Attachments

- ☐ Traffic Volume Comparison (2008 vs 2014)
- ☐ Traffic Volume Data
- ☐ Seasonal Data
- ☐ Speed Study
- ☐ Sight Distance Calculations
- ☐ Crash Data
- ☐ Growth Data
- ☐ ITE Trip Generation Calculations
- ☐ Landscaping Relocation Trip Tracings
- ☐ Applicant's Letter to Planning Board
- ☐ Trip Distribution Calculations
- ☐ Capacity Analyses
- ☐ Delay Observations

□ Traffic Volume Comparison (2008 vs 2014)

Location: Main Street (Route 27) at Route 2 WB Ramp - Acton, MA
Date: Thursday, February 27, 2014
Tech(s): MDM - MHoule (AM Peak Hour)/CJones (PM Peak Hour)

Weekday Morning Peak Hour

	Peak Hour Volume							
Movement	**May-08**	**Unadj. Feb 2014**	**Difference (Feb vs May)**	**Feb Avg Adj**	**Feb Avg**	**May Avg Adj**	**May Avg**	**Difference (Adjusted)**
NB T	687	641	-7%	1.08	692	0.96	660	4.8%
NB R	249	260	4%	1.08	281	0.96	239	17.6%
SB L	87	55	-37%	1.08	59	0.96	84	-29.8%
SB T	494	402	-19%	1.08	434	0.96	474	-8.4%
WB L	8	5	-38%	1.08	5	0.96	8	-37.5%
WB R	53	30	-43%	1.08	32	0.96	51	-37.3%
Total	**1,578**	**1,393**	**-12%**	**1.08**	**1,504**	**0.96**	**1,515**	**-0.7%**

Weekday Evening Peak Hour

	Peak Hour Volume							
Movement	**May-08**	**Unadj. Feb 2014**	**Difference (Feb vs May)**	**Feb Avg Adj**	**Feb Avg**	**May Avg Adj**	**May Avg**	**Difference (Adjusted)**
NB T	765	747	-2%	1.08	807	0.96	734	9.9%
NB R	490	424	-13%	1.08	458	0.96	470	-2.6%
SB L	158	133	-16%	1.08	144	0.96	152	-5.3%
SB T	666	575	-14%	1.08	621	0.96	639	-2.8%
WB L	12	8	-33%	1.08	9	0.96	12	-25.0%
WB R	78	71	-9%	1.08	77	0.96	75	2.7%
Total	**2,169**	**1,958**	**-10%**	**1.08**	**2,115**	**0.96**	**2,082**	**1.6%**

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 5 - STERLING - RTE.12 - NORTH OF RTE.I-190

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	February Adjustment to Year	May Adjustment to Year	
05	7,333	8,200	8,308	8,194	9,300	9,439	8,516	8,669	8,559	8,500	8,300	8,100	8,452	1.03	0.91	
	6%	-4%	3%	4%	-6%	-4%	-4%	-1%	-1%	-2%	-3%	-3%	-1%			
06	7,800	7,909	8,517	8,504	8,752	9,024	8,197	8,580	8,507	8,291	8,019	7,838	8,328	1.05	0.95	
	-2%	-3%	-5%	-2%	3%	0%	6%	2%	2%	6%	2%	-1%	1%			
07	7,615	7,693	8,091	8,322	8,987	8,988	*8,700*	8,742	8,658	8,754	8,169	7,767	8,374	1.09	0.93	
	8%	4%	3%	10%	1%	0%	-1%	-4%	-2%	-4%	-4%	-1%	1%			
08	8,243	7,993	8,296	9,168	9,115	8,992	8,578	8,425	8,482	8,400	7,839	7,700	8,436	1.06	0.93	
	-7%	0%	-1%	-4%	-3%	0%	1%	1%	0%	0%	2%	2%	-1%			
09	7,685	8,011	8,189	8,776	8,819	8,997	8,654	8,533	8,519	8,434	7,969	7,858	8,370	1.04	0.95	
	0%	0%	1%	0%	1%	0%	0%	1%	0%	0%	7%	6%	1%			
12	7,626	8,041	8,526	8,900	9,068	8,976	8,700	8,798	8,599	8,485	9,626	9,186	8,711	1.08	0.96	
														1.06	0.94	Sub Average

STATION 403 - CONCORD - RTE.2 - EAST OF CONCORD ROTARY

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
05	41,051	43,677	45,426	46,370	46,939	51,129	44,632	46,318	46,004	49,000	45,178	*43,329*	45,754	1.05	0.97	
	8%	0%	2%	-2%	-1%	-3%	-3%	-2%	0%	0%	0%	0%	0%			
06	44,150	43,659	46,395	45,607	46,453	49,481	43,449	45,449	45,925	49,000	44,963	*43,417*	45,662	1.05	0.98	
	-5%	-4%	-5%	-2%	1%	-1%	2%	0%	-1%	0%	-4%	-4%	-2%			
07	41,988	41,749	43,930	44,696	46,932	49,031	44,131	45,508	45,546	49,000	43,366	41,478	44,780	1.07	0.95	
	2%	2%	-1%	2%	-3%	-3%	-1%	-4%	-1%	-5%	-3%	-4%	-1%			
08	43,000	42,665	43,583	45,399	45,662	47,666	43,805	43,567	45,196	46,795	42,144	39,843	44,110	1.03	0.97	
	-5%	1%	-2%	0%	-1%	-3%	2%	0%	1%	-1%	2%	3%	0%			
09	40,852	43,270	42,575	45,436	45,175	46,287	44,558	43,739	45,515	46,288	42,994	*40,976*	43,972	1.02	0.97	
	0%	-3%	9%	11%	0%	1%	-3%	-10%	-10%	-1%	2%	8%	0%			
10	40,986	41,824	46,473	50,492	45,142	46,670	43,442	39,324	40,742	45,954	43,689	*44,351*	44,091	1.05	0.98	
	-5%	-3%	-5%	-12%	1%	-1%	-2%	10%	10%	-2%	0%	-5%	-2%			
11	38,992	40,387	43,984	44,255	45,396	46,356	42,701	43,418	44,903	44,901	43,509	42,193	43,416	1.08	0.96	
	4%	4%	-3%	0%	1%	-2%	-5%	3%	-2%	0%	-1%	-4%	-1%			
12	40,729	41,899	42,785	44,163	45,938	45,325	40,408	44,763	43,912	45,055	42,990	40,311	43,190	1.03	0.94	
	7%	-4%	-6%	-3%	-2%	-5%	-1%	0%	-2%	1%	-3%	-1%	-2%			
13	41,885	38,845	41,520	43,138	44,501	44,259	42,378	43,216	43,864	45,281	42,411	41,606	42,742	1.10	0.96	
														1.05	0.97	Sub Average

STATION 4089 - MARLBOROUGH - RTE.I-495 - NORTH OF RTE.I-290

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
05	86,000	88,000	91,400	93,441	102,364	106,066	115,416	115,922	96,206	99,993	93,582	95,470	98,655	1.12	0.96	
	7%	7%	4%	4%	-2%	0%	-6%	-2%	9%	-1%	0%	-5%	1%			
06	91,632	93,896	94,654	97,548	99,848	106,518	107,960	113,530	104,483	99,380	93,184	90,801	99,453	1.06	1.00	
	-8%	-9%	-5%	-7%	-6%	3%	7%	0%	7%	9%	-3%	-8%	-1%			
07	84,308	85,309	89,689	90,259	*93,798*	*110,000*	*115,167*	*113,408*	*111,734*	*108,209*	90,152	83,708	97,978	1.15	1.04	
	0%	-1%	0%	1%	2%	-1%	-1%	0%	-1%	0%	1%	1%	0%			
13	84,833	80,097	88,525	94,408	*102,794*	*106,460*	*109,155*	*113,942*	*103,408*	*107,206*	96,380	88,507	97,976	1.22	0.95	
														1.14	0.99	Sub Average

STATION 4798 - LEXINGTON - RTE. 2 - WEST OF PLEASANT ST.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
05	57,027	66,995	72,196	77,189	74,222	74,735	66,931	69,361	77,829	76,238	*75,564*	72,282	71,714	1.07	0.97	
	10%	1%	0%	-2%	3%	2%	4%	3%	-3%	2%	0%	-3%	1%			
07	*68,000*	68,616	72,673	74,017	78,084	77,591	72,321	*73,150*	*73,355*	79,113	74,842	*67,488*	73,271	1.07	0.94	
														1.07	0.95	Sub Average

	February	May
Average Adjusment Factor	1.08	0.96

Average Yearly Growth Calculated -0.38%
Yearly Growth Factor Used 1.0%

ITALICS = ESTIMATED DATA
MADT

□ Traffic Volume Data

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA 01752
508-303-0370
www.mdmtrans.com

N/S: Main Street (Route 27)
Between Rt 2 WB Ramps and Isaac Davis Way
Acton, MA

Site Code: 00044200
Station ID:

442 Acton Main Street at isaac davis 2-28-2014-volume-15 min

Start Time	27-Feb-14 Thu	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		2	151			2	141				
12:15		6	160			2	97				
12:30		3	161			6	102				
12:45		2	133	13	605	2	148	12	488	25	1093
01:00		4	124			1	110				
01:15		1	128			0	107				
01:30		1	136			3	107				
01:45		2	139	8	527	3	136	7	460	15	987
02:00		0	157			1	114				
02:15		0	145			0	130				
02:30		1	139			1	115				
02:45		1	164	2	605	2	125	4	484	6	1089
03:00		0	122			4	149				
03:15		3	176			2	109				
03:30		1	149			2	156				
03:45		5	176	9	623	0	133	8	547	17	1170
04:00		3	162			5	183				
04:15		5	211			4	154				
04:30		5	172			3	190				
04:45		6	170	19	715	5	152	17	679	36	1394
05:00		11	187			6	189				
05:15		14	196			7	185				
05:30		28	206			26	189				
05:45		49	230	102	819	22	153	61	716	163	1535
06:00		72	154			36	188				
06:15		88	133			77	153				
06:30		88	165			85	89				
06:45		141	142	389	594	77	106	275	536	664	1130
07:00		170	179			125	103				
07:15		163	159			135	96				
07:30		162	121			81	110				
07:45		167	83	662	542	98	69	439	378	1101	920
08:00		155	84			103	57				
08:15		175	73			116	51				
08:30		173	79			93	75				
08:45		175	69	678	305	123	65	435	248	1113	553
09:00		168	50			99	91				
09:15		172	55			89	42				
09:30		136	39			105	51				
09:45		119	49	595	193	96	44	389	228	984	421
10:00		119	31			91	29				
10:15		118	24			85	20				
10:30		113	16			83	15				
10:45		133	28	483	99	94	10	353	74	836	173
11:00		118	23			108	17				
11:15		121	7			108	6				
11:30		116	14			108	6				
11:45		158	5	513	49	121	3	445	32	958	81
Total		3473	5676			2445	4870			5918	10546
Percent	0.0%	38.0%	62.0%			33.4%	66.6%			35.9%	64.1%
Combined Total		9149				7315				16464	
Total		3473	5676			2445	4870			5918	10546
Percent		38.0%	62.0%			33.4%	66.6%			35.9%	64.1%
Combined Total		9149				7315				16464	
ADT	ADT 16,142		AADT 16,142								

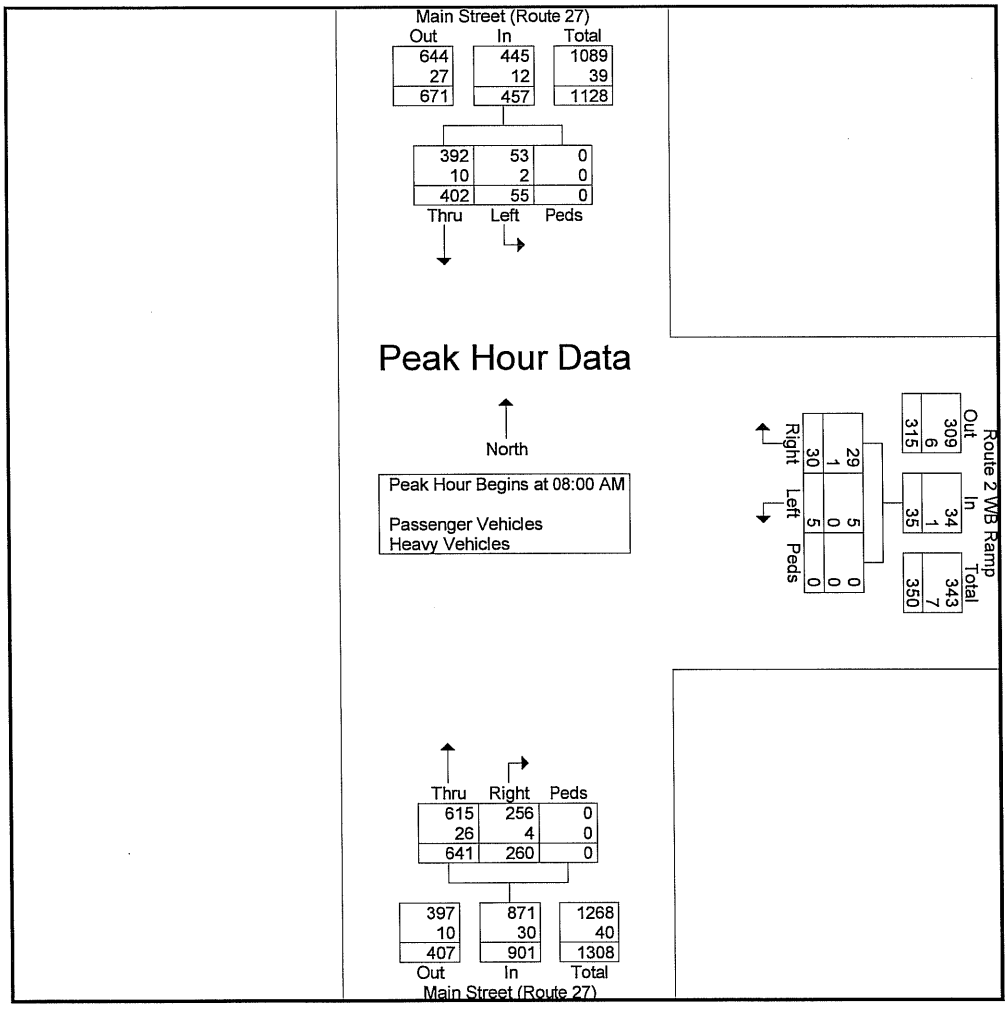
MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Main Street (Route 27)
E: Route 2 WB Ramp
Acton, MA

File Name : 442 Route 2 WB Ramp at Main St AM
Site Code : 74400002
Start Date : 2/27/2014
Page No : 2

	Main Street (Route 27) From North				Route 2 WB Ramp From East				Main Street (Route 27) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 7:00:00 AM to 8:45:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 8:00:00 AM													
8:00:00 AM	101	14	0	115	**10**	1	0	**11**	57	147	0	204	330
8:15:00 AM	92	15	0	107	6	0	0	6	**83**	**169**	0	**252**	**365**
8:30:00 AM	90	9	0	99	7	**2**	0	9	71	158	0	229	337
8:45:00 AM	**119**	**17**	0	**136**	7	2	0	9	49	167	0	216	361
Total Volume	402	55	0	457	30	5	0	35	260	641	0	901	1393
% App. Total	88	12	0		85.7	14.3	0		28.9	71.1	0		
PHF	.845	.809	.000	.840	.750	.625	.000	.795	.783	.948	.000	.894	.954
Passenger Vehicles	392	53	0	445	29	5	0	34	256	615	0	871	1350
% Passenger Vehicles	97.5	96.4	0	97.4	96.7	100	0	97.1	98.5	95.9	0	96.7	96.9
Heavy Vehicles	10	2	0	12	1	0	0	1	4	26	0	30	43
% Heavy Vehicles	2.5	3.6	0	2.6	3.3	0	0	2.9	1.5	4.1	0	3.3	3.1



MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Main Street (Route 27)
E: Route 2 WB Ramp
Acton, MA

File Name : 442 Route 2 WB Ramp at Main St AM
Site Code : 74400002
Start Date : 2/27/2014
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	Main Street (Route 27) From North				Route 2 WB Ramp From East				Main Street (Route 27) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	94	11	0	105	25	0	0	25	60	114	0	174	304
07:15 AM	100	28	0	128	7	1	0	8	57	136	0	193	329
07:30 AM	72	12	0	84	4	3	0	7	58	137	0	195	286
07:45 AM	83	20	0	103	6	3	0	9	76	157	0	233	345
Total	349	71	0	420	42	7	0	49	251	544	0	795	1264
08:00 AM	101	14	0	115	10	1	0	11	57	147	0	204	330
08:15 AM	92	15	0	107	6	0	0	6	83	169	0	252	365
08:30 AM	90	9	0	99	7	2	0	9	71	158	0	229	337
08:45 AM	119	17	0	136	7	2	0	9	49	167	0	216	361
Total	402	55	0	457	30	5	0	35	260	641	0	901	1393
Grand Total	751	126	0	877	72	12	0	84	511	1185	0	1696	2657
Apprch %	85.6	14.4	0		85.7	14.3	0		30.1	69.9	0		
Total %	28.3	4.7	0	33	2.7	0.5	0	3.2	19.2	44.6	0	63.8	
Passenger Vehicles	737	122	0	859	69	11	0	80	504	1140	0	1644	2583
% Passenger Vehicles	98.1	96.8	0	97.9	95.8	91.7	0	95.2	98.6	96.2	0	96.9	97.2
Heavy Vehicles	14	4	0	18	3	1	0	4	7	45	0	52	74
% Heavy Vehicles	1.9	3.2	0	2.1	4.2	8.3	0	4.8	1.4	3.8	0	3.1	2.8

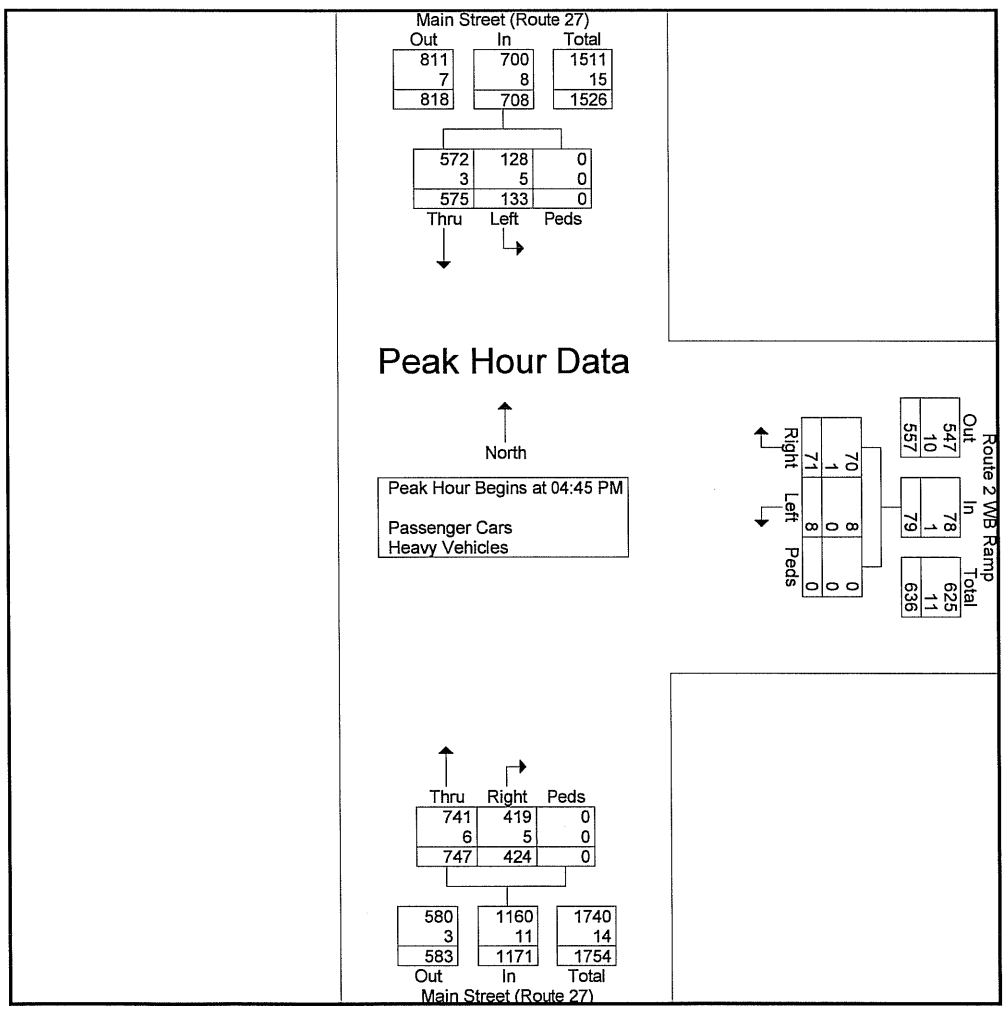
MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Main Street (Route 27)
E: Route 2 WB Ramp
Acton, MA

File Name : 442 Route 2 WB Ramp at Main St PM
Site Code : 00442002
Start Date : 2/27/2014
Page No : 2

	Main Street (Route 27) From North				Route 2 WB Ramp From East				Main Street (Route 27) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. 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	131	34	0	165	14	1	0	15	**121**	189	0	**310**	490
05:00 PM	142	**35**	0	177	14	2	0	16	119	173	0	292	485
05:15 PM	**152**	33	0	**185**	20	**5**	0	**25**	85	**194**	0	279	489
05:30 PM	150	31	0	181	**23**	0	0	23	99	191	0	290	**494**
Total Volume	575	133	0	708	71	8	0	79	424	747	0	1171	1958
% App. Total	81.2	18.8	0		89.9	10.1	0		36.2	63.8	0		
PHF	.946	.950	.000	.957	.772	.400	.000	.790	.876	.963	.000	.944	.991
Passenger Cars	572	128	0	700	70	8	0	78	419	741	0	1160	1938
% Passenger Cars	99.5	96.2	0	98.9	98.6	100	0	98.7	98.8	99.2	0	99.1	99.0
Heavy Vehicles	3	5	0	8	1	0	0	1	5	6	0	11	20
% Heavy Vehicles	0.5	3.8	0	1.1	1.4	0	0	1.3	1.2	0.8	0	0.9	1.0



MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Main Street (Route 27)
E: Route 2 WB Ramp
Acton, MA

File Name : 442 Route 2 WB Ramp at Main St PM
Site Code : 00442002
Start Date : 2/27/2014
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles

	Main Street (Route 27) From North				Route 2 WB Ramp From East				Main Street (Route 27) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	147	34	0	181	22	1	0	23	89	148	0	237	441
04:15 PM	133	26	0	159	22	4	0	26	102	196	0	298	483
04:30 PM	144	40	0	184	11	1	0	12	99	166	0	265	461
04:45 PM	131	34	0	165	14	1	0	15	121	189	0	310	490
Total	555	134	0	689	69	7	0	76	411	699	0	1110	1875
05:00 PM	142	35	0	177	14	2	0	16	119	173	0	292	485
05:15 PM	152	33	0	185	20	5	0	25	85	194	0	279	489
05:30 PM	150	31	0	181	23	0	0	23	99	191	0	290	494
05:45 PM	136	25	0	161	26	2	0	28	81	202	0	283	472
Total	580	124	0	704	83	9	0	92	384	760	0	1144	1940
Grand Total	1135	258	0	1393	152	16	0	168	795	1459	0	2254	3815
Apprch %	81.5	18.5	0		90.5	9.5	0		35.3	64.7	0		
Total %	29.8	6.8	0	36.5	4	0.4	0	4.4	20.8	38.2	0	59.1	
Passenger Cars	1129	252	0	1381	150	16	0	166	782	1442	0	2224	3771
% Passenger Cars	99.5	97.7	0	99.1	98.7	100	0	98.8	98.4	98.8	0	98.7	98.8
Heavy Vehicles	6	6	0	12	2	0	0	2	13	17	0	30	44
% Heavy Vehicles	0.5	2.3	0	0.9	1.3	0	0	1.2	1.6	1.2	0	1.3	1.2

- Seasonal Data

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 5 - STERLING - RTE.12 - NORTH OF RTE.I-190

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	February Adjustment to Year	
05	7,333	8,200	8,308	8,194	9,300	9,439	8,516	8,669	8,559	8,500	8,300	8,100	8,452	1.03	
	6%	-4%	3%	4%	-6%	-4%	-4%	-1%	-1%	-2%	-3%	-3%	-1%		
06	7,800	7,909	8,517	8,504	8,752	9,024	8,197	8,580	8,507	8,291	8,019	7,838	8,328	1.05	
	-2%	-3%	-5%	-2%	3%	0%	6%	2%	2%	6%	2%	-1%	1%		
07	7,615	7,693	8,091	8,322	8,987	8,988	*8,700*	8,742	8,658	8,754	8,169	7,767	8,374	1.09	
	8%	4%	3%	10%	1%	0%	-1%	-4%	-2%	-4%	-4%	-1%	1%		
08	8,243	7,993	8,296	9,168	9,115	8,992	8,578	8,425	8,482	8,400	7,839	7,700	8,436	1.06	
	-7%	0%	-1%	-4%	-3%	0%	1%	1%	0%	0%	2%	2%	-1%		
09	7,685	8,011	8,189	8,776	8,819	8,997	8,654	8,533	8,519	8,434	7,969	7,858	8,370	1.04	
	0%	0%	1%	0%	1%	0%	0%	1%	0%	0%	7%	6%	1%		
12	7,626	8,041	8,526	8,900	9,068	8,976	8,700	8,798	8,599	8,485	9,626	9,186	8,711	1.08	
														1.06	Sub Average

STATION 403 - CONCORD - RTE.2 - EAST OF CONCORD ROTARY

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	41,051	43,677	45,426	46,370	46,939	51,129	44,632	46,318	46,004	49,000	45,178	*43,329*	45,754	1.05	
	8%	0%	2%	-2%	-1%	-3%	-3%	-2%	0%	0%	0%	0%	0%		
06	44,150	43,659	46,395	45,607	46,453	49,481	43,449	45,449	45,925	49,000	44,963	*43,417*	45,662	1.05	
	-5%	-4%	-5%	-2%	1%	-1%	2%	0%	-1%	0%	-4%	-4%	-2%		
07	41,988	41,749	43,930	44,696	46,932	49,031	44,131	45,508	45,546	49,000	43,366	41,478	44,780	1.07	
	2%	2%	-1%	2%	-3%	-3%	-1%	-4%	-1%	-5%	-3%	-4%	-1%		
08	43,000	42,665	43,583	45,399	45,662	47,666	43,805	43,567	45,196	46,795	42,144	39,843	44,110	1.03	
	-5%	1%	-2%	0%	-1%	-3%	2%	0%	1%	-1%	2%	3%	0%		
09	40,852	43,270	42,575	45,436	45,175	46,287	44,558	43,739	45,515	46,288	42,994	*40,976*	43,972	1.02	
	0%	-3%	9%	11%	0%	1%	-3%	-10%	-10%	-1%	2%	8%	0%		
10	40,986	41,824	46,473	50,492	45,142	46,670	43,442	39,324	40,742	45,954	43,689	*44,351*	44,091	1.05	
	-5%	-3%	-5%	-12%	1%	-1%	-2%	10%	10%	-2%	0%	-5%	-2%		
11	38,992	40,387	43,984	44,255	45,396	46,356	42,701	43,418	44,903	44,901	43,509	42,193	43,416	1.08	
	4%	4%	-3%	0%	1%	-2%	-5%	3%	-2%	0%	-1%	-4%	-1%		
12	40,729	41,899	42,785	44,163	45,938	45,325	40,408	44,763	43,912	45,055	42,990	40,311	43,190	1.03	
	7%	-4%	-6%	-3%	-2%	-5%	-1%	0%	-2%	1%	-3%	-1%	-2%		
13	41,885	38,845	41,520	43,138	44,501	44,259	42,378	43,216	43,864	45,281	42,411	41,606	42,742	1.10	
														1.05	Sub Average

STATION 4089 - MARLBOROUGH - RTE.I-495 - NORTH OF RTE.I-290

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	86,000	88,000	91,400	93,441	102,364	106,066	115,416	115,922	96,206	99,993	93,582	95,470	98,655	1.12	
	7%	7%	4%	4%	-2%	0%	-6%	-2%	9%	-1%	0%	-5%	1%		
06	91,632	93,896	94,654	97,548	99,848	106,518	107,960	113,530	104,483	99,380	93,184	90,801	99,453	1.06	
	-8%	-9%	-5%	-7%	-6%	3%	7%	0%	7%	9%	-3%	-8%	-1%		
07	84,308	85,309	89,689	90,259	*93,798*	*110,000*	*115,167*	*113,408*	*111,734*	*108,209*	90,152	83,708	97,978	1.15	
	0%	-1%	0%	1%	2%	-1%	-1%	0%	-1%	0%	1%	1%	0%		
13	84,833	80,097	88,525	94,408	*102,794*	*106,460*	*109,155*	*113,942*	*103,408*	*107,206*	96,380	88,507	97,976	1.22	
														1.14	Sub Average

STATION 4798 - LEXINGTON - RTE. 2 - WEST OF PLEASANT ST.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	57,027	66,995	72,196	77,189	74,222	74,735	66,931	69,361	77,829	76,238	*75,564*	72,282	71,714	1.07	
	10%	1%	0%	-2%	3%	2%	4%	3%	-3%	2%	0%	-3%	1%		
07	*68,000*	68,616	72,673	74,017	78,084	77,591	72,321	*73,150*	*73,355*	79,113	74,842	*67,488*	73,271	1.07	
														1.07	Sub Average

Average Adjusment Factor (May) 1.08

Average Yearly Growth Calculated -0.38%
Yearly Growth Factor Used 1.0%

ITALICS = ESTIMATED DATA
MADT

□ Speed Study

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA 01752
508-303-0370
www.mdmtrans.com

N/S: Main Street (Route 27)
Between Rt 2 WB Ramps and Isaac Davis Way
Acton, MA

Site Code: 00044200
Station ID:

442 Acton Main Street at isaac davis 2-27-14 Speed

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
02/27/14	0	0	0	1	3	6	3	0	0	0	0	0	0	0	13	41
01:00	0	0	0	2	1	2	2	0	0	1	0	0	0	0	8	45
02:00	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	43
03:00	0	0	0	1	5	2	1	0	0	0	0	0	0	0	9	39
04:00	0	0	0	1	7	8	2	1	0	0	0	0	0	0	19	40
05:00	0	1	2	11	46	35	6	1	0	0	0	0	0	0	102	38
06:00	0	0	1	19	124	183	58	3	1	0	0	0	0	0	389	40
07:00	0	0	4	70	302	248	33	5	0	0	0	0	0	0	662	38
08:00	0	0	9	64	276	279	48	2	0	0	0	0	0	0	678	39
09:00	0	0	0	42	256	241	51	5	0	0	0	0	0	0	595	39
10:00	0	0	3	30	205	208	31	5	1	0	0	0	0	0	483	39
11:00	0	0	1	43	200	223	39	7	0	0	0	0	0	0	513	39
12 PM	0	0	12	59	245	245	43	1	0	0	0	0	0	0	605	39
13:00	0	0	3	46	219	215	40	4	0	0	0	0	0	0	527	39
14:00	1	2	15	75	260	217	34	0	1	0	0	0	0	0	605	38
15:00	0	1	4	67	262	239	48	2	0	0	0	0	0	0	623	39
16:00	2	2	10	129	334	206	31	1	0	0	0	0	0	0	715	38
17:00	2	24	50	196	362	162	23	0	0	0	0	0	0	0	819	36
18:00	37	16	40	148	244	93	15	1	0	0	0	0	0	0	594	36
19:00	0	0	4	99	266	156	16	0	1	0	0	0	0	0	542	37
20:00	1	1	3	50	117	112	18	3	0	0	0	0	0	0	305	39
21:00	0	0	6	29	87	62	8	1	0	0	0	0	0	0	193	38
22:00	0	0	3	25	40	26	5	0	0	0	0	0	0	0	99	38
23:00	0	0	0	8	18	19	3	1	0	0	0	0	0	0	49	39
Total	43	47	170	1215	3880	3187	559	43	4	1	0	0	0	0	9149	

Percentiles	15th Percentile :	28 MPH
	50th Percentile :	33 MPH
	85th Percentile :	38 MPH
	95th Percentile :	41 MPH
Statistics	Mean Speed(Average) :	34 MPH
	10 MPH Pace Speed :	30-39 MPH
	Number in Pace :	6420
	Percent in Pace :	70.2%
	Number of Vehicles > 35 MPH :	3794
	Percent of Vehicles > 35 MPH :	41.5%

Summary	15th Percentile :	28 MPH
	50th Percentile :	33 MPH
	85th Percentile :	38 MPH
	95th Percentile :	41 MPH
Statistics	Mean Speed(Average) :	34 MPH

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N/S: Main Street (Route 27)
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Site Code: 00044200
Station ID:

442 Acton Main Street at isaac davis 2-27-14 Speed

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
02/27/14	0	0	0	0	3	4	4	0	0	1	0	0	0	0	12	44
01:00	0	0	0	0	3	3	1	0	0	0	0	0	0	0	7	40
02:00	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	39
03:00	0	0	0	1	4	3	0	0	0	0	0	0	0	0	8	38
04:00	0	0	1	3	3	8	2	0	0	0	0	0	0	0	17	40
05:00	0	0	0	6	14	30	10	1	0	0	0	0	0	0	61	41
06:00	0	0	0	19	90	130	33	3	0	0	0	0	0	0	275	40
07:00	5	10	23	44	136	183	37	1	0	0	0	0	0	0	439	39
08:00	2	3	9	43	160	178	40	0	0	0	0	0	0	0	435	39
09:00	0	0	4	29	157	163	31	5	0	0	0	0	0	0	389	39
10:00	0	2	10	14	150	139	34	4	0	0	0	0	0	0	353	39
11:00	0	0	4	43	189	173	35	1	0	0	0	0	0	0	445	39
12 PM	0	0	6	31	229	190	31	1	0	0	0	0	0	0	488	39
13:00	0	2	7	28	185	198	36	4	0	0	0	0	0	0	460	39
14:00	2	1	8	75	215	160	23	0	0	0	0	0	0	0	484	38
15:00	0	3	7	44	238	206	44	5	0	0	0	0	0	0	547	39
16:00	11	15	25	80	312	202	31	3	0	0	0	0	0	0	679	38
17:00	5	12	24	101	342	211	20	1	0	0	0	0	0	0	716	37
18:00	28	32	68	143	193	65	6	0	0	1	0	0	0	0	536	35
19:00	3	2	4	76	167	103	19	4	0	0	0	0	0	0	378	38
20:00	2	1	3	26	120	88	8	0	0	0	0	0	0	0	248	38
21:00	0	0	2	38	108	66	14	0	0	0	0	0	0	0	228	38
22:00	0	1	2	14	37	18	1	1	0	0	0	0	0	0	74	37
23:00	0	0	1	2	14	12	2	1	0	0	0	0	0	0	32	39
Total	58	84	208	860	3069	2537	462	35	0	2	0	0	0	0	7315	

Percentiles	15th Percentile :	28 MPH
	50th Percentile :	33 MPH
	85th Percentile :	38 MPH
	95th Percentile :	41 MPH
Statistics	Mean Speed(Average) :	34 MPH
	10 MPH Pace Speed :	30-39 MPH
	Number in Pace :	5038
	Percent in Pace :	68.9%
	Number of Vehicles > 35 MPH :	3036
	Percent of Vehicles > 35 MPH :	41.5%

Summary	15th Percentile :	28 MPH
	50th Percentile :	33 MPH
	85th Percentile :	38 MPH
	95th Percentile :	41 MPH
Statistics	Mean Speed(Average) :	34 MPH

□ Sight Distance Calculations

Stopping Sight Distance - Northerly Driveway (Posted Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	109.8	238.4
Direction 2	SB	35	128.625	134.8	263.5

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	35	35
Grade	0.024	-0.045
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Northerly Driveway (Average Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	34	124.95	103.6	228.6
Direction 2	SB	34	124.95	127.2	252.2

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	34	34
Grade	0.024	-0.045
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Northerly Driveway (85th % Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	38	139.65	129.5	269.1
Direction 2	SB	38	139.65	158.9	298.6

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	38	38
Grade	0.024	-0.045
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Central Driveway (Posted Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	117.4	246.0
Direction 2	SB	35	128.625	128.5	257.1

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	35	35
Grade	0	-0.03
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Central Driveway (Average Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	34	124.95	110.8	235.7
Direction 2	SB	34	124.95	121.2	246.2

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	34	34
Grade	0	-0.03
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Central Driveway (85th % Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	38	139.65	138.4	278.0
Direction 2	SB	38	139.65	151.4	291.1

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	38	38
Grade	0	-0.03
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Southerly Driveway (Posted Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	123.1	251.7
Direction 2	SB	35	128.625	128.5	257.1

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	35	35
Grade	-0.016	-0.03
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Southerly Driveway (Average Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	34	124.95	116.1	241.1
Direction 2	SB	34	124.95	121.2	246.2

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	34	34
Grade	-0.016	-0.03
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Southerly Driveway (85th % Speeds)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	38	139.65	145.1	284.7
Direction 2	SB	38	139.65	151.4	291.1

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	38	38
Grade	-0.016	-0.03
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Posted Speed Limit

Northerly Site Driveway ISD = 1.47 * 35 * 7.5 = 385.9ft **SAY 390 ft**
(left-turn from a stop)

Southerly Site Driveway ISD = 1.47 * 35 * 7.5 = 385.9ft **SAY 390 ft**
(left-turn from a stop)

Landscaping Driveway Driveway ISD = 1.47 * 35 * 6.5 = 334.4ft **SAY 335 ft**
(right-turn from a stop)

Average Observed Travel Speeds (34 mph NB & SB)

Northerly Site Driveway ISD = 1.47 * 34 * 7.5 = 374.9ft **SAY 375 ft**
(left-turn from a stop)

Southerly Site Driveway ISD = 1.47 * 34 * 7.5 = 374.9ft **SAY 375 ft**
(left-turn from a stop)

Landscaping Driveway Driveway ISD = 1.47 * 34 * 6.5 = 324.9ft **SAY 325 ft**
(right-turn from a stop)

85th Percentile Observed Travel Speeds (38 mph NB & SB)

Northerly Site Driveway ISD = 1.47 * 38 * 7.5 = 419ft **SAY 420 ft**
(left-turn from a stop)

Southerly Site Driveway ISD = 1.47 * 38 * 7.5 = 419ft **SAY 420 ft**
(left-turn from a stop)

Landscaping Driveway Driveway ISD = 1.47 * 38 * 6.5 = 363.1ft **SAY 365 ft**
(right-turn from a stop)

- ☐ Crash Data

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Acton, MA COUNT DATE : Feb-14

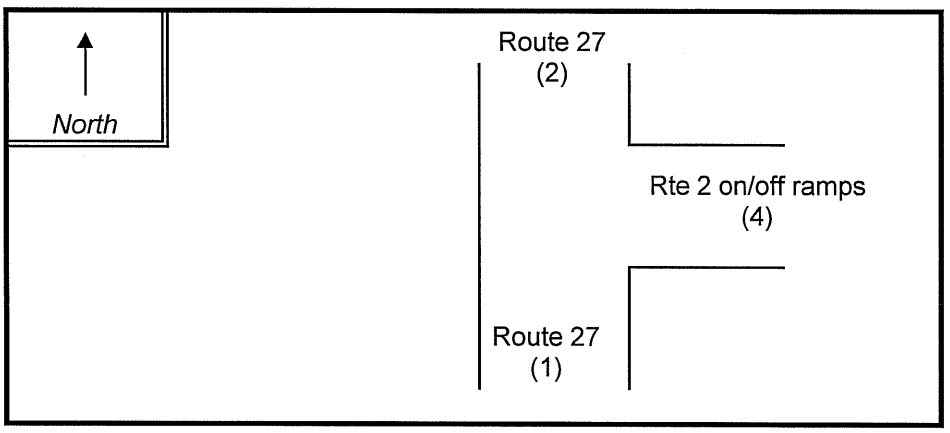
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Route 27)

MINOR STREET(S) : Route 2 Westbound Ramps

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	1,265	765		86		2,116

" K " FACTOR : **0.093** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **22,753**

TOTAL # OF CRASHES : 13 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **4.33**

CRASH RATE CALCULATION : 0.52 RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.66

Project Title & Date: 442 - Acton

MassDOT Crash Report for ACTON for the year 2009

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
2520704	ACTON	11-Sep-2009	11:03 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	Dry	Daylight	Cloudy/Cloudy	MAIN STREET Rte 27 S / ROUTE 2 Rte 2 E					
2536141	ACTON	07-Nov-2009	12:52 PM	Property damage only (none injured)	2	0	0	Angle	V1: Slowing or stopped in traffic / V2:Turning left	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	Dry	Daylight	Clear	Rte 27 / MAIN STREET / Rte 2					
2470784	ACTON	12-May-2009	7:15 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Bus (seats for more than 15 people, including driver) / V2:Passenger car	Dry	Daylight	Clear	ROUTE 2 Rte 2 W / MAIN STREET Rte 27 N					
2534102	ACTON	06-May-2009	9:20 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Not reported / V2:Not reported	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	Dry	Daylight	Cloudy	Rte 2 W / Rte 27 N				ENTRANCE FROM RTE 27N	
2486532	ACTON	16-Jun-2009	3:38 PM	Non-fatal injury	2	1	0	Rear-end	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	Dry	Daylight	Clear	MAIN STREET / RAMP-RT 2 WB TO RT 27					
2595203	ACTON	24-Jan-2009	9:45 AM	Unknown	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2:Not reported	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	Dry	Daylight	Clear		Rte 2		Exit 42 on Rte 2		

massDOT

MassDOT Crash Report for ACTON for the year 2010

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nontatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
2658582	ACTON	09-Oct-2010	2:03 PM	Property damage only (none injured)	3	0	0	Rear-end	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1:Southbound / V2:Southbound / V3:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	Dry	Daylight	Clear	Rte 27 S / MAIN STREET / Rte 2					
2659397	ACTON	25-Oct-2010	8:55 AM	Non-fatal injury	2	1	0	Rear-end	V1: Slowing or stopped in traffic / V2:Unknown	V1:Eastbound / V2:Eastbound	V1: Unknown / V2: Unknown	V1: Passenger car / V2:Passenger car	Dry	Daylight	Cloudy	Rte 27 / MAIN STREET / Rte 2					
2619480	ACTON	24-Jun-2010	5:41 PM	Non-fatal injury	2	1	0	Rear-end	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2:Passenger car	Wet	Daylight	Cloudy	MAIN STREET Rte 2 W / RAMP-RT 2 WB TO RT 27 Rte 27					
2681304	ACTON	09-Dec-2010	5:38 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2:Passenger car	Dry	Dark - lighted roadway	Clear		300 feet N from Intersection 362 MAIN STREET Rte 27 / Rte 2				
#REF!																					

MassDOT Crash Report for ACTON for the year 2011

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
2708916	ACTON	08-Mar-2011	8:13 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1:Southbound / V2:Southbound	V1: Unknown / V2: Collision with motor vehicle in traffic	V1: Bus (seats for 7-15 people, including driver) / V2:Passenger car	Dry	Daylight	Clear	MAIN STREET Rte 27 S / Rte 2 E					
3372236	ACTON	18-Oct-2011	6:22 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Entering traffic lane / V2:Entering traffic lane	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Single-unit truck (2-axle, 6-tire) / V2:Passenger car	Dry	Dusk	Clear		MASSACHUSETTS AVENUE Rte 2 W / RAMP-RT 2 WB TO RT 27 Rte 27			RAMP FROM RTE 27	
2715649	ACTON	28-Mar-2011	7:17 AM	Property damage only (none injured)	2	0	0	Angle	V1: Turning left / V2:Travelling straight ahead	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Not reported / V2:Not reported	Dry	Daylight	Clear		345 MAIN STREET				

□ Growth Data

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 5 - STERLING - RTE.12 - NORTH OF RTE.I-190

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	February Adjustment to Year	
05	7,333	8,200	8,308	8,194	9,300	9,439	8,516	8,669	8,559	8,500	8,300	8,100	8,452	1.03	
	6%	-4%	3%	4%	-6%	-4%	-4%	-1%	-1%	-2%	-3%	-3%	-1%		
06	7,800	7,909	8,517	8,504	8,752	9,024	8,197	8,580	8,507	8,291	8,019	7,838	8,328	1.05	
	-2%	-3%	-5%	-2%	3%	0%	6%	2%	2%	6%	2%	-1%	1%		
07	7,615	7,693	8,091	8,322	8,987	8,988	*8,700*	8,742	8,658	8,754	8,169	7,767	8,374	1.09	
	8%	4%	3%	10%	1%	0%	-1%	-4%	-2%	-4%	-4%	-1%	1%		
08	8,243	7,993	8,296	9,168	9,115	8,992	8,578	8,425	8,482	8,400	7,839	7,700	8,436	1.06	
	-7%	0%	-1%	-4%	-3%	0%	1%	1%	0%	0%	2%	2%	-1%		
09	7,685	8,011	8,189	8,776	8,819	8,997	8,654	8,533	8,519	8,434	7,969	7,858	8,370	1.04	
	0%	0%	1%	0%	1%	0%	0%	1%	0%	0%	7%	6%	1%		
12	7,626	8,041	8,526	8,900	9,068	8,976	8,700	8,798	8,599	8,485	9,626	9,186	8,711	1.08	
														1.06	Sub Average

STATION 403 - CONCORD - RTE.2 - EAST OF CONCORD ROTARY

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	41,051	43,677	45,426	46,370	46,939	51,129	44,632	46,318	46,004	49,000	45,178	*43,329*	45,754	1.05	
	8%	0%	2%	-2%	-1%	-3%	-3%	-2%	0%	0%	0%	0%	0%		
06	44,150	43,659	46,395	45,607	46,453	49,481	43,449	45,449	45,925	49,000	44,963	*43,417*	45,662	1.05	
	-5%	-4%	-5%	-2%	1%	-1%	2%	0%	-1%	0%	-4%	-4%	-2%		
07	41,988	41,749	43,930	44,696	46,932	49,031	44,131	45,508	45,546	49,000	43,366	41,478	44,780	1.07	
	2%	2%	-1%	2%	-3%	-3%	-1%	-4%	-1%	-5%	-3%	-4%	-1%		
08	43,000	42,665	43,583	45,399	45,662	47,666	43,805	43,567	45,196	46,795	42,144	39,843	44,110	1.03	
	-5%	1%	-2%	0%	-1%	-3%	2%	0%	1%	-1%	2%	3%	0%		
09	40,852	43,270	42,575	45,436	45,175	46,287	44,558	43,739	45,515	46,288	42,994	*40,976*	43,972	1.02	
	0%	-3%	9%	11%	0%	1%	-3%	-10%	-10%	-1%	2%	8%	0%		
10	40,986	41,824	46,473	50,492	45,142	46,670	43,442	39,324	40,742	45,954	43,689	*44,351*	44,091	1.05	
	-5%	-3%	-5%	-12%	1%	-1%	-2%	10%	10%	-2%	0%	-5%	-2%		
11	38,992	40,387	43,984	44,255	45,396	46,356	42,701	43,418	44,903	44,901	43,509	42,193	43,416	1.08	
	4%	4%	-3%	0%	1%	-2%	-5%	3%	-2%	0%	-1%	-4%	-1%		
12	40,729	41,899	42,785	44,163	45,938	45,325	40,408	44,763	43,912	45,055	42,990	40,311	43,190	1.03	
	7%	-4%	-6%	-3%	-2%	-5%	-1%	0%	-2%	1%	-3%	-1%	-2%		
13	41,885	38,845	41,520	43,138	44,501	44,259	42,378	43,216	43,864	45,281	42,411	41,606	42,742	1.10	
														1.05	Sub Average

STATION 4089 - MARLBOROUGH - RTE.I-495 - NORTH OF RTE.I-290

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	86,000	88,000	91,400	93,441	102,364	106,066	115,416	115,922	96,206	99,993	93,582	95,470	98,655	1.12	
	7%	7%	4%	4%	-2%	0%	-6%	-2%	9%	-1%	0%	-5%	1%		
06	91,632	93,896	94,654	97,548	99,848	106,518	107,960	113,530	104,483	99,380	93,184	90,801	99,453	1.06	
	-8%	-9%	-5%	-7%	-6%	3%	7%	0%	7%	9%	-3%	-8%	-1%		
07	84,308	85,309	89,689	90,259	*93,798*	*110,000*	*115,167*	*113,408*	*111,734*	*108,209*	90,152	83,708	97,978	1.15	
	0%	-1%	0%	1%	2%	-1%	-1%	0%	-1%	0%	1%	1%	0%		
13	84,833	80,097	88,525	94,408	*102,794*	*106,460*	*109,155*	*113,942*	*103,408*	*107,206*	96,380	88,507	97,976	1.22	
														1.14	Sub Average

STATION 4798 - LEXINGTON - RTE. 2 - WEST OF PLEASANT ST.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	57,027	66,995	72,196	77,189	74,222	74,735	66,931	69,361	77,829	76,238	*75,564*	72,282	71,714	1.07	
	10%	1%	0%	-2%	3%	2%	4%	3%	-3%	2%	0%	-3%	1%		
07	*68,000*	68,616	72,673	74,017	78,084	77,591	72,321	*73,150*	*73,355*	79,113	74,842	*67,488*	73,271	1.07	
														1.07	Sub Average

Average Adjusment Factor (May) 1.08

Average Yearly Growth Calculated -0.38%
Yearly Growth Factor Used 1.0%

ITALICS = ESTIMATED DATA
MADT

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 817 - Nursery (Garden Center)

Average Vehicle Trips Ends vs: Acres
Independent Variable (X): 1.9

AVERAGE WEEKDAY DAILY

T = 108.10* (X)
T = 108.10* 1.87
T = 202.15
T = 202 vehicle trips
with 50% (101 vpd) entering and 50% (101 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 2.82 * (X)
T = 2.82* 1.87
T = 5.27
T = 5 vehicle trips
with 52% (3 vph) entering and 48% (2 vph) exiting.

*Directional distribution unavailable; taken from directional distribution for LUC 817 AM Peak Hour of Generator

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 8.06 * (X)
T = 8.06 * 1.87
T = 15.07
T = 15 vehicle trips
with 49% (7 vph) entering and 51% (8 vph) exiting.

*Directional distribution unavailable; taken from directional distribution for LUC 817 PM Peak Hour of Generator

SATURDAY DAILY

T = 154.82 * (X)
T = 154.82* 1.87
T = 289.51
T = 290 vehicle trips
with 50% (145 vpd) entering and 50% (145 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

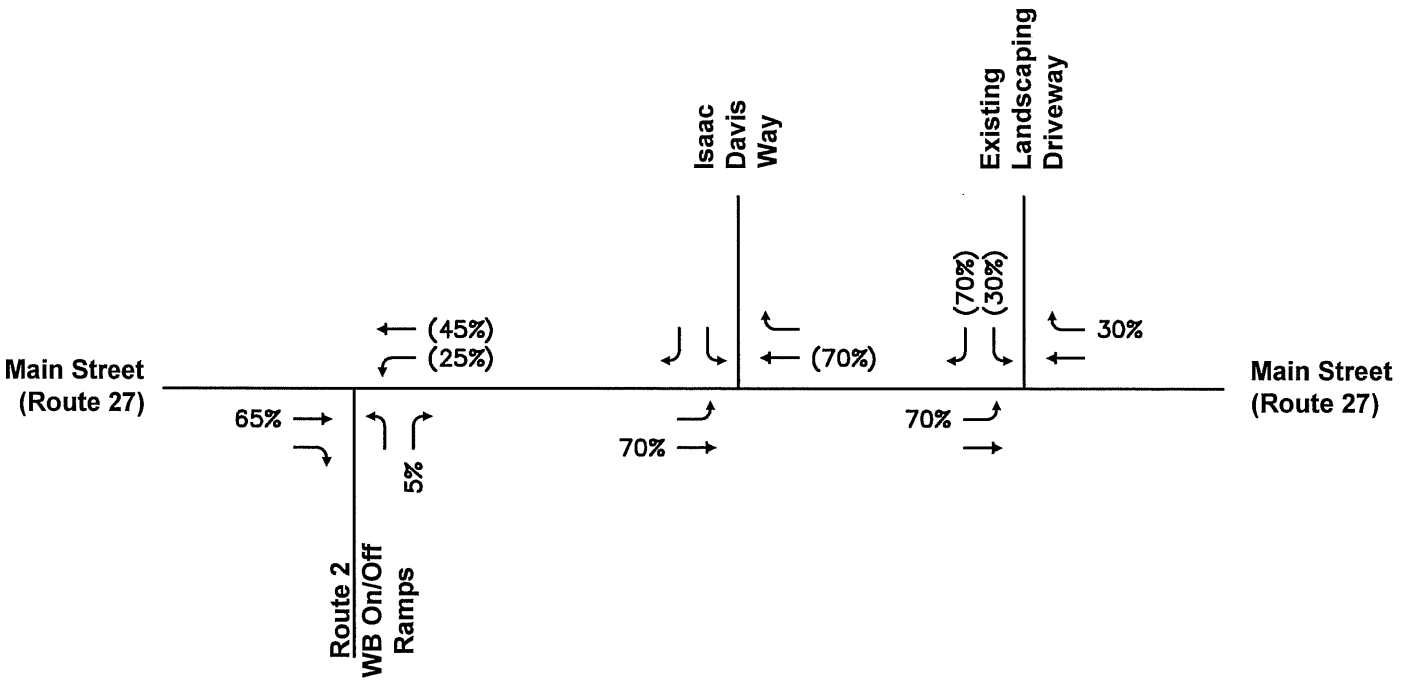
T = 23.29* (X)
T = 23.29* 1.87
T = 43.55
T = 44 vehicle trips
with 49% (22 vph) entering and 51% (22 vph) exiting.

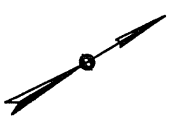
*Directional distribution unavailable; assumed to be same as weekday PM peak hour distribution.

Summary

Pass-By: 0.25

	Total	Pass-By	Net New
AM			
In	3	0	3
Out	2	0	2
Total	5	0	5
PM			
In	7	2	5
Out	8	2	6
Total	15	4	11
Sat			
In	22	6	16
Out	22	6	16
Total	44	12	32
Daily			
In	101	26	75
Out	101	26	75
Total	202	52	150
Sat Daily			
In	145	37	108
Out	145	37	108
Total	290	74	216





North
Scale: Not to Scale

NOTES:
NEGL. = Negligible
 # (#) = Entering Distribution (Exiting Distribution)

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

Re-Occupancy of Landscaping Center
Trip Distribution

Date: March 2014
Dwg No. 442 TIAS02.dwg
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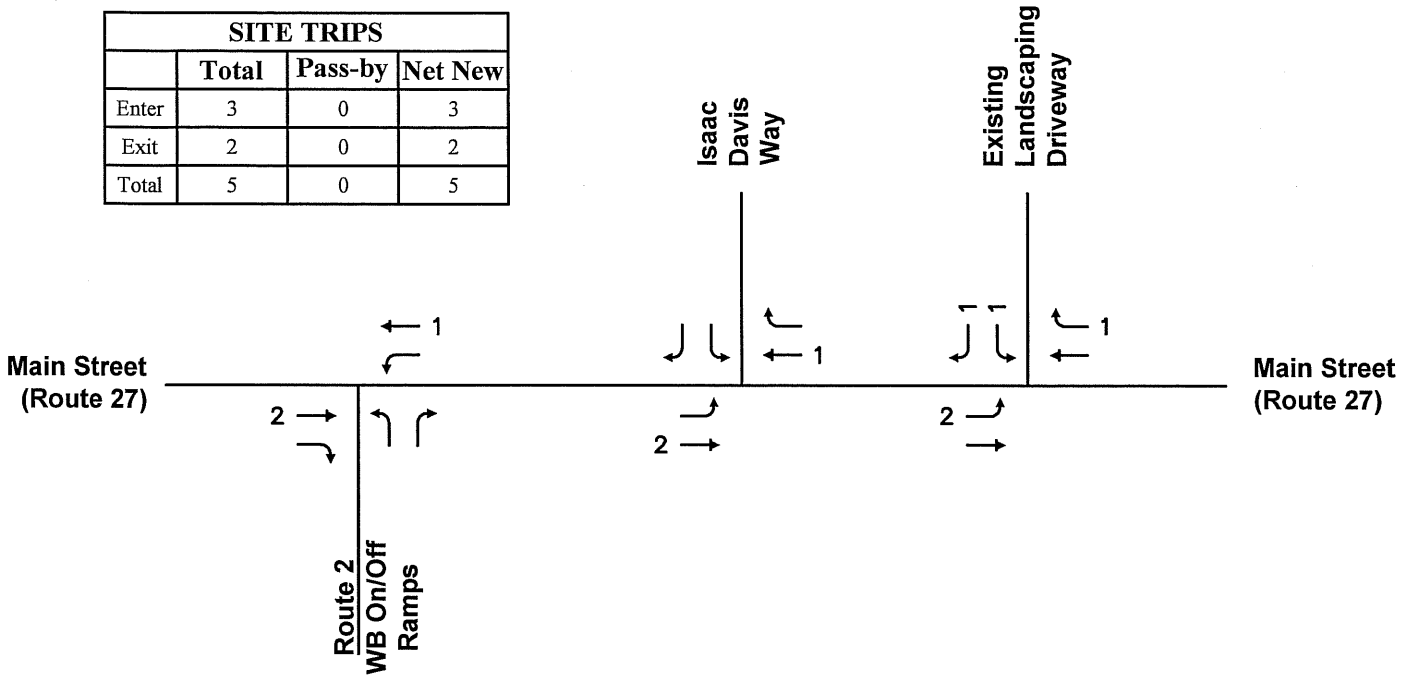
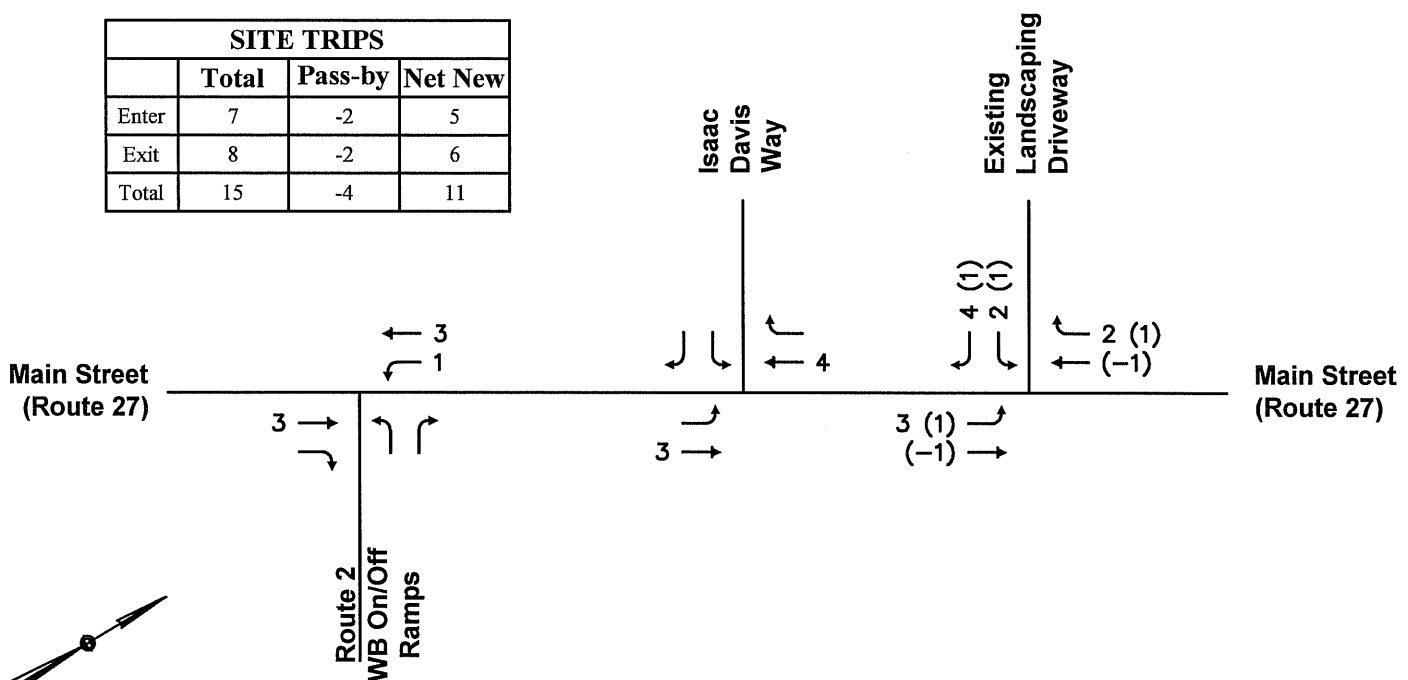
SITE TRIPS			
	Total	Pass-by	Net New
Enter	3	0	3
Exit	2	0	2
Total	5	0	5



Weekday Morning Peak Hour

SITE TRIPS			
	Total	Pass-by	Net New
Enter	7	-2	5
Exit	8	-2	6
Total	15	-4	11



Scale: Not to Scale

NOTES:
NEGL. = Negligible
 # (#) = New trips (pass-by trips)

Weekday Evening Peak Hour

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Re-Occupancy of Landscaping Center Trips

Date: March 2014
Dwg No. 442 TIAS02.dwg
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□ ITE Trip Generation Calculations

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 565 - Day Care Center

Average Vehicle Trips Ends vs: Students
Independent Variable (X): 262

AVERAGE WEEKDAY DAILY

T = 4.38 * (X)
T = 4.38 * 262.00
T = 1147.56
T = 1,148 vehicle trips
with 50% (574 vpd) entering and 50% (574 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.80 (X)
T = 0.80* 262.00
T = 209.60
T = 210 vehicle trips
with 53% (111 vpd) entering and 47% (99 vpd) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.81 (X)
T = 0.81* 0.00
T = 212.22
T = 212 vehicle trips
with 47% (100 vpd) entering and 53% (112 vpd) exiting.

SATURDAY DAILY

T = 0.39 * (X)
T = 0.39 * 262
T = 102.18
T = 102 vehicle trips
with 50% (51 vpd) entering and 50% (51 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.11 * (X)
T = 0.11 * 262
T = 28.82
T = 29 vehicle trips
with 63% (18 vph) entering and 37% (11 vph) exiting.

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Project: 442 - Acton
Sheet No. 1 of 1
Prepared By: CJones Date: 03/03/2014
Checked By: Date:
Description: Trip Generation Calculations - Empirical Basis

The empirically-based trip generation estimates for the proposed 262-student day care center are based on the July 11, 2007 letter from NGCC to the Walpole Planning Board, Re: Traffic Patterns of Next Generation Children's Centers.

Average Statistics for NGCC Centers:

20%of students are siblings
5% of students are children of NGCC staff
25% total trip reduction (0.75 adjustment factor)

Therefore, the estimated number of trips during the morning drop-off and evening pick-up periods is:

262 students x 1 vehicle trip per student x 0.75 = 196 trips

196 trips entering + 196 trips exiting = 392 total trips

NGCC experiences an almost uniform distribution of drop-offs between 7 AM and 10 AM and pick-ups between 3 PM and 6 PM.

Therefore, the morning and peak hour trip generation is:
392 trips/3 hours ≈ 130 trips/hour (65 entering + 65 exiting)

NGCC staff generally arrive before students arrive and depart after students are pick-up. Therefore, the staff is estimated to generate a negligible amount of traffic during the AM and PM peak hours.

□ Applicant's Letter to Planning Board

Next Generation Children's Centers
A Leader in Early Childhood Education

TO: WALPOLE PLANNING BOARD

FROM: WALTER KELLEHER, CFO-NGCC

SUBJECT: TRAFFIC PATTERNS OF NEXT GENERATION CHILDREN'S CENTERS

DATE: JULY 11, 2007

First, let me say that Next Generation Children's Centers Inc. is a good neighbor. We are not open late, we close most days at 6:00 PM. The exception is our monthly Director's meeting. We are not open on the weekends (The exception would be special occasions such as graduation or a child I.D. drive). We meticulously care for our beautiful facilities, both inside and out, and we keep our landscaping beautiful and inviting. NGCC will provide the highest quality childcare for your townspeople and their neighbors. NGCC will create over 50 jobs for the area and make a positive contribution to the town tax base as well as providing a much-needed service for the community.

Traffic patterns vary slightly from center to center. However, they have many areas of commonality. Based upon the averages of our existing eight centers in similar communities, the traffic patterns are as follows:

- The vast majority of our families in a community-based center are people who live near our centers or who are already driving by our center. Most commuters will travel less than 5 minutes from their normal commuting pattern to go to a childcare center.

- The number of children when the center is at total capacity: **338 children**
  The center will not be full for at least **three years**, but it is best to use a maximum calculation for traffic analysis. The center's enrollment will build over a period of time and will not cause an overwhelming influx of vehicles into the area.

- The average percentage of siblings in all of our centers is **19.5%** of the total enrollment. Therefore **20%** is not an unreasonable supposition. This reduces the total number of trips by **20%** or **68** trips in the morning and **68** trips in the evening. Employee's children reduce the number of trips by another **5%** or **17** trips in the morning and **17** trips in the evening. Therefore the maximum number of morning parent trips would be **253** and the number of evening parent trips would be **253** trips when the center is at total capacity not including any carpooling.

- The drop off and pick up trips are almost evenly distributed over the hours of 7:00AM to 10:00 AM in the morning and 3:00 PM to 6:00 PM in the evening. The more affluent the community, the higher the number of children that are brought in later in the morning. These are children of stay-at-home moms who want their children to experience peer socialization and prepare their children for public school. It is a safe prediction that the children of Walpole will arrive at the center throughout the morning hours and will be picked up throughout the evening hours based upon our experience in our eight operating centers.

- Without knowing in advance as to what our enrollment structure would look like, we can only use our experience in similar sized centers in towns with similar demographics.
    - **98%** of our children are dropped off between 7:00 AM and 10:00 A.M. and picked up between 3:00 PM and 6:00 P.M.
    - The pattern is well distributed throughout the three-hour period.
    - The average is **64** trips per hour or **16** trips per **15** minutes in a center with a **240** child enrollment. The Walpole average will be **84** trips per hour or **21** trips per **15** minutes.
    - The average drop off time in the morning is significantly shorter than the afternoon. (**8** minutes in the morning and **14** minutes in the evening).

- There will be **44** teachers and **5** floating teachers or program managers in the Walpole center. Adding the **2** Co-Directors and **2** assistants, the total is **53** employees maximum in the center at one time when the center is at full occupancy. The majority of the teachers and management arrive in the morning **before** the arrival of the children. Our teachers park in an assigned area farthest from the entrance. We reserve between **30 to 50** parking spots close to the entrance for parent parking. Per the state regulations for early childhood providers, each parent must accompany their children into the center and to their classroom and sign them in and out.

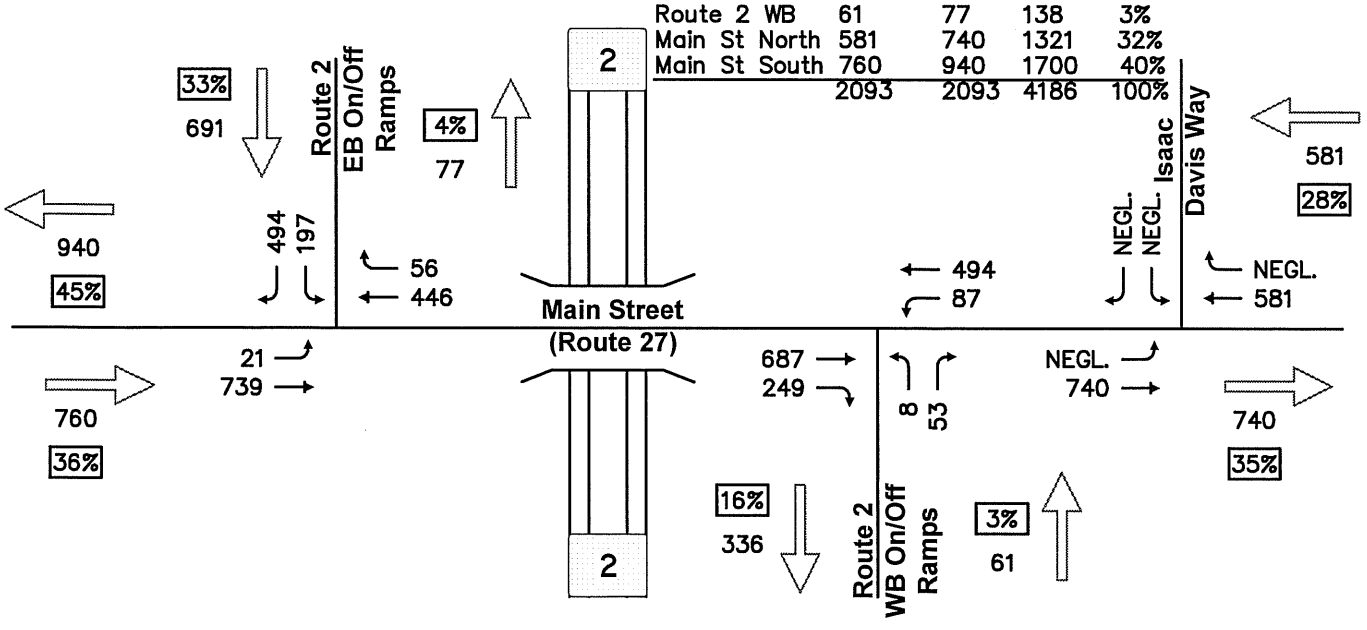
- Our **ideal** setup for parking is for **53** reserved parking spots for employees and **30 to 50** parking spots reserved for parents.

- All three of our 20,000 square foot prototypes have less than 100 parking spots and function well without parking problems or customer complaints. We believe that the proposed **110** parking spots give us more than enough spots to cover any contingencies.

Thank you for your consideration.

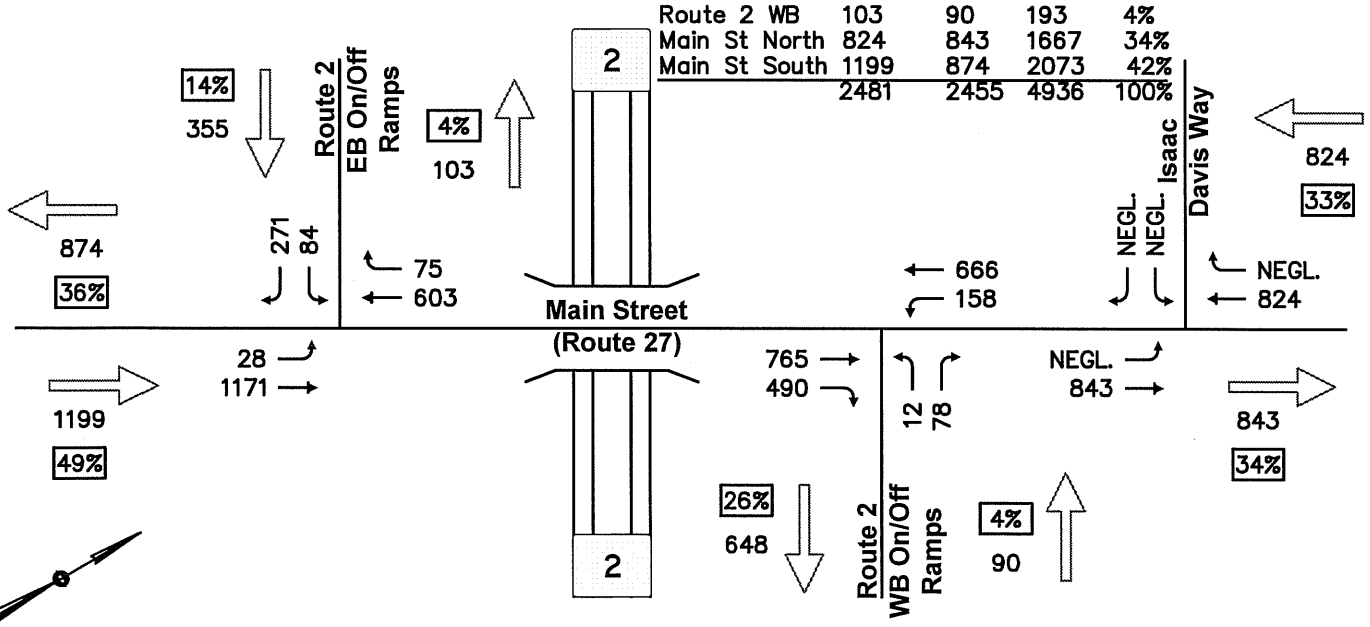
Next Generation Children's Centers Inc.
Corporate Offices
307 Boston Post Road Sudbury, MA 01776

□ Trip Distribution Calculations



	VOLUME IN	VOLUME OUT	TOTAL	%
Route 2 EB	691	336	1027	25%
Route 2 WB	61	77	138	3%
Main St North	581	740	1321	32%
Main St South	760	940	1700	40%
	2093	2093	4186	100%

Weekday Morning Peak Hour



	VOLUME IN	VOLUME OUT	TOTAL	%
Route 2 EB	355	648	1003	20%
Route 2 WB	103	90	193	4%
Main St North	824	843	1667	34%
Main St South	1199	874	2073	42%
	2481	2455	4936	100%

North
Scale: Not to Scale

NOTES:
NEGL. = Negligible

Weekday Evening Peak Hour

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

NGCC Trip Distribution Calculations - Step 1
Existing Travel Patterns

(Source: *Traffic Impact Assessment, Next Generation Children's Center, 348, 350 & 352 Main Street, Acton, Massachusetts,* prepared by MDM Transportation Consultants, Inc., July 18, 2008)

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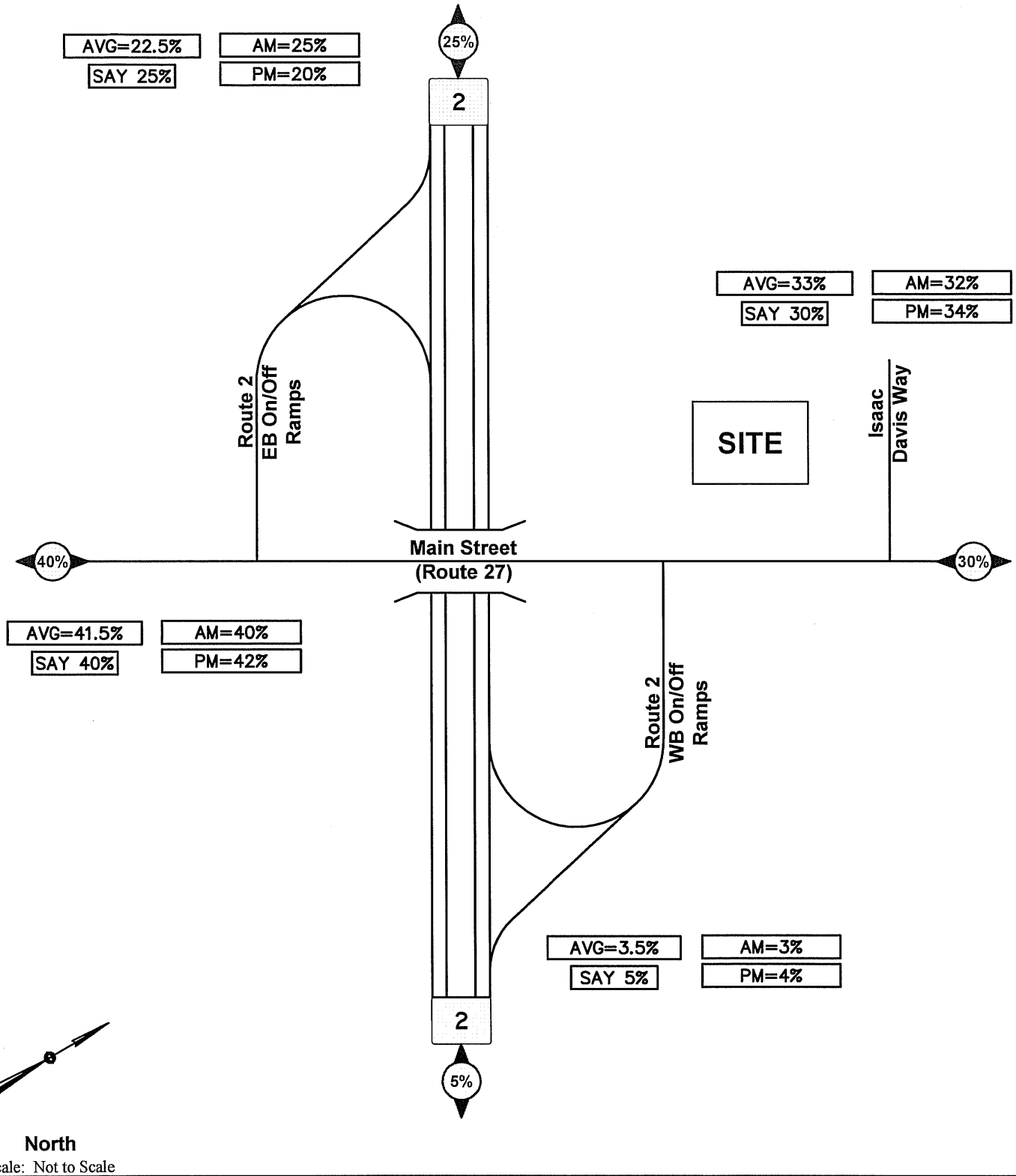

Scale: Not to Scale

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
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NGCC Trip Distribution Calculations - Step 2
Existing Travel Patterns

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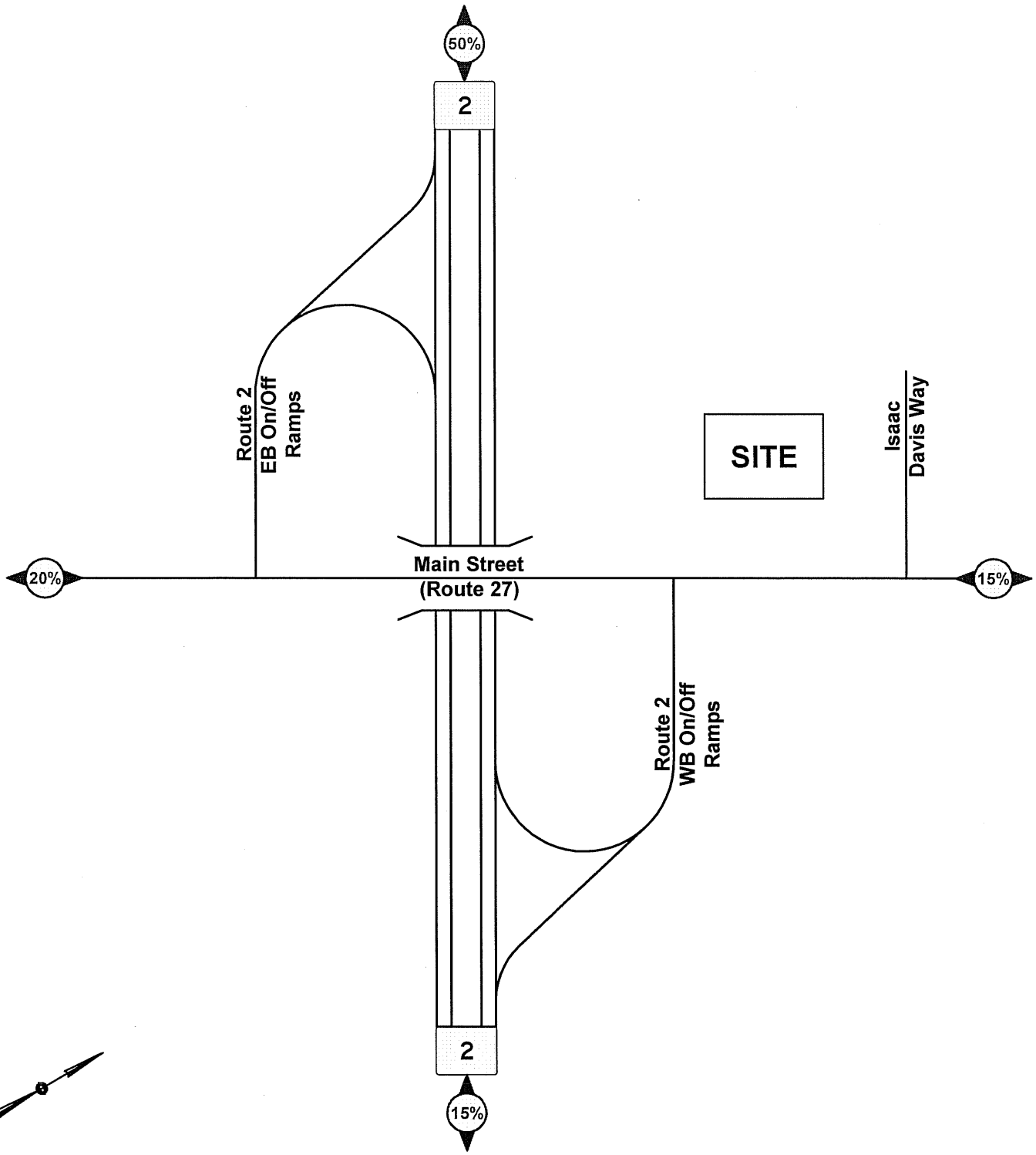

North
Scale: Not to Scale

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
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NGCC Trip Distribution Calculations - Step 3
Journey to Work

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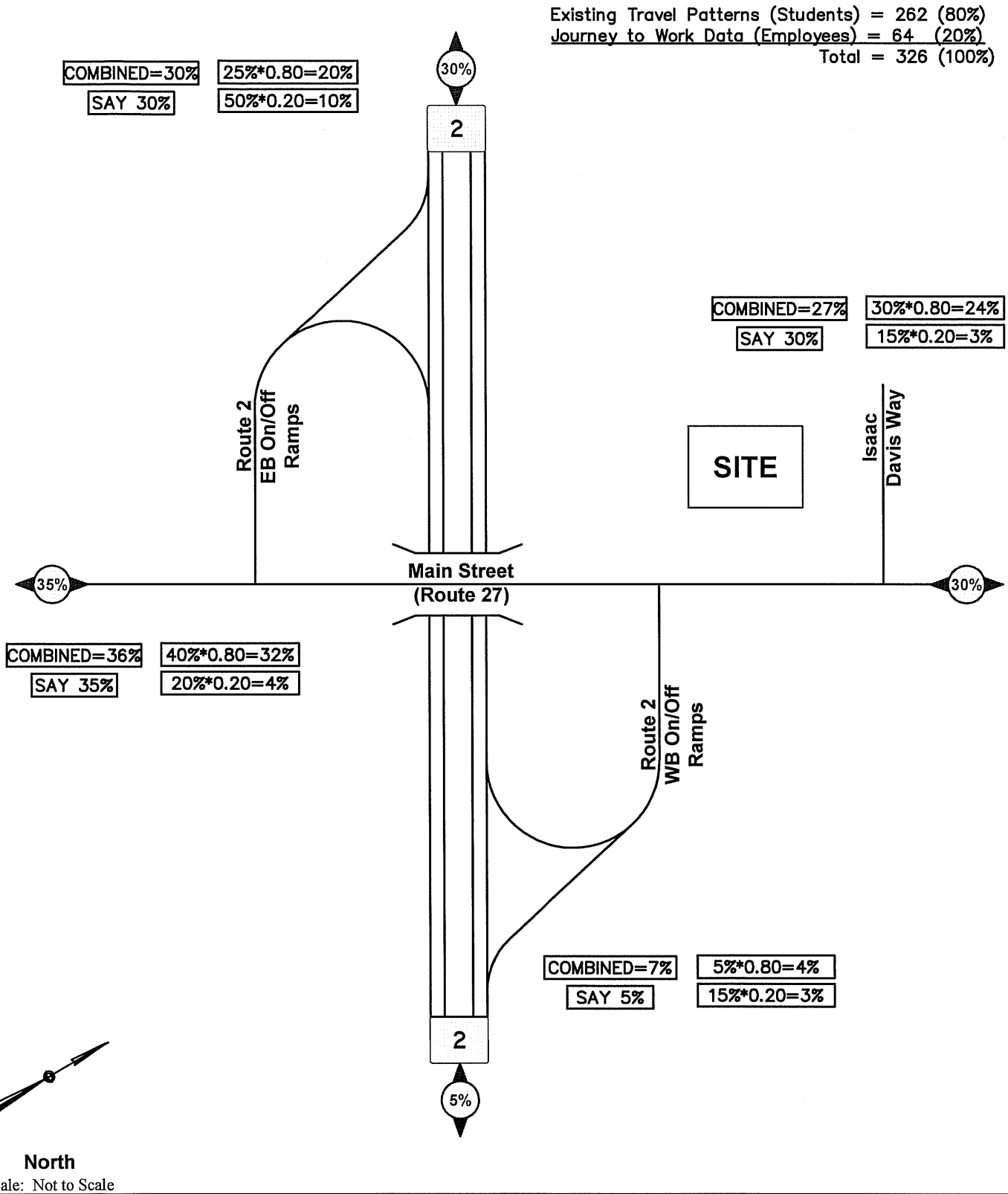
Residence MCD/County to Workplace MCD/County Flows for Massachusetts: 2000
Sorted by Workplace State-County, or State-County-County Subdivision (in 12 states)

Residence State-County-MCD Name		Workplace State-County-MCD Name	Count		To Site
Burlington town Middlesex Co. MA		Acton town Middlesex Co. MA	43	0.4%	2W
Wellesley town Norfolk Co. MA		Acton town Middlesex Co. MA	43	0.4%	2W
Lynn city Essex Co. MA		Acton town Middlesex Co. MA	44	0.4%	2W
Needham town Norfolk Co. MA		Acton town Middlesex Co. MA	44	0.4%	2W
Bedford town Middlesex Co. MA		Acton town Middlesex Co. MA	48	0.4%	2W
Gardner city Worcester Co. MA		Acton town Middlesex Co. MA	48	0.4%	2E
Stoneham town Middlesex Co. MA		Acton town Middlesex Co. MA	48	0.4%	2W
Tewksbury town Middlesex Co. MA		Acton town Middlesex Co. MA	49	0.4%	2E
Wilmington town Middlesex Co. MA		Acton town Middlesex Co. MA	50	0.4%	2E
Milford town Worcester Co. MA		Acton town Middlesex Co. MA	51	0.4%	2E
Brookline town Norfolk Co. MA		Acton town Middlesex Co. MA	52	0.4%	2W
Hudson town Hillsborough Co. NH		Acton town Middlesex Co. MA	52	0.4%	2E
Winchendon town Worcester Co. MA		Acton town Middlesex Co. MA	52	0.4%	2E
Carlisle town Middlesex Co. MA		Acton town Middlesex Co. MA	53	0.5%	27S
Lancaster town Worcester Co. MA		Acton town Middlesex Co. MA	56	0.5%	2E
Watertown city Middlesex Co. MA		Acton town Middlesex Co. MA	56	0.5%	2W
Franklin city Norfolk Co. MA		Acton town Middlesex Co. MA	60	0.5%	2E
Tyngsbor. town Middlesex Co. MA		Acton town Middlesex Co. MA	62	0.5%	2E
Medford city Middlesex Co. MA		Acton town Middlesex Co. MA	66	0.6%	2W
Sudbury town Middlesex Co. MA		Acton town Middlesex Co. MA	68	0.6%	27N
Cambridge city Middlesex Co. MA		Acton town Middlesex Co. MA	69	0.6%	2W
Shrewsbury town Worcester Co. MA		Acton town Middlesex Co. MA	69	0.6%	2E
Northbor. town Worcester Co. MA		Acton town Middlesex Co. MA	71	0.6%	2E
Andover town Essex Co. MA		Acton town Middlesex Co. MA	72	0.6%	2E
Hudson town Middlesex Co. MA		Acton town Middlesex Co. MA	73	0.6%	2E
Lexington town Middlesex Co. MA		Acton town Middlesex Co. MA	75	0.6%	2W
Newton city Middlesex Co. MA		Acton town Middlesex Co. MA	75	0.6%	2W
Woburn city Middlesex Co. MA		Acton town Middlesex Co. MA	76	0.6%	2W
Haverhill city Essex Co. MA		Acton town Middlesex Co. MA	89	0.8%	2E
Arlington town Middlesex Co. MA		Acton town Middlesex Co. MA	90	0.8%	2W
Natick town Middlesex Co. MA		Acton town Middlesex Co. MA	94	0.8%	27N
Belmont town Middlesex Co. MA		Acton town Middlesex Co. MA	99	0.8%	2W
Clinton town Worcester Co. MA		Acton town Middlesex Co. MA	104	0.9%	2E
Lunenburg town Worcester Co. MA		Acton town Middlesex Co. MA	108	0.9%	2E
Worcester city Worcester Co. MA		Acton town Middlesex Co. MA	108	0.9%	2W
Somerville city Middlesex Co. MA		Acton town Middlesex Co. MA	111	0.9%	2W
Malden city Middlesex Co. MA		Acton town Middlesex Co. MA	117	1.0%	2E
Dracut town Middlesex Co. MA		Acton town Middlesex Co. MA	125	1.1%	2E
Shirley town Middlesex Co. MA		Acton town Middlesex Co. MA	133	1.1%	2E
Ayer town Middlesex Co. MA		Acton town Middlesex Co. MA	144	1.2%	2E
Nashua city Hillsborough Co. NH		Acton town Middlesex Co. MA	151	1.3%	2E
Fitchburg city Worcester Co. MA		Acton town Middlesex Co. MA	153	1.3%	2E
Harvard town Worcester Co. MA		Acton town Middlesex Co. MA	159	1.4%	2E
Townsend town Middlesex Co. MA		Acton town Middlesex Co. MA	165	1.4%	2W
Waltham city Middlesex Co. MA		Acton town Middlesex Co. MA	179	1.5%	2E
Groton town Middlesex Co. MA		Acton town Middlesex Co. MA	182	1.5%	2E
Framingham town Middlesex Co. MA		Acton town Middlesex Co. MA	193	1.6%	2W
Stow town Middlesex Co. MA		Acton town Middlesex Co. MA	193	1.6%	27N
Pepperell town Middlesex Co. MA		Acton town Middlesex Co. MA	198	1.7%	2E
Concord town Middlesex Co. MA		Acton town Middlesex Co. MA	209	1.8%	2W

Marlbor. city Middlesex Co. MA	Acton town Middlesex Co. MA	212	1.8%	2E	
Billerica town Middlesex Co. MA	Acton town Middlesex Co. MA	222	1.9%	2E	
Boston city Suffolk Co. MA	Acton town Middlesex Co. MA	236	2.0%	2W	
Boxbor. town Middlesex Co. MA	Acton town Middlesex Co. MA	251	2.1%	27N	
Littleton town Middlesex Co. MA	Acton town Middlesex Co. MA	295	2.5%	2E	
Westford town Middlesex Co. MA	Acton town Middlesex Co. MA	330	2.8%	2E	
Lowell city Middlesex Co. MA	Acton town Middlesex Co. MA	338	2.9%	2E	
Leominster city Worcester Co. MA	Acton town Middlesex Co. MA	345	2.9%	2E	
Chelmsford town Middlesex Co. MA	Acton town Middlesex Co. MA	357	3.0%	2E	
Maynard town Middlesex Co. MA	Acton town Middlesex Co. MA	371	3.2%	27N	
Acton town Middlesex Co. MA	Acton town Middlesex Co. MA	2418	20.5%		27S
	Total	**11774**	**100.0%**		



Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

NGCC Trip Distribution Calculations - Step 4
Combined Existing Travel Patterns & Journey to Work

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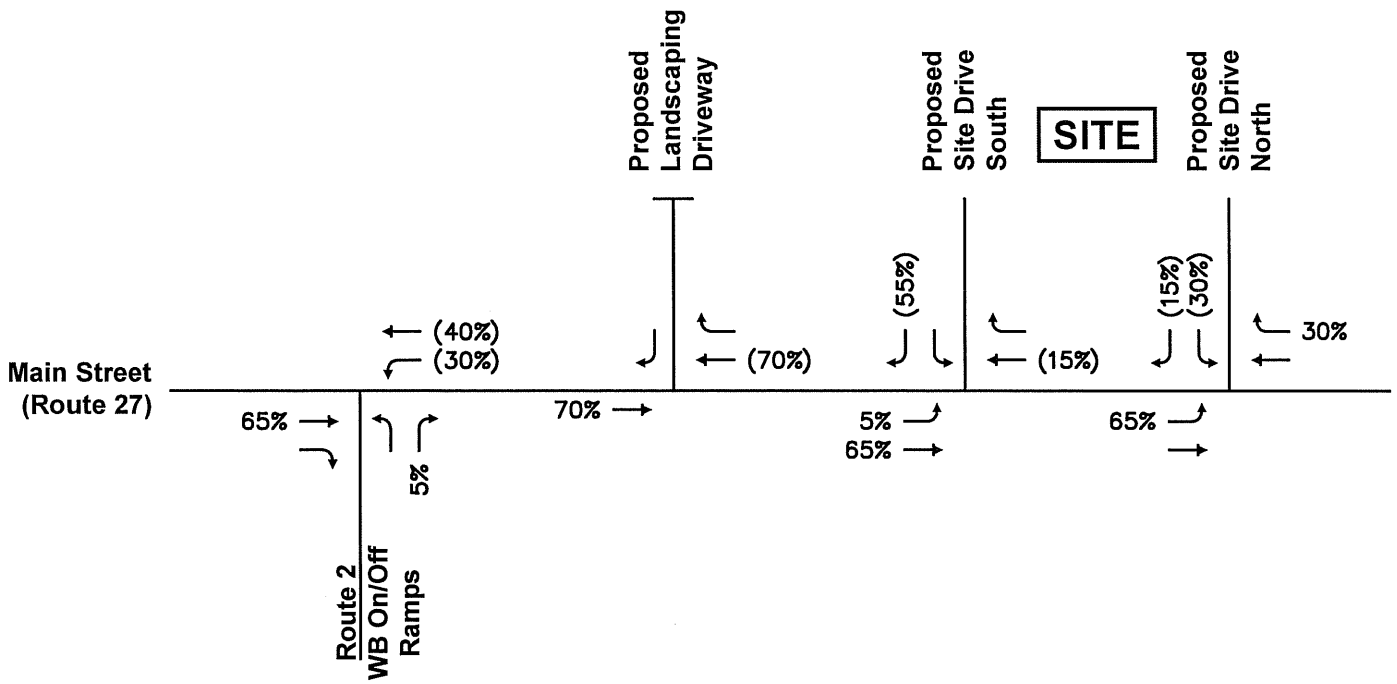

NOTES:
 # (#) = Entering Distribution (Exiting Distribution)

-Distribution at NGCC driveways based on parking layout and main building entrance location.
-Distribution shown is for student-related trips during the AM and PM peak hours.
-Staff-related trips during these peak hours is estimated to be neglible.

North
Scale: Not to Scale

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
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NGCC Trip Distribution Calculations - Step 5

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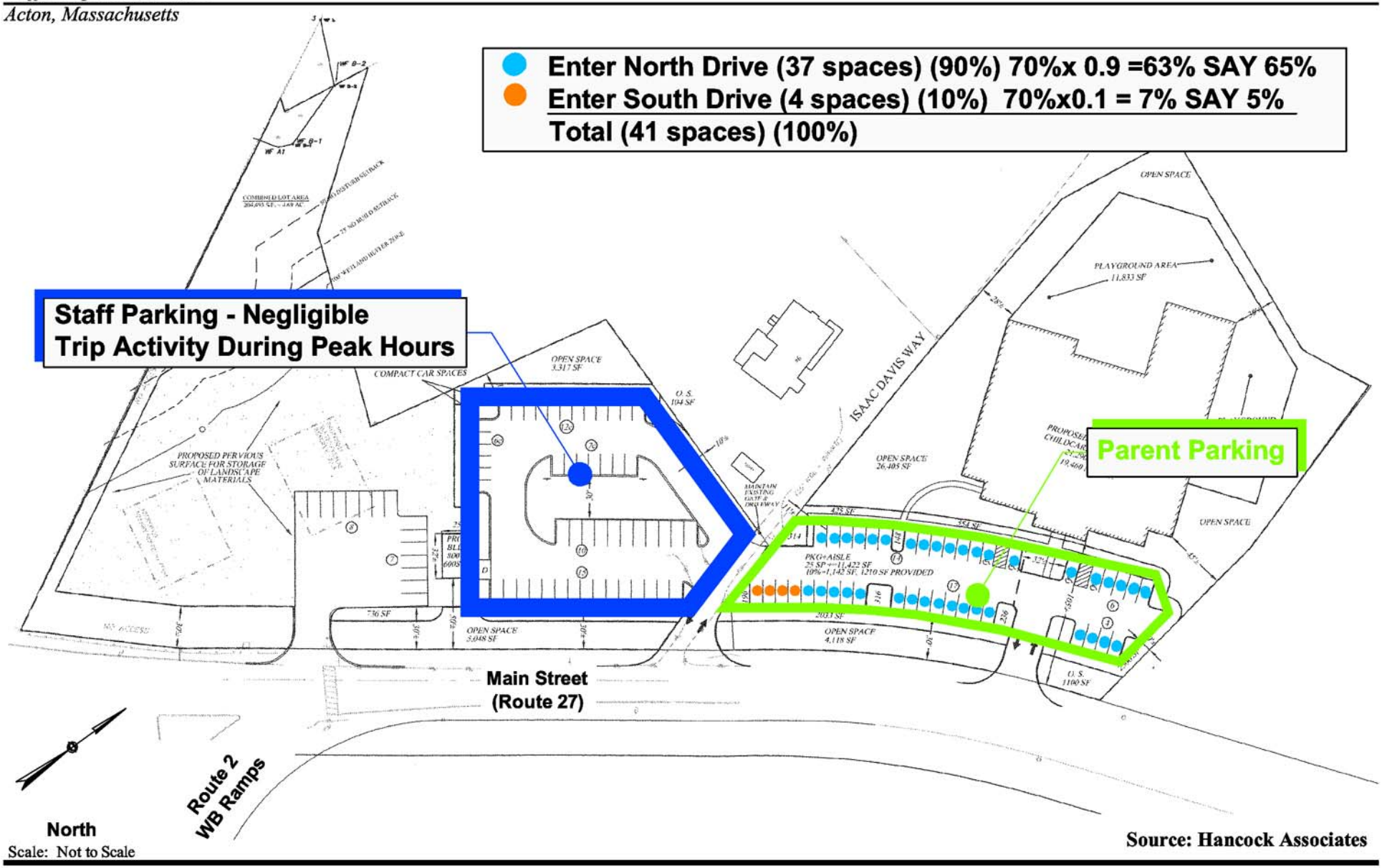

Source: Hancock Associates

MDM TRANSPORTATION CONSULTANTS, INC.
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Attachments

Entering Trip Distribution Calculations - Site Driveways
(Trips Arriving from the South along Route 27)

Date: March 2014
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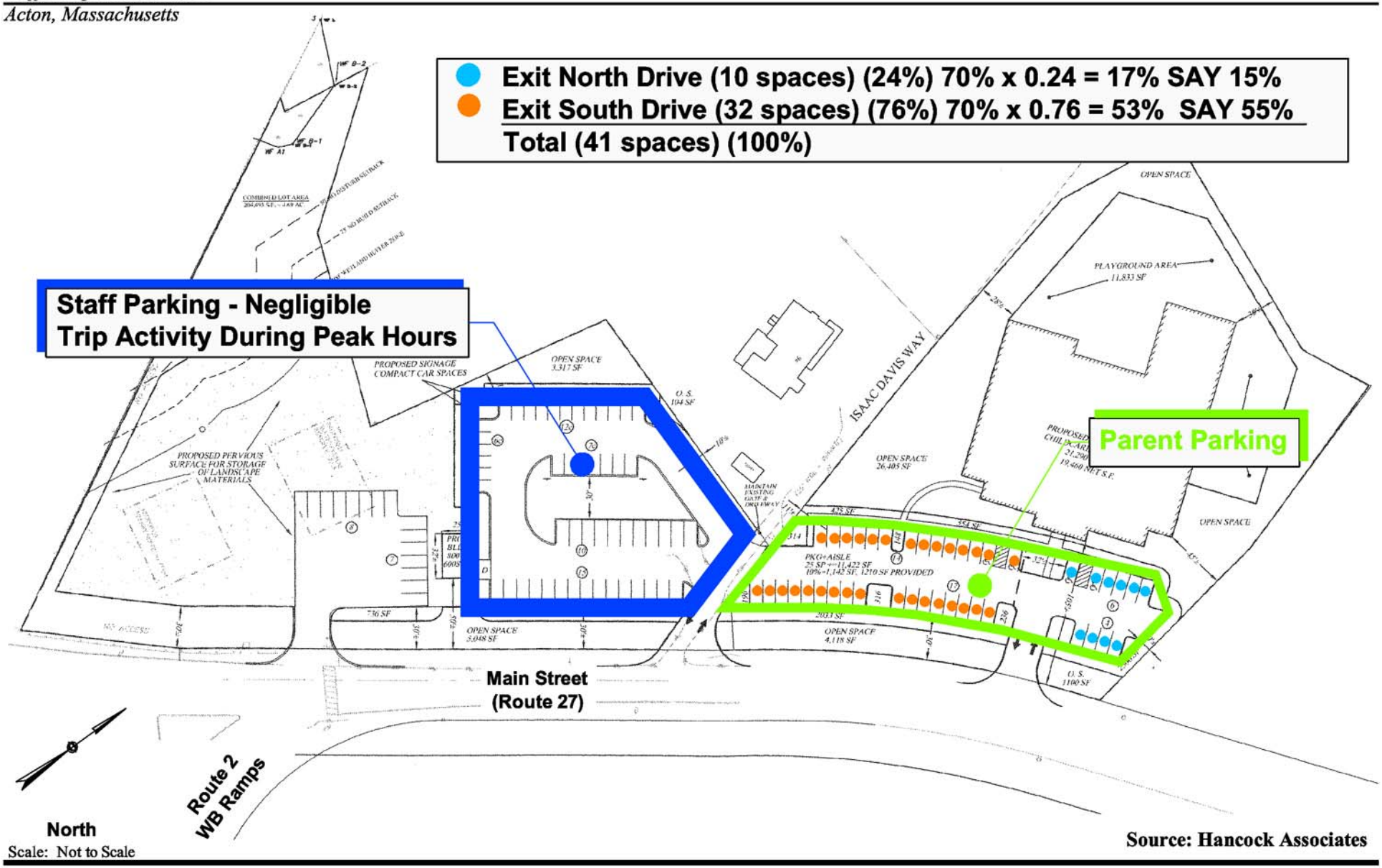

Source: Hancock Associates

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Attachments

Exiting Trip Distribution Calculations - Site Driveways
(Trips Exiting to the South along Route 27)

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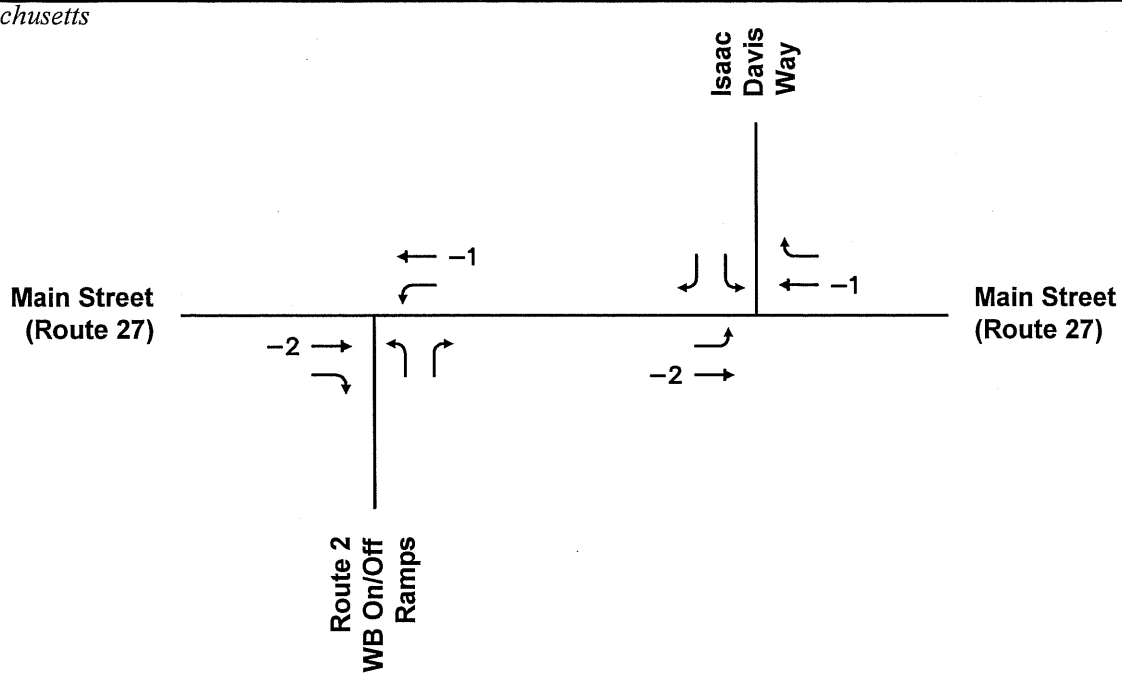
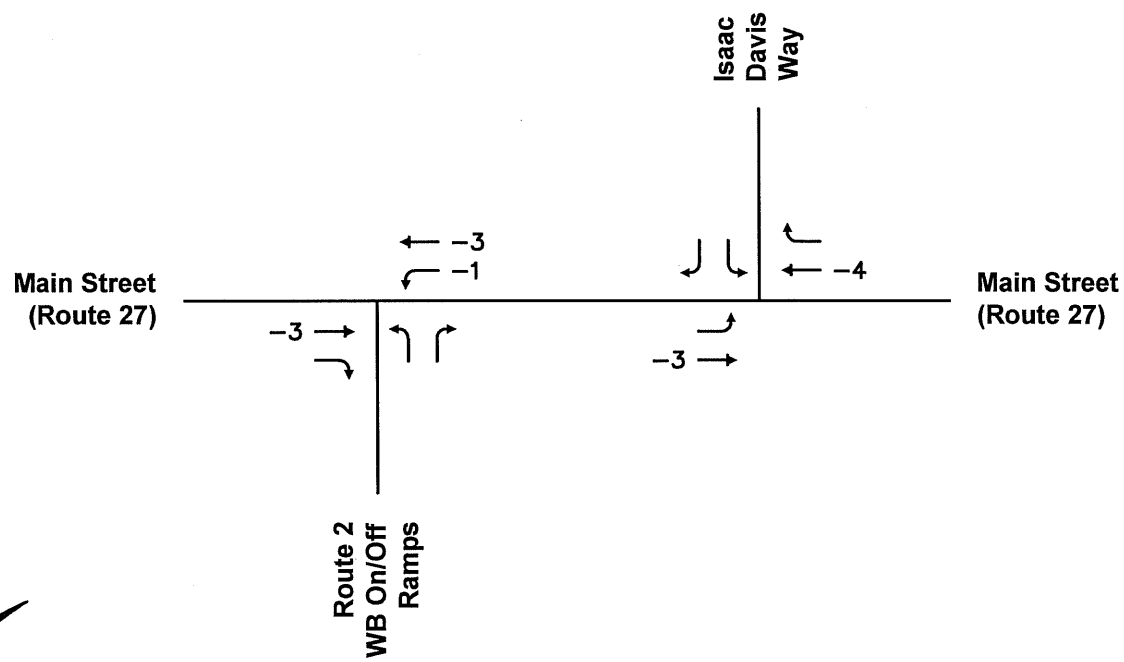
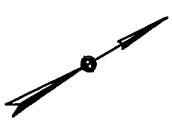
□ Landscaping Relocation Trip Tracings



Weekday Morning Peak Hour





North
Scale: Not to Scale

NOTES:
NEGL. = Negligible

Weekday Evening Peak Hour

MDM TRANSPORTATION CONSULTANTS, INC.
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Attachments

Removal of Landscaping Center Trips

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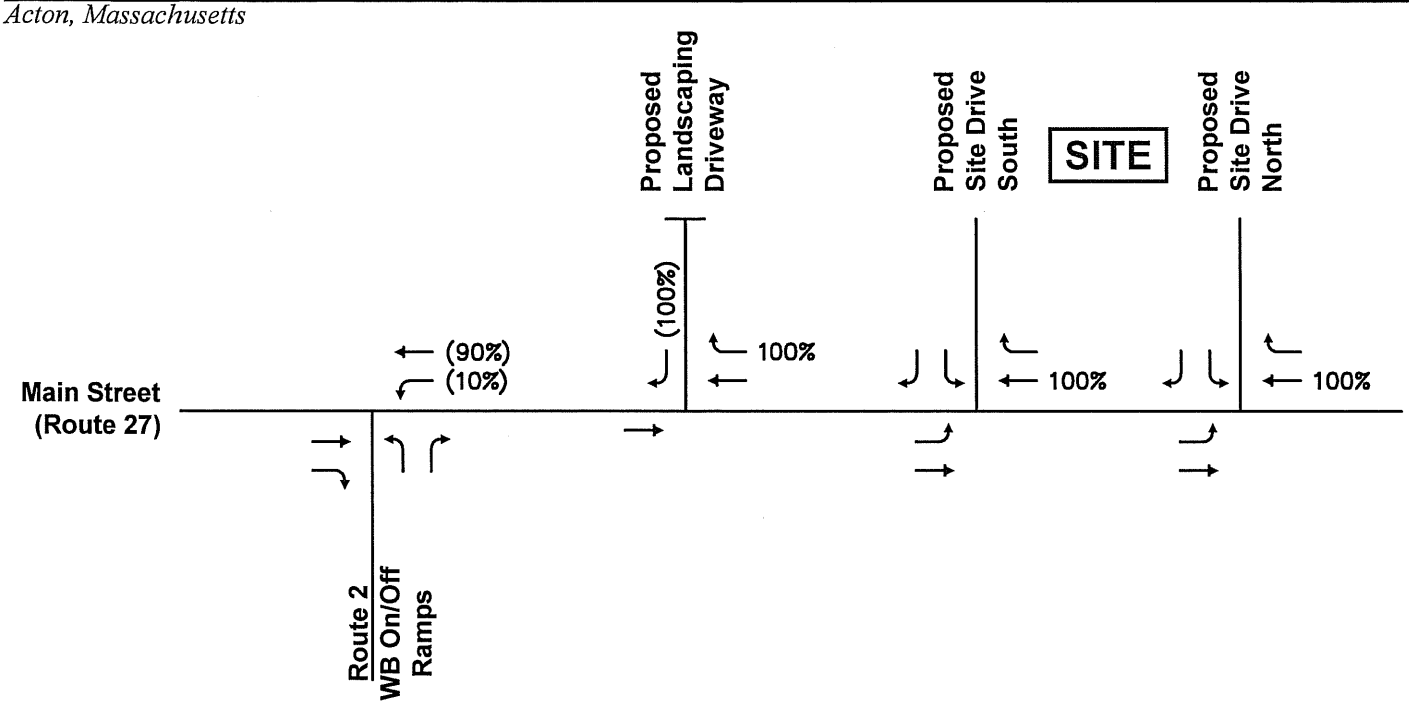
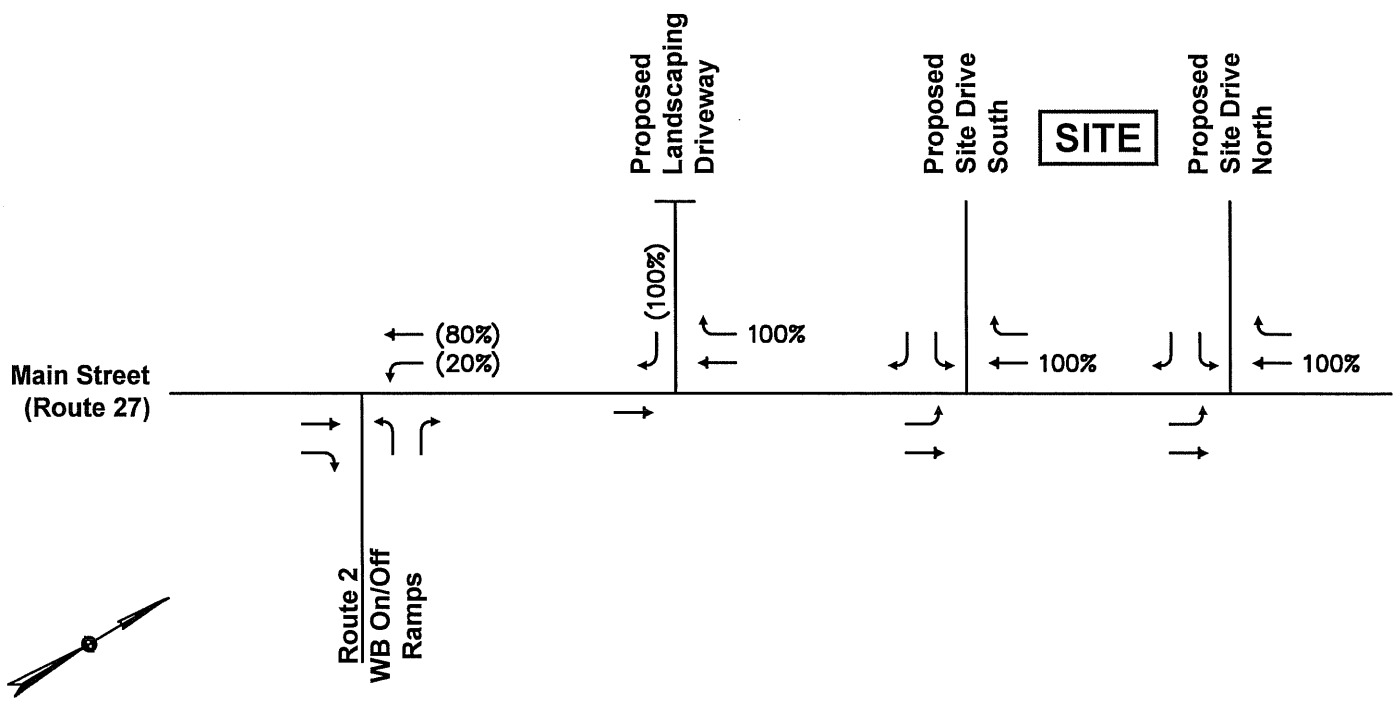


Weekday Morning Peak Hour



North
Scale: Not to Scale

NOTES:
NEGL. = Negligible

Weekday Evening Peak Hour

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
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Proposed Landscaping Center Relocation Trip Distribution

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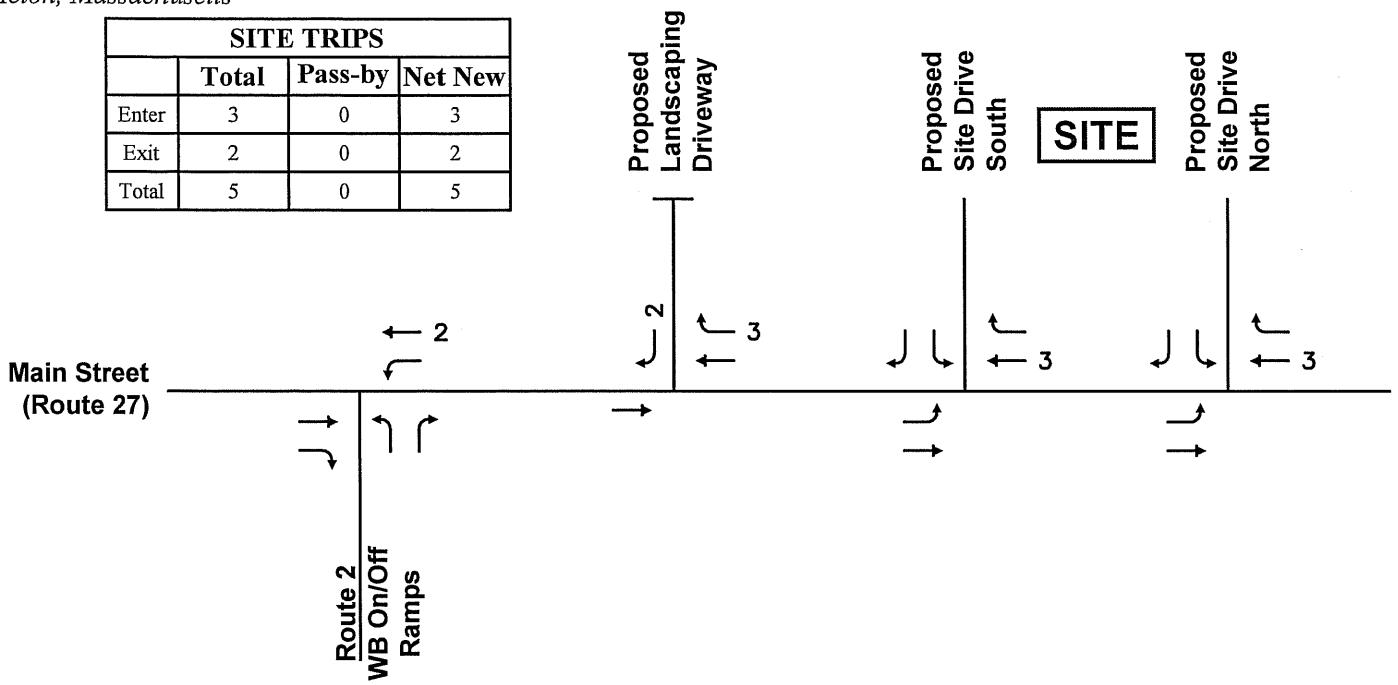
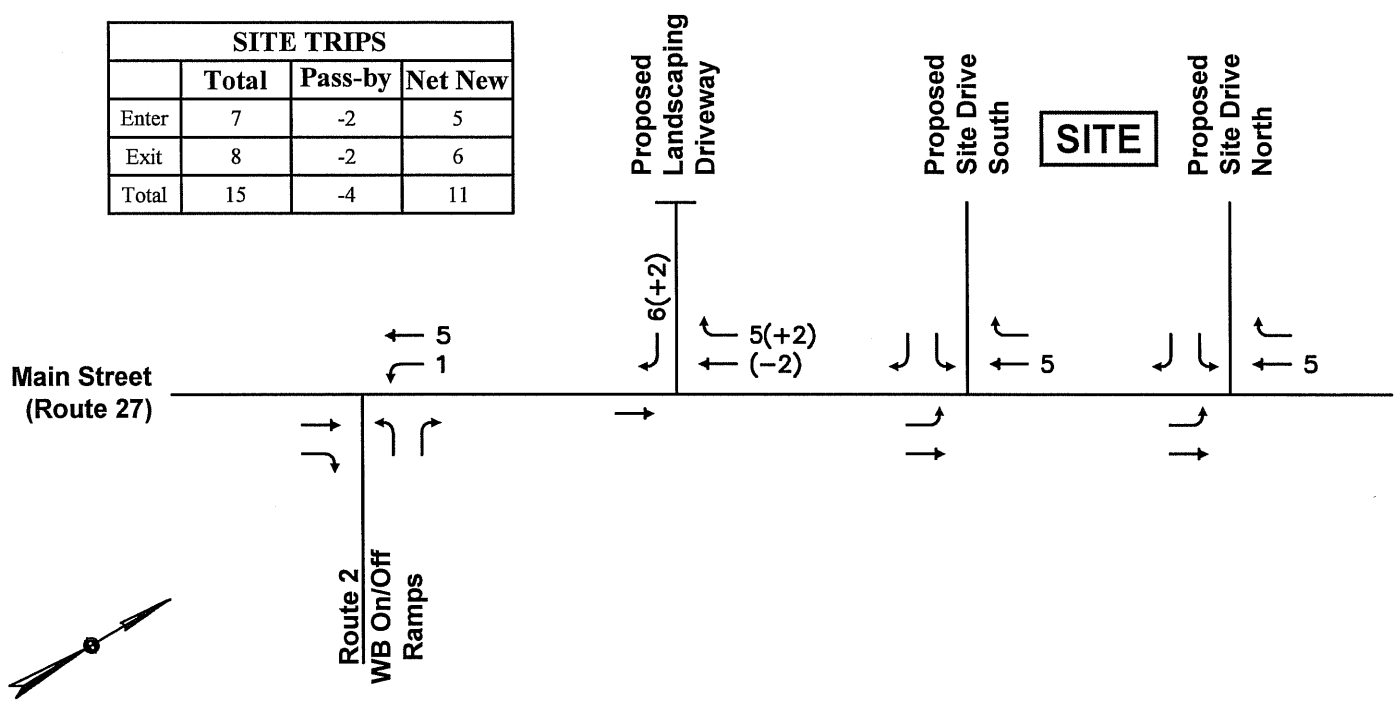
SITE TRIPS			
	Total	Pass-by	Net New
Enter	3	0	3
Exit	2	0	2
Total	5	0	5



Weekday Morning Peak Hour

SITE TRIPS			
	Total	Pass-by	Net New
Enter	7	-2	5
Exit	8	-2	6
Total	15	-4	11



Scale: Not to Scale

NOTES:
NEGL. = Negligible

Weekday Evening Peak Hour

Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
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Proposed Landscaping Center Relocation Trips

Date: March 2014
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□ Capacity Analyses

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements, and greater than 80 seconds for signalized movements).

Signalized Intersection Performance Measures

The six LOS designations for signalized intersections may be described as follows:

- *LOS A* describes operations with low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The LOS for signalized intersections are calculated using the operational analysis methodology of the 2010 *Highway Capacity Manual*.[1] This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. **Table A1** summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table A1
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[1]

Level of Service	Control (Signal) Delay per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

[1]Source: *Highway Capacity Manual 2010;* Transportation Research Board; Washington, DC; 2010.

[1]*Highway Capacity Manual* 2010; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersection Performance Measures

The six LOS designations for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The LOS designations of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[2] LOS is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for LOS at unsignalized intersections are also given in the *Highway Capacity Manual 2010.* **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[1]

Average Control Delay (seconds per vehicle)	Level of Service	
	$v/c \leq 1$	$v/c > 1$
≤ 10.0	A	F
10.1 to 15.0	B	F
15.1 to 25.0	C	F
25.1 to 35.0	D	F
35.1 to 50.0	E	F
>50.0	F	F

[1]Source: *Highway Capacity Manual 2010,* Transportation Research Board; Washington, DC; 2010.

[2] ibid

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	5	32	692	281	59	434
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	3	2	4	4	3
Mvmt Flow	5	34	728	296	62	457

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1309	728	0	-	728	0
Stage 1	728	-	-	-	-	-
Stage 2	581	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.236	-
Pot Cap-1 Maneuver	177	422	-	0	866	-
Stage 1	482	-	-	0	-	-
Stage 2	563	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	160	422	-	-	866	-
Mov Cap-2 Maneuver	160	-	-	-	-	-
Stage 1	482	-	-	-	-	-
Stage 2	509	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.2	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	160	422	866	-
HCM Lane V/C Ratio	-	0.033	0.08	0.072	-
HCM Control Delay (s)	-	28.3	14.3	9.5	0
HCM Lane LOS	-	D	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0.3	0.2	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	9	77	807	458	144	621
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	0	1	1	1	4	1
Mvmt Flow	9	78	815	463	145	627

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1733	815	0	-	815	0
Stage 1	815	-	-	-	-	-
Stage 2	918	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	2.236	-
Pot Cap-1 Maneuver	98	379	-	0	804	-
Stage 1	439	-	-	0	-	-
Stage 2	392	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	71	379	-	-	804	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	439	-	-	-	-	-
Stage 2	283	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.7	0	2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	71	379	804	-
HCM Lane V/C Ratio	-	0.128	0.205	0.181	-
HCM Control Delay (s)	-	63	16.9	10.5	0
HCM Lane LOS	-	F	C	B	A
HCM 95th %tile Q(veh)	-	0.4	0.8	0.7	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	5	34	729	295	62	457
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	3	2	4	4	3
Mvmt Flow	5	36	767	311	65	481

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1379	767	0	-	767	0
Stage 1	767	-	-	-	-	-
Stage 2	612	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.236	-
Pot Cap-1 Maneuver	161	401	-	0	838	-
Stage 1	462	-	-	0	-	-
Stage 2	545	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	144	401	-	-	838	-
Mov Cap-2 Maneuver	144	-	-	-	-	-
Stage 1	462	-	-	-	-	-
Stage 2	487	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17	0	1.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	144	401	838	-
HCM Lane V/C Ratio	-	0.037	0.089	0.078	-
HCM Control Delay (s)	-	30.9	14.9	9.7	0
HCM Lane LOS	-	D	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0.3	0.3	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	9	81	851	481	152	656
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	0	1	1	1	4	1
Mvmt Flow	9	82	860	486	154	663

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1830	860	0	-	860	0
Stage 1	860	-	-	-	-	-
Stage 2	970	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	2.236	-
Pot Cap-1 Maneuver	85	357	-	0	773	-
Stage 1	418	-	-	0	-	-
Stage 2	371	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	58	357	-	-	773	-
Mov Cap-2 Maneuver	58	-	-	-	-	-
Stage 1	418	-	-	-	-	-
Stage 2	254	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.1	0	2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	58	357	773	-
HCM Lane V/C Ratio	-	0.157	0.229	0.199	-
HCM Control Delay (s)	-	78.3	18.1	10.8	0
HCM Lane LOS	-	F	C	B	A
HCM 95th %tile Q(veh)	-	0.5	0.9	0.7	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	5	40	799	295	92	497
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	3	2	4	4	3
Mvmt Flow	5	42	841	311	97	523

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1558	841	0	-	841	0
Stage 1	841	-	-	-	-	-
Stage 2	717	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.236	-
Pot Cap-1 Maneuver	125	363	-	0	786	-
Stage 1	426	-	-	0	-	-
Stage 2	487	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	103	363	-	-	786	-
Mov Cap-2 Maneuver	103	-	-	-	-	-
Stage 1	426	-	-	-	-	-
Stage 2	402	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19	0	1.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	103	363	786	-
HCM Lane V/C Ratio	-	0.051	0.116	0.123	-
HCM Control Delay (s)	-	41.8	16.2	10.2	0
HCM Lane LOS	-	E	C	B	A
HCM 95th %tile Q(veh)	-	0.2	0.4	0.4	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	30	15	72	761	521	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	4	3	0
Mvmt Flow	33	16	78	827	566	36

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1568	584	602	0	-	0
Stage 1	584	-	-	-	-	-
Stage 2	984	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	123	515	985	-	-	-
Stage 1	561	-	-	-	-	-
Stage 2	365	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	105	515	985	-	-	-
Mov Cap-2 Maneuver	105	-	-	-	-	-
Stage 1	561	-	-	-	-	-
Stage 2	311	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	42.7	0.8	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	985	-	143	-	-
HCM Lane V/C Ratio	0.079	-	0.342	-	-
HCM Control Delay (s)	9	0	42.7	-	-
HCM Lane LOS	A	A	E	-	-
HCM 95th %tile Q(veh)	0.3	-	1.4	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	54	6	833	536	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	4	3	0
Mvmt Flow	0	59	7	905	583	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1501	583	583	0	-	0
Stage 1	583	-	-	-	-	-
Stage 2	918	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	136	516	1001	-	-	-
Stage 1	562	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	134	516	1001	-	-	-
Mov Cap-2 Maneuver	134	-	-	-	-	-
Stage 1	562	-	-	-	-	-
Stage 2	387	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1001	-	516	-	-
HCM Lane V/C Ratio	0.007	-	0.114	-	-
HCM Control Delay (s)	8.6	0	12.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	2	0	839	587	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	4	3	0
Mvmt Flow	0	2	0	912	638	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1552	640	641	0	-	0
Stage 1	640	-	-	-	-	-
Stage 2	912	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	126	479	953	-	-	-
Stage 1	529	-	-	-	-	-
Stage 2	395	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	479	953	-	-	-
Mov Cap-2 Maneuver	126	-	-	-	-	-
Stage 1	529	-	-	-	-	-
Stage 2	395	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	953	-	479	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	12.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	9	86	913	481	185	703
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	0	1	1	1	4	1
Mvmt Flow	9	87	922	486	187	710

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2006	922	0	-	922	0
Stage 1	922	-	-	-	-	-
Stage 2	1084	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	2.236	-
Pot Cap-1 Maneuver	66	329	-	0	732	-
Stage 1	391	-	-	0	-	-
Stage 2	327	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	38	329	-	-	732	-
Mov Cap-2 Maneuver	38	-	-	-	-	-
Stage 1	391	-	-	-	-	-
Stage 2	189	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	30	0	2.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	38	329	732	-
HCM Lane V/C Ratio	-	0.239	0.264	0.255	-
HCM Control Delay (s)	-	127.3	19.8	11.6	0
HCM Lane LOS	-	F	C	B	A
HCM 95th %tile Q(veh)	-	0.8	1	1	-

Intersection

Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	34	17	65	929	809	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	37	18	71	1010	879	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2047	896	912	0	-	0
Stage 1	896	-	-	-	-	-
Stage 2	1151	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	62	342	755	-	-	-
Stage 1	402	-	-	-	-	-
Stage 2	304	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	49	342	755	-	-	-
Mov Cap-2 Maneuver	49	-	-	-	-	-
Stage 1	402	-	-	-	-	-
Stage 2	239	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	157.2	0.7	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	755	-	69	-	-
HCM Lane V/C Ratio	0.094	-	0.803	-	-
HCM Control Delay (s)	10.3	0	157.2	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	0.3	-	3.8	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	61	5	994	826	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	66	5	1080	898	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1989	898	898	0	-	0
Stage 1	898	-	-	-	-	-
Stage 2	1091	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	68	341	765	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	325	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	67	341	765	-	-	-
Mov Cap-2 Maneuver	67	-	-	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	320	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	765	-	341	-	-
HCM Lane V/C Ratio	0.007	-	0.194	-	-
HCM Control Delay (s)	9.7	0	18.1	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	8	0	999	880	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	9	0	1086	957	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2046	960	964	0	-	0
Stage 1	960	-	-	-	-	-
Stage 2	1086	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	62	314	722	-	-	-
Stage 1	375	-	-	-	-	-
Stage 2	327	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	62	314	722	-	-	-
Mov Cap-2 Maneuver	62	-	-	-	-	-
Stage 1	375	-	-	-	-	-
Stage 2	327	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.8	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	722	-	314	-	-
HCM Lane V/C Ratio	-	-	0.028	-	-
HCM Control Delay (s)	0	-	16.8	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	5	37	769	295	81	484
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	3	2	4	4	3
Mvmt Flow	5	39	809	311	85	509

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1489	809	0	-	809	0
Stage 1	809	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.236	-
Pot Cap-1 Maneuver	138	379	-	0	808	-
Stage 1	441	-	-	0	-	-
Stage 2	507	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	118	379	-	-	808	-
Mov Cap-2 Maneuver	118	-	-	-	-	-
Stage 1	441	-	-	-	-	-
Stage 2	432	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.1	0	1.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	118	379	808	-
HCM Lane V/C Ratio	-	0.045	0.103	0.106	-
HCM Control Delay (s)	-	36.9	15.6	10	0
HCM Lane LOS	-	E	C	A	A
HCM 95th %tile Q(veh)	-	0.1	0.3	0.4	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	10	42	761	521	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	4	3	0
Mvmt Flow	22	11	46	827	566	22

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1495	577	588	0	-	0
Stage 1	577	-	-	-	-	-
Stage 2	918	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	137	520	997	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	125	520	997	-	-	-
Mov Cap-2 Maneuver	125	-	-	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	359	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	31.7	0.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	997	-	167	-	-
HCM Lane V/C Ratio	0.046	-	0.195	-	-
HCM Control Delay (s)	8.8	0	31.7	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.1	-	0.7	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	35	3	803	531	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	4	3	0
Mvmt Flow	0	38	3	873	577	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1456	577	577	0	-	0
Stage 1	577	-	-	-	-	-
Stage 2	879	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	144	520	1006	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	409	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	143	520	1006	-	-	-
Mov Cap-2 Maneuver	143	-	-	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	407	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1006	-	520	-	-
HCM Lane V/C Ratio	0.003	-	0.073	-	-
HCM Control Delay (s)	8.6	0	12.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	2	0	806	563	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	4	3	0
Mvmt Flow	0	2	0	876	612	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1490	614	615	0	-	0
Stage 1	614	-	-	-	-	-
Stage 2	876	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	138	496	974	-	-	-
Stage 1	544	-	-	-	-	-
Stage 2	411	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	138	496	974	-	-	-
Mov Cap-2 Maneuver	138	-	-	-	-	-
Stage 1	544	-	-	-	-	-
Stage 2	411	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	974	-	496	-	-
HCM Lane V/C Ratio	-	-	0.004	-	-
HCM Control Delay (s)	0	-	12.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	9	84	890	481	171	684
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Free	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	0	1	1	1	4	1
Mvmt Flow	9	85	899	486	173	691

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1935	899	0	-	899	0
Stage 1	899	-	-	-	-	-
Stage 2	1036	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	2.236	-
Pot Cap-1 Maneuver	73	339	-	0	747	-
Stage 1	401	-	-	0	-	-
Stage 2	345	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	46	339	-	-	747	-
Mov Cap-2 Maneuver	46	-	-	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	215	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.1	0	2.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	46	339	747	-
HCM Lane V/C Ratio	-	0.198	0.25	0.231	-
HCM Control Delay (s)	-	101.6	19.1	11.3	0
HCM Lane LOS	-	F	C	B	A
HCM 95th %tile Q(veh)	-	0.6	1	0.9	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	10	42	929	809	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	22	11	46	1010	879	22

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1991	890	901	0	-	0
Stage 1	890	-	-	-	-	-
Stage 2	1101	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	68	345	763	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	321	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	59	345	763	-	-	-
Mov Cap-2 Maneuver	59	-	-	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	277	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	75.3	0.4	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	763	-	82	-	-
HCM Lane V/C Ratio	0.06	-	0.398	-	-
HCM Control Delay (s)	10	0	75.3	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	0.2	-	1.6	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	35	3	971	819	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	38	3	1055	890	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1952	890	890	0	-	0
Stage 1	890	-	-	-	-	-
Stage 2	1062	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	71	345	770	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	335	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	70	345	770	-	-	-
Mov Cap-2 Maneuver	70	-	-	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	332	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	770	-	345	-	-
HCM Lane V/C Ratio	0.004	-	0.11	-	-
HCM Control Delay (s)	9.7	0	16.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	8	0	974	847	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	0	9	0	1059	921	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1983	924	928	0	-	0
Stage 1	924	-	-	-	-	-
Stage 2	1059	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	68	329	745	-	-	-
Stage 1	390	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	68	329	745	-	-	-
Mov Cap-2 Maneuver	68	-	-	-	-	-
Stage 1	390	-	-	-	-	-
Stage 2	336	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	745	-	329	-	-
HCM Lane V/C Ratio	-	-	0.026	-	-
HCM Control Delay (s)	0	-	16.2	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

□ Delay Observations

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 WB Off Ramp
Main Street (Route 27)
Acton, MA

File Name : 442 Delay Study Rt 2 WB Ramp
Site Code : 74400001
Start Date : 2/27/2014
Page No : 1

Ln.	No.	Joined Queue	Released From Queue	Delay
1	10	8:00:06 AM	8:00:08 AM	2
1	11	8:10:08 AM	8:10:27 AM	19
1	12	8:12:09 AM	8:12:11 AM	2
1	13	8:18:17 AM	8:18:25 AM	8
1	14	8:18:18 AM	8:18:28 AM	10
1	15	8:40:58 AM	8:41:00 AM	2
1	16	8:43:18 AM	8:43:29 AM	11
1	17	8:48:31 AM	8:48:42 AM	11
1	18	8:50:34 AM	8:50:38 AM	4

Summary Information:

8:00:00 AM - 8:51:00 AM	Left
Total Vehicle Count:	9
Delayed Vehicle Count:	9
Through Vehicle Count:	0
Average Stopped Time:	7.67
Maximum Stopped Time:	19
Min. Secs. for Delay:	0
Average Queue:	0.02
Queue Density:	1.11
Maximum Queue:	2
Delay in Vehicle Hour:	0.02
Total Delay:	69

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

Route 2 WB Off Ramp
Main Street (Route 27)
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File Name : 442 Delay Study Rt 2 WB Ramp
Site Code : 74400001
Start Date : 2/27/2014
Page No : 1

Ln.	No.	Joined Queue	Released From Queue	Delay
1	1	7:13:01 AM	7:13:12 AM	11
1	2	7:19:16 AM	7:19:18 AM	2
1	3	7:36:44 AM	7:36:46 AM	2
1	4	7:37:09 AM	7:37:12 AM	3
1	5	7:39:00 AM	7:39:04 AM	4
1	6	7:50:08 AM	7:50:28 AM	20
1	7	7:50:29 AM	7:50:35 AM	6
1	8	7:54:33 AM	7:55:04 AM	31
1	9	7:57:07 AM	7:57:09 AM	2
1	10	8:00:06 AM	8:00:08 AM	2
1	11	8:10:08 AM	8:10:27 AM	19
1	12	8:12:09 AM	8:12:11 AM	2
1	13	8:18:17 AM	8:18:25 AM	8
1	14	8:18:18 AM	8:18:28 AM	10
1	15	8:40:58 AM	8:41:00 AM	2
1	16	8:43:18 AM	8:43:29 AM	11
1	17	8:48:31 AM	8:48:42 AM	11
1	18	8:50:34 AM	8:50:38 AM	4

Summary Information:

7:13:00 AM - 8:51:00 AM	Left
Total Vehicle Count:	18
Delayed Vehicle Count:	18
Through Vehicle Count:	0
Average Stopped Time:	8.33
Maximum Stopped Time:	31
Min. Secs. for Delay:	0
Average Queue:	0.03
Queue Density:	1.05
Maximum Queue:	2
Delay in Vehicle Hour:	0.03
Total Delay:	150

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 WB Off-Ramp Left-Turn Lane
Main Street (Route 27)
Acton, MA

File Name : 442 Delay Study Rt 2 WB Ramp PM
Site Code : 00442003
Start Date : 2/27/2014
Page No : 1

Ln.	No.	Joined Queue	Released From Queue	Delay
1	8	4:46:14 PM	4:46:21 PM	7
1	9	5:06:17 PM	5:06:22 PM	5
1	10	5:08:09 PM	5:08:42 PM	33
1	11	5:15:05 PM	5:15:17 PM	12
1	12	5:18:02 PM	5:18:23 PM	21
1	13	5:25:26 PM	5:25:29 PM	3
1	14	5:28:03 PM	5:28:29 PM	26

Summary Information:

4:45:00 PM - 5:44:00 PM	Lane 1
Total Vehicle Count:	7
Delayed Vehicle Count:	7
Through Vehicle Count:	0
Average Stopped Time:	15.29
Maximum Stopped Time:	33
Min. Secs. for Delay:	0
Average Queue:	0.04
Queue Density:	1.00
Maximum Queue:	1
Delay in Vehicle Hour:	0.04
Total Delay:	107

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 WB Off-Ramp Left-Turn Lane
Main Street (Route 27)
Acton, MA

File Name : 442 Delay Study Rt 2 WB Ramp PM
Site Code : 00442003
Start Date : 2/27/2014
Page No : 1

Ln.	No.	Joined Queue	Released From Queue	Delay
1	1	4:12:00 PM	4:12:03 PM	3
1	2	4:19:44 PM	4:20:01 PM	17
1	3	4:21:48 PM	4:22:13 PM	25
1	4	4:22:06 PM	4:22:25 PM	19
1	5	4:26:30 PM	4:26:47 PM	17
1	6	4:33:20 PM	4:33:29 PM	9
1	7	4:35:28 PM	4:35:43 PM	15
1	8	4:46:14 PM	4:46:21 PM	7
1	9	5:06:17 PM	5:06:22 PM	5
1	10	5:08:09 PM	5:08:42 PM	33
1	11	5:15:05 PM	5:15:17 PM	12
1	12	5:18:02 PM	5:18:23 PM	21
1	13	5:25:26 PM	5:25:29 PM	3
1	14	5:28:03 PM	5:28:29 PM	26
1	15	5:53:47 PM	5:53:48 PM	1
1	16	5:53:50 PM	5:54:16 PM	26

Summary Information:

4:12:00 PM - 5:55:00 PM	Lane 1
Total Vehicle Count:	16
Delayed Vehicle Count:	16
Through Vehicle Count:	0
Average Stopped Time:	14.94
Maximum Stopped Time:	33
Min. Secs. for Delay:	0
Average Queue:	0.04
Queue Density:	1.03
Maximum Queue:	2
Delay in Vehicle Hour:	0.04
Total Delay:	239