in the Highway Capacity Manual (HCM) and SimTraffic. The critical element in this analysis is the limiting distance between the two intersections and the re-assignment of turning traffic to the Beaver Street intersection. The critical distance (425') is westbound in the morning at the Medway Street (Route 109)/Beaver Street intersection and eastbound in the evening peak hour (450') at the Medway Street (Route 109)/I-495 Southbound Ramps. Analysis results showing Level of Service and vehicle queues at these intersections are show in Table 2 for the 2009 Existing Condition and results indicate no back-ups or vehicle queuing into adjacent intersections.

For the 2009 Build Conditions with roundabout, the analysis results are shown in Table 3. It should be pointed out that only the critical eastbound through and westbound through

movements are shown in Table 3 as these movements have the respective limiting distances between intersections as noted earlier.

Intersection	Time Period	Critical Movement	Delay (sec)	95% Q (ft)	LOS
Medway/Beaver	AM/PM	WB Thru	11.3/16.4	170/130	B/B
		WB Right	2.3/3.8	39/0	A/A
		EB left/Thru	9.5/86.0	81/418+	A/F
		NB Left	38.1/28.4	37/55	D/C
		NB Thru	52.8/31.9	96+/105	D/C
		NB Right	16.1/522.2	52/690+	B/F
		SB Left	28.6/70.2	102/315+	C/E
		SB Right	7.3/6.5	41/52	A/A
		<b>OVERALL</b>	<b>13.0/120.8</b>	<b>NA</b>	<b>B/F</b>
Medway/I-495 SB Ramps	AM/PM	WB Thru	6.8/7.2	100/118	A/A
		WB Left	51.6/107.8	133+/201+	D/F
		<b>EB Thru</b>	13.5/18.6	134/265	B/B
		SB left	19.9/21.7	62/99	B/C
		<b>OVERALL</b>	<b>23.2/22.0</b>	<b>NA</b>	<b>C/C</b>

+ Vehicle queue may be longer; **bold-face** = critical movements between intersections

Intersection	Time Period	Critical Movement	Critical Distance	Maximum Queue	Delay (seconds)
Medway/Beaver	AM	WB Thru	<b>425'</b>	<b>371'</b>	7.8
	PM	WB Thru	425'	269'	103.1
Intersection	AM/PM				
Medway/I-495 SB Ramps	AM	EB Thru	450'	133'	13.5
	PM	EB Thru	<b>450'</b>	<b>265'</b>	18.6

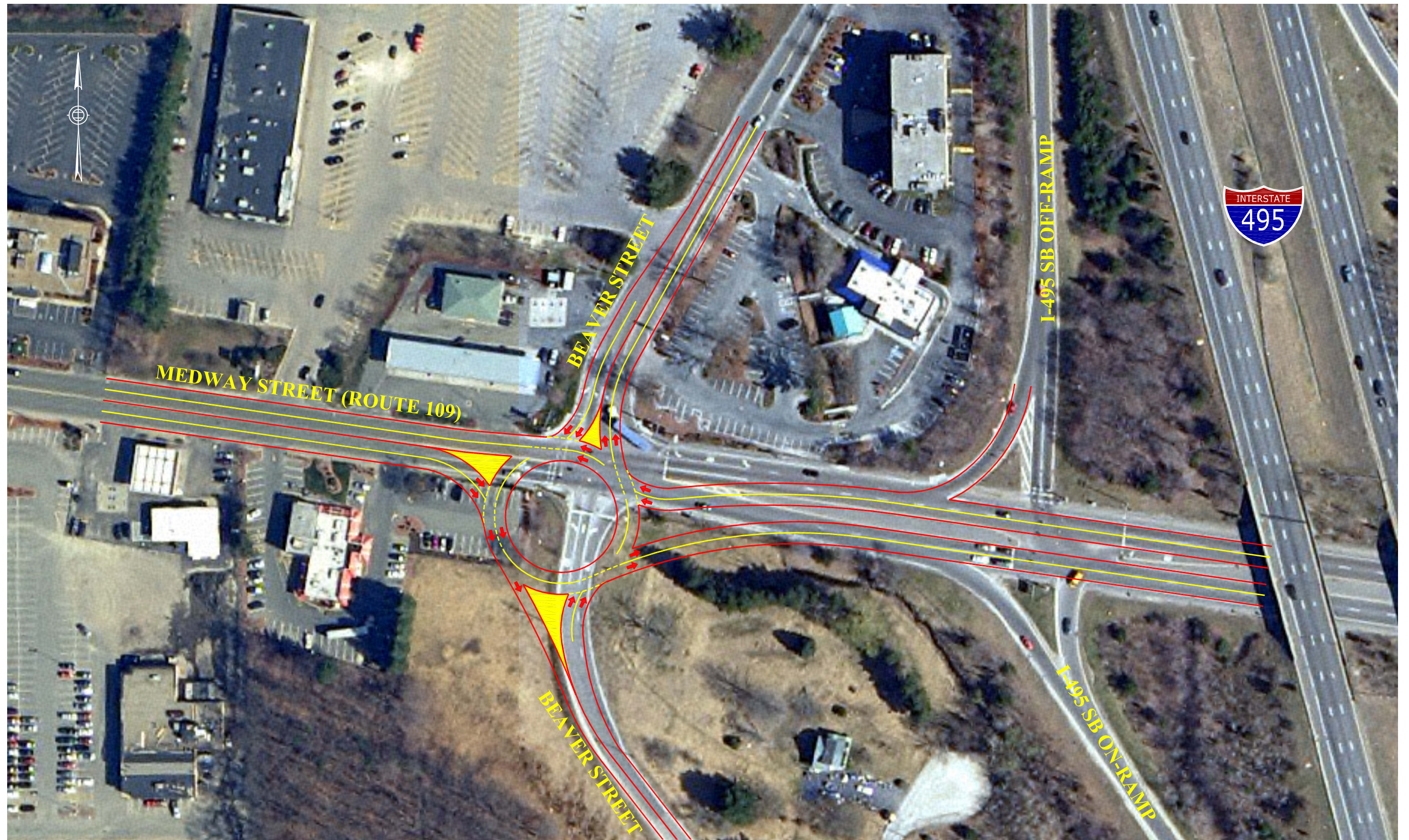
**Bold-face = critical movements between intersections**

As can be seen from Table 3, the calculated vehicle queues from the respective stop lines are within the critical distances, although vehicle delays are longer in the PM peak period.

## CONCLUSION

Based on this feasibility assessment and assumptions related to traffic diversions, it appears placement of a roundabout at the Beaver Street intersection with Medway Street is feasible. Any preliminary design should consider compliance with the MassHighway Design Guide and considerations of the volume of truck traffic traveling this corridor.











# **APPENDIX F**

**MassDOT Highway Division  
Project Development Process**

## Overview of the Project Development Process

Transportation decision making is complex and can be influenced by legislative mandates, environmental regulations, financial limitations, agency programmatic commitments, and partnering opportunities. Decision-makers and reviewing agencies, when consulted early and often throughout the project development process, can ensure that all participants understand the potential impact these factors can have on project implementation. Project development is the process that takes a transportation improvement from concept through construction.

The MassDOT Highway Division has developed a comprehensive project development process, which is contained in Chapter 2 of the *MassDOT Highway Division's Project Development and Design Guide*. The eight-step process covers a range of activities extending from identification of a project need, through completion of a set of finished contract plans, to construction of the project. The sequence of decisions made through the project development process progressively narrows the project focus and, ultimately, leads to a project that addresses the identified needs. The descriptions provided below are focused on the process for a highway project, but the same basic process will need to be followed for non-highway projects as well.

### *1. Needs Identification*

For each of the locations at which an improvement is to be implemented, MassDOT leads an effort to define the problem, establishes project goals and objectives, and defines the scope of the planning needed for implementation. To that end, it has to complete a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facility or location. The PNF documents the problems and explains why corrective action is needed. For this study, the information defining the need for the project will be drawn primarily, perhaps exclusively, from the present report. Also, at this point in the process, MassDOT meets with potential participants, such as the Metropolitan Planning Organization (MPO) and community members, to allow for an informal review of the project.

The PNF is reviewed by the MassDOT Highway Division district office whose jurisdiction includes the location of the proposed project. MassDOT also sends the PNF to the MPO, for informational purposes. The outcome of this step determines whether the project requires further planning, whether it is already well supported by prior planning studies, and, therefore, whether it is ready to move forward into the design phase, or whether it should be dismissed from further consideration.

### *2. Planning*

This phase will likely not be required for the implementation of the improvements proposed in this planning study, as this planning report should constitute the outcome of this step. However, in general, the purpose of this implementation step is for the project

proponent to identify issues, impacts, and approvals that may need to be obtained, so that the subsequent design and permitting processes are understood.

The level of planning needed will vary widely, based on the complexity of the project. Typical tasks include: define the existing context, confirm project need, establish goals and objectives, initiate public outreach, define the project, collect data, develop and analyze alternatives, make recommendations, and provide documentation. Likely outcomes include consensus on the project definition to enable it to move forward into environmental documentation (if needed) and design, or a recommendation to delay the project or dismiss it from further consideration.

### *3. Project Initiation*

At this point in the process, the proponent, MassDOT Highway Division, fills out a Project Initiation Form (PIF) for each improvement, which is reviewed by its Project Review Committee (PRC) and the MPO. The PRC is composed of the Chief Engineer, each District Highway Director, and representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge departments, and the MassDOT Federal Aid Program Office (FAPO). The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First the PRC reviews and evaluates the proposed project based on the MassDOT's statewide priorities and criteria. If the result is positive, MassDOT Highway Division moves the project forward to the design phase and to programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes project evaluation based on the MPO's regional priorities and criteria. The MPO may assign project evaluation criteria score, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

### *4. Environmental Permitting, Design, and Right-of-Way Process*

This step has four distinct but closely integrated elements: public outreach, environmental documentation and permitting (if required), design, and right-of-way acquisition (if required). The outcome of this step is a fully designed and permitted project ready for construction. However, a project does not have to be fully designed in order for the MPO to program it in the TIP. The sections below provide more detailed information on the four elements of this step of the project development process.

#### Public Outreach

Continued public outreach in the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. The public outreach is often in the form of required public hearings, but can

also include less formal dialogues with those interested in and affected by a proposed project.

#### Environmental Documentation and Permitting

The project proponent, in coordination with the Environmental Services section of the MassDOT Highway Division, will be responsible for identifying and complying with all applicable federal, state, and local environmental laws and requirements. This includes determining the appropriate project category for both the Massachusetts Environmental Protection Act (MEPA) and the National Environmental Protection Act (NEPA).

Environmental documentation and permitting is often completed in conjunction with the Preliminary Design phase described below.

#### Design

There are three major phases of design. The first is Preliminary Design, which is also referred to as the 25-percent submission. The major components of this phase include full survey of the project area, preparation of base plans, development of basic geometric layout, development of preliminary cost estimates, and submission of a functional design report. Preliminary Design, although not required to, is often completed in conjunction with the Environmental Documentation and Permitting. The next phase is Final Design, which is also referred to as the 75-percent and 100-percent submission. The major components of this phase include preparation of a subsurface exploratory plan (if required), coordination of utility relocations, development of traffic management plans through construction zones, development of final cost estimates, and refinement and finalization of the construction plans. Once Final Design is complete, a full set of Plans, Specifications, and Estimates (PS&E) is developed for the project.

#### Right-of-Way Acquisition

A separate set of Right-of-Way plans are required for any project that requires land acquisition or easements. The plans must identify the existing and proposed layout lines, easements, property lines, names of property owners, and the dimensions and areas of estimated takings and easements.

#### *5. Programming (Identification of Funding)*

Programming, which typically begins during the design phase, can actually occur at any time during the process, from planning to design. In this step, which is distinct from project initiation, the proponent requests that the MPO place the project in the region's Transportation Improvement Program (TIP). The proponent requesting the project's listing on the TIP can be the community or it can be one of the MPO member agencies (the Regional Planning Agency, MassDOT, and the Regional Transit Authority). The MPO then considers the project in terms of state and regional needs, evaluation criteria,

and compliance with the regional Transportation Plan and decides whether to place it in the draft TIP for public review and then in the final TIP.

#### *6. Procurement*

Following project design and programming of a highway project, the MassDOT Highway Division publishes a request for proposals. It then reviews the bids and awards the contract to the qualified bidder with the lowest bid.

#### *7. Construction*

After a construction contract is awarded, MassDOT Highway Division and the contractor develop a public participation plan and a management plan for the construction process.

#### *8. Project Assessment*

The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. MassDOT Highway Division can apply what is learned in this process to future projects. Table 8 gives the schematic timetable of the project development process.

## Project Development Schematic Timetable

<b>Step</b>	<b>Schedule Influence</b>	<b>Typical Duration</b>
<p><b>Step I: Problem/Need/Opportunity Identification</b></p> <p>The proponent completes a PNF. This form is reviewed by the MassDOT district office, which guides the proponent in subsequent steps of the process.</p>	<p>The PNF may be prepared quickly by the proponent to include any readily available supporting data. The district office will return comments to the proponent within one month of receiving the PNF.</p>	<p>One-to-three months</p>
<p><b>Step II: Planning</b></p> <p>Project planning can range from agreeing on a clear solution to a detailed analysis of alternatives and their impacts.</p>	<p>For some projects, no planning beyond preparation of the PNF is required. Some projects require a planning study centered on specific issues associated with a proposed solution or a narrow family of alternatives. Complex projects likely would require a detailed alternatives analysis.</p>	<p>Project Planning Report: three-to-24+ months</p>
<p><b>Step III: Project Initiation</b></p> <p>The proponent prepares and submits a PIF and a TEC form. The MPO and MassDOT district office informally review the PIF and TEC; and the PRC formally reviews them.</p>	<p>The PIF includes refinement of the preliminary information contained in the PNF. Additional information summarizing the results of the planning process, such as the project planning report, is included with the PIF and TEC. The schedule is determined by PRC staff (depending on project complexity) and meeting schedule.</p>	<p>One-to-four months</p>
<p><b>Step IV: Design, Environmental, and Right-of-Way</b></p> <p>The proponent completes the project design. Concurrently, the proponent completes necessary environmental permitting analyses and files permit applications. Any right-of-way needed for the project is identified and the acquisition process begins.</p>	<p>The schedule depends upon the size of the project and the complexity of the design, permitting, and right-of-way issues. The MassDOT district and appropriate sections complete the design review.</p>	<p>Three- to-48+ months</p>
<p><b>Step V: Programming</b></p> <p>The MPO considers the project in terms of its regional priorities and determines whether to include the project in the draft TIP, which is made available for public comment, and includes a project description and funding source.</p>	<p>The schedule for this step is subject to each MPO's programming cycle and meeting schedule. It is possible that the MPO will not include a project in its draft TIP based on its review and approval procedures.</p>	<p>Three-to-12+ months</p>

<b>Step</b>	<b>Schedule Influence</b>	<b>Typical Duration</b>
<p><b>Step VI: Procurement</b></p> <p>The project is advertised for construction and a contract is awarded.</p>	<p>Administration of competing projects can influence the advertising schedule.</p>	<p>One-to-12 months</p>
<p><b>Step VII: Construction</b></p> <p>The construction process is initiated including public notification and any anticipated public involvement. Construction continues to project completion.</p>	<p>The duration of this step is entirely dependent upon project complexity and phasing.</p>	<p>Three-to-60+ months</p>
<p><b>Step VIII: Project Assessment</b></p> <p>The construction period is complete and project elements and processes are evaluated on a voluntary basis.</p>	<p>The duration of this step is dependent upon the proponent's approach and any required follow-up.</p>	<p>One month</p>

Source: MassDOT Highway Division Project Development and Design Guide.