

Ref: 8890

October 12, 2021

Zoning Board of Appeals
Town of Norwell
345 Main Street
Norwell, Massachusetts 02061

Re: Responses to Comments from Zoning Board of Appeals Meetings
Proposed Residential Development - 15 High Street
Norwell, Massachusetts

To the Members of the Norwell Zoning Board of Appeals:

Vanasse & Associates, Inc. (VAI) has compiled responses to comments regarding traffic voiced during Zoning Board of Appeals (ZBA) meetings dated August 4, 2021 and September 9, 2021. Although there were a number of individual comments, for ease of review we have provided the general issue area followed by our response.

Issue Area – High Street and Trip Distribution

Comment 1: *Queueing issues from Washington Street intersection affecting northern driveway*

Response: As noted in the VAI response to CHA peer review comments, in our opinion this would be a drastic action to restrict left-turn movements from the north driveway, which are expected to result in less than 1 vehicle turning left every 6-7 minutes during the highest-volume condition (of the driveway) morning time period. During this same peak hour, the queue from the Washington Street intersection extends on average half the distance to this driveway.

Comment 2: *Traffic coming southerly on Route 53 turning right to High Street*

Response: With regard to the existing issue of traffic traveling southerly on Route 53 and turning right to High Street, this is an existing condition. Potential remedies include tightening the radius to reduce travel speed; removing the landscaped island to put the right-turn lane into the intersection; installing STOP-signs to put the right-turn movement under STOP-sign control; or adding other signage to increase awareness and reduce vehicle speeds.

Comment 3: *Conflicts with CVS driveway and people not following right turn only to High Street*

Response: As was indicated during the meeting of September 9, 2021, the Applicant is in discussions with the owner of the CVS property to revise their driveway to High Street to increase adherence to the intended turn restrictions.

Issue Area – Traffic Volume Adjustments and Background Projects

Comment 4: *School operations during COVID not accounted for in initial TIA*

Response: Traffic counts used in the study were collected in October of 2020 and April of 2021. The counts in April were performed when school was operating in normal session, while counts in October were performed when school was in hybrid session. Although April 1st was the Thursday before Good Friday, schools were noted to be open and in particular the Cole elementary school was returned to full operation with all 500 students in the building from 8:45 to 3:20 on Monday, Tuesday, Thursday, and Friday. April 1, 2021 was a Thursday and students were expected to be in school.

With regard to the October 2020 counts, the schools started to bring back students in hybrid mode with Cole Elementary School in hybrid mode since September 16, 2020. Half of the student population (250 students) attended school in the morning 8:40-11:30 and the other half (250 students) attended school in the afternoon 12:30-3:20 with no in-person school on Wednesdays. Most of the students were picked up and dropped off. October 8, 2020 was a Thursday so students were expected to be in school.

Comment 4: *COVID Adjustments not accurate*

Response: For this response, VAI repeated traffic counts on High Street at the intersection of High Street with the Washington Square Condominium Complex adjacent to the Project and also via an Automatic Traffic Recorder (ATR) device on High Street in the vicinity of the proposed Project driveways. While the evening counts were similar to those previously conducted in April, the morning counts were approximately 22 percent higher than those conducted in April. Accordingly, VAI re-analyzed the intersection of Washington Street with High Street and Grove Street for the AM peak hour with a 22 percent increase to the AM volumes. As noted in Table 11R, the revised analysis indicates the intersection under this condition operates with slightly more delay; however, the overall operation is not significantly changed from that presented in the traffic analysis and the Project impact is still noted to be minimal with queue increases of at most one vehicle to the various movements at the intersection.



Table 11R
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY-22% Increase

Signalized Intersection/Peak Hour/Movement	2021 Existing				2028 No-Build				2028 Build			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d Avg/95 th	V/C	Delay	LOS	Queue Avg/95 th	V/C	Delay	LOS	Queue Avg/95 th
Route 53 at High Street and Grove Street												
<i>Weekday Morning:</i>												
High Street EB LT	0.68	35.9	D	131/292	0.72	37.9	D	143/284	0.75	39.5	D	151/313
High Street EB TH RT	0.16	20.4	C	38/100	0.17	20.7	C	42/108	0.18	20.6	C	44/111
Grove Street WB LT	0.66	63.3	E	62/133	0.68	64.4	E	68/144	0.68	64.7	E	68/145
Grove Street WB TH	0.62	54.9	D	87/170	0.63	54.6	D	94/181	0.63	55.1	E	95/183
Grove Street WB RT	0.37	0.6	A	0/0	0.39	0.7	A	0/0	0.39	0.7	A	0/0
Route 53 SB LT	0.79	56.1	E	162/390	0.8	56.5	E	179/427	0.81	56.8	E	179/427
Route 53 SB TH	0.98	73.3	E	308/720	1.07	98.3	F	376/792	1.08	99.8	F	377/792
Route 53 SB RT	0.15	0.2	A	0/0	0.17	0.2	A	0/0	0.17	0.2	A	0/0
Route 53 NB LT	0.07	40.2	D	12/44	0.08	40.5	D	14/47	0.08	40.6	D	14/48
Route 53 NB TH RT	0.70	40.9	D	182/373	0.81	46.7	D	204/419	0.81	47.1	D	204/419
Overall	--	35.8	D	--	--	41.6	D	--	--	42.1	D	--

^aVolume-to-capacity ratio.

^bControl (signal) delay per vehicle in seconds.

^cLevel of service.

^dQueue length in feet.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.



In addition, the ATR device recorded daily traffic volumes over a 48-hour period. The unadjusted daily average of the two days is 7,520 vehicles per day (vpd); if this figure is adjusted using the same COVID factor as used in the initial TIA, the average daily traffic level becomes 7,970 vpd, similar to the 8,100 vpd value noted in the initial TIA.

Comment 5: *High Street Speed Data from TIA not accurate*

Response: Vehicle speeds were also collected using the ATR device. This data was collected over a 48-hour period and represents over 15,000 data points. A summary of the results is provided in Table 3R.

Table 3R
VEHICLE TRAVEL SPEED MEASUREMENTS^a

Speed Type	Initial TIA		Updated Data ^b	
	High Street Northbound	High Street Southbound	High Street Northbound	High Street Southbound
Mean (Average)	33	30	27	30
85 th Percentile	35	33	32	34
Posted Limit	30	35	30	35

^amph = miles per hour.

^bCollected September 20-21, 2021 by VAI.

As shown in Table 3R, the speed measurements are generally consistent between the two sets of data, with High Street northbound speeds slightly lower than previously observed and High Street southbound speeds the same on an average basis and slightly higher on the 85th percentile basis. This validates the speed measurements and sight distance review presented in the initial TIA.

Comment 6: *Rezoning Proposals and Shingle Mill project should have been accounted for in TIA*

Response: During the research phase of the initial TIA, the town of Norwell was contacted with regard to any background developments to be included for future conditions analysis. These include developments approved but not yet constructed or occupied. Potential developments that involve possible changes to a site but are not yet approved are not typically included, as there is no guarantee that a development will occur within the 7-year time frame used in the TIA, or that it will occur at all. The only project referenced by the Town was the development located at 119 Washington Street, which involved the addition of a drive-through facility to a previously approved 3,500 square foot (sf) addition on the northern side of the building. Traffic volumes from this development were included in the TIA. No other development projects were identified by the Town.

To address this comment, the CTPS February 2020 Technical Memorandum prepared for the potential effects of new development in the Queen Anne's Plaza and Accord Industrial



Park was reviewed to address the question of the potential traffic increases due to this rezoning effort in the town. Comparisons of 2026 traffic conditions for the development scenarios contemplated in the memo were used to identify traffic volume increases on Washington Street south of the Queen Anne's Plaza driveway, which would have a direct effect on Washington Street at the High Street/Grove Street intersection. However, the development scenarios presented in the Memorandum resulted in at most an increase of 3 trips during the weekday morning and weekday evening peak hours, with some scenarios resulting in a decrease in traffic volume on Washington Street. The background traffic growth rate of approximately 7% over the seven-year horizon period resulted in a much higher increase to the Washington St traffic volumes; therefore, it can be assumed that the 3-trip increase was included in the background traffic growth rate increases.

The Shingle Mill residential development in Rockland was also reviewed in response to comments. This potential development is proposed to provide approximately 236 apartment units located on the west side of Pond Street and Route 3, approximately 1.5 miles drive from the site. It is not likely that traffic from this development would impact the Washington St corridor due to its proximity to other alternate roadways and the Route 3 interchange located between the Shingle Mill site and the proposed project. Traffic increases from this project are assumed to be included in the background traffic growth rate.

These developments are shown in relation to the Project on Figure 1.

Issue Area – Deliveries, Traffic generation of Project

Comment 7: *Amazon and other deliveries effects on traffic*

Response: Delivery vehicles such as Amazon, USPS, UPS etc. follow an optimized route with consolidated stops to make the delivery as expedient as possible. Depending on the area the delivery vehicles typically serve one side of the street and make a turn to do the other side. This is the same vehicle and does not result in additional vehicle trips to the area. In addition, Amazon uses flex drivers working later during night to deliver left-over packages outside of peak commute times.

It should be noted that due to the popularity of e-commerce and its increasing growth as a share of retail sales, the presence of delivery vehicles on area roadways will only increase in the future. This effect will be felt on all roadways and may be balanced by a reduction in vehicle trips to brick-and-mortar retail buildings.

Comment 8: *Understanding of project traffic generation*

Traffic analysis is based on peak hours. This includes the peak hours of adjacent street traffic as well as the peak hours of site generators. In order to illustrate this condition, a graph of the hourly traffic flow over a 24-hour period on High Street was compiled with the projected hourly traffic flow of the Project over the same period. This graph is shown on Figure 2 and illustrates the peak hours of High Street traffic occurring during the morning time period from 8:00 AM to 9:00 AM and the afternoon or evening peak hour



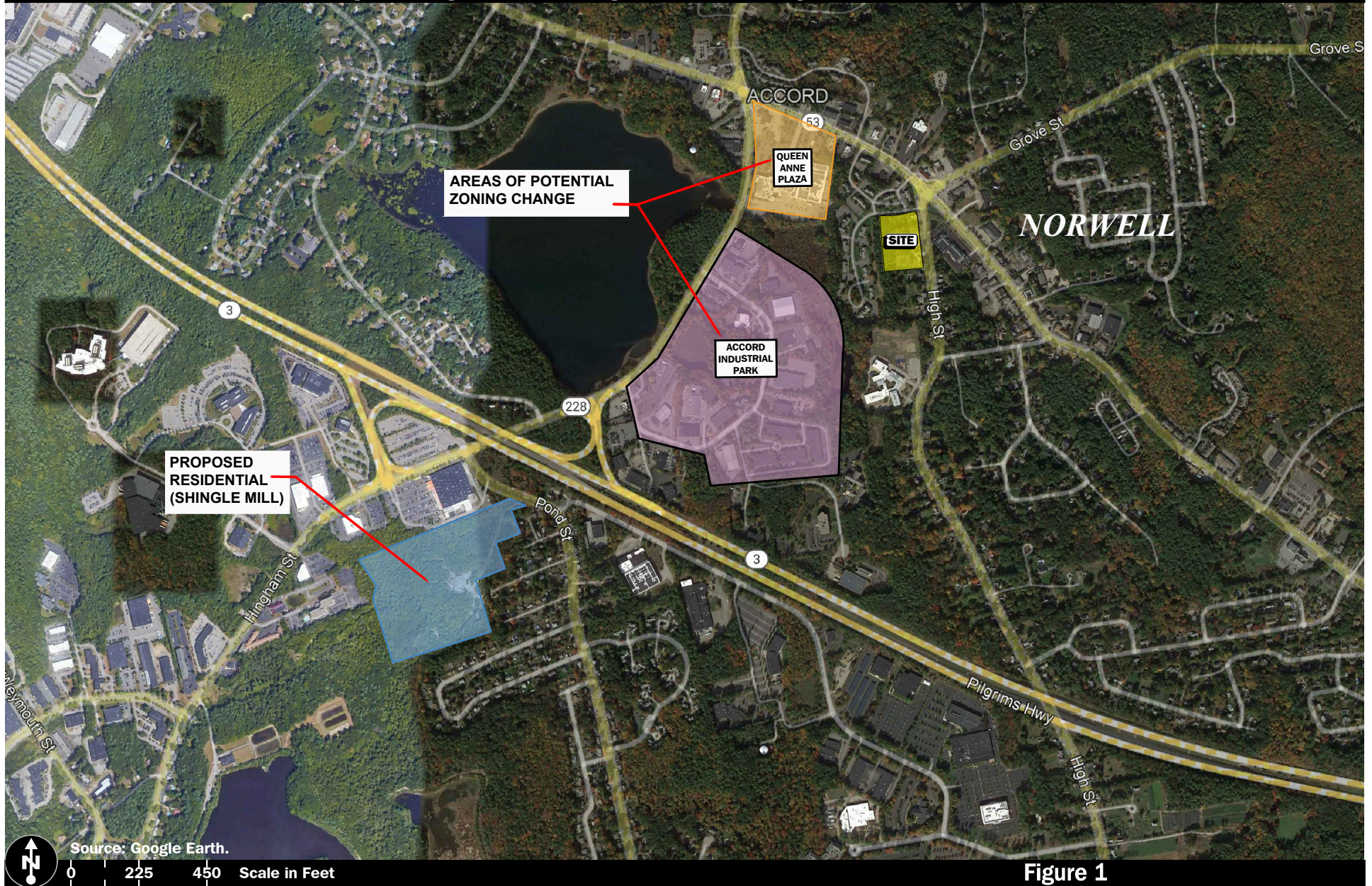
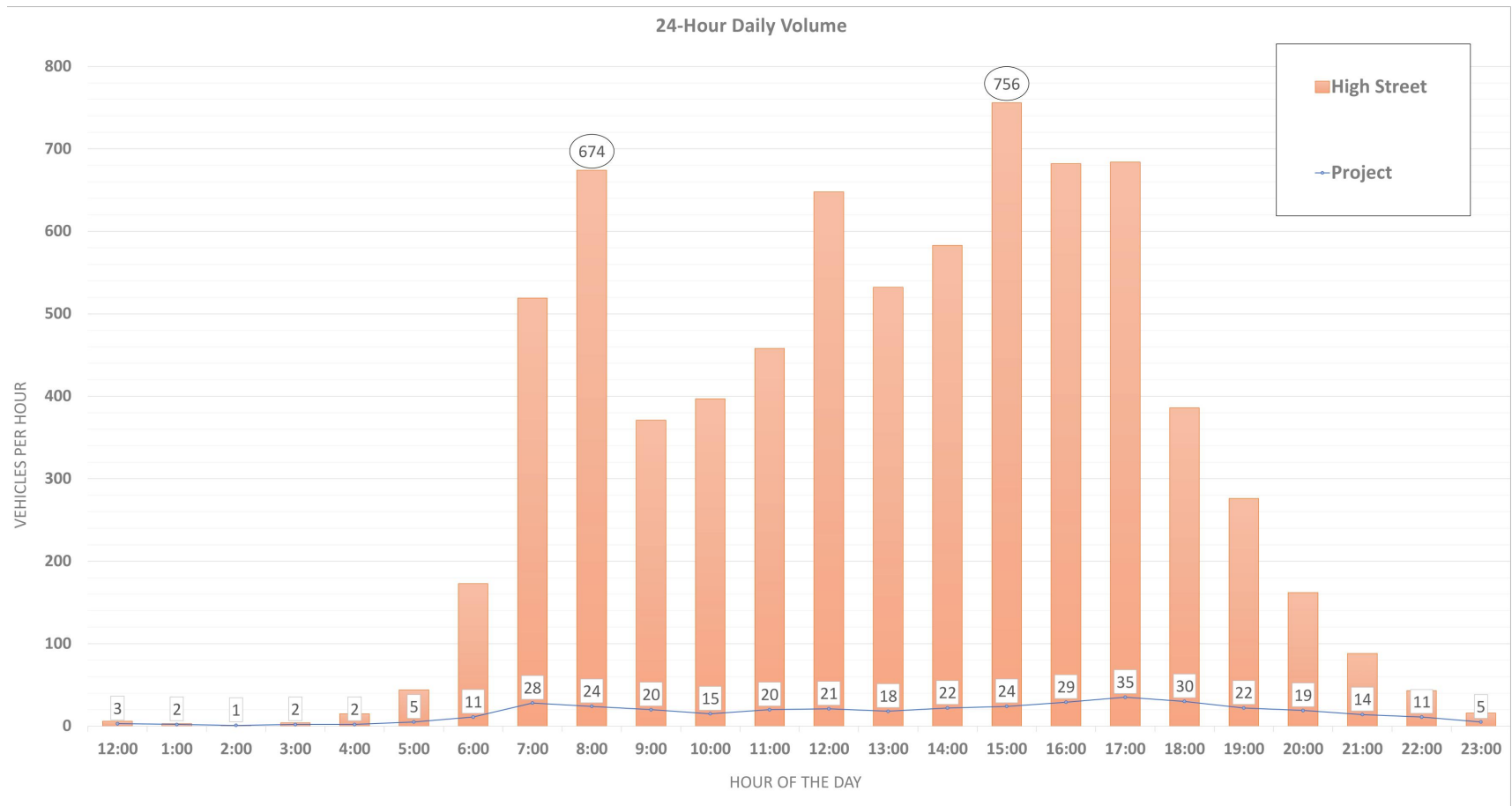


Figure 1

Site Context



Not to Scale



Figure 2

Distribution of Daily Volume for Project Trips and High Street

noted to be 5:00 PM to 6:00 PM. It also notes that the peak hours of the Project trip generation are expected to be anywhere between 7:00 AM to 8:00 AM or 8:00 AM to 9:00 AM, and between 5:00 PM and 6:00 PM. This shows the relative traffic impact of the project as it relates to the traffic flows on High Street. The traffic analysis uses the highest 60 minutes during the morning and evening time periods and applies the peak hour traffic estimates for the project to analyze the highest-case traffic condition.

Issue Area – General Comments

Comment 9: *Will school buses stop on High Street?*

Response: The Applicant will coordinate with the Town on this issue. Typically, students within one mile of the school should walk or be driven by parents.

Comment 10: *Shifting traffic to south will lead to school impacts*

Response: The majority of traffic (80 percent) is expected to be destined to and from the north to travel to Route 3 and access Washington Street. A minor level of traffic (between 6 and 8 trips) is expected to travel to the south on High Street which is a minor increase.

Comment 11: *Where do visitors park?*

Response: Visitor parking is available in designated parking areas on site.

Comment 12: *What traffic signal will stop cars for children in crosswalk?*

Response: VAI has recommended the relocation of the High Street midblock crosswalk to a location further from the Washington Street intersection. This will need to be reviewed to determine the availability of property required to extend a sidewalk along the east side of High Street to the crosswalk location.

I trust that the above satisfactorily addresses the comments and if you should have any questions or require additional information, please feel free to contact me at sthornton@rdva.com.

Sincerely,

VANASSE & ASSOCIATES, INC.



Scott W. Thornton, P.E.,
Principal

Cc: S. Gallagher, P. Crabtree – Northland Residential

Enclosure: Technical Appendix



APPENDIX

TURNING MOVEMENT COUNTS

AUTOMATIC TRAFFIC RECORDER DATA

VEHICLE TRAVEL SPEED DATA

TRAFFIC INCREASES

CAPACITY ANALYSIS

TURNING MOVEMENT COUNTS

Accurate Counts

978-664-2565

N/S Street : High Street
E/W Street : Driveway
City/State : Norwell, MA
Weather : Clear

File Name : 88900001
Site Code : 88900001
Start Date : 9/21/2021
Page No : 1

Groups Printed- Cars - Trucks

	High St From North		High St From South		Dwy From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	22	2	2	69	2	0	97
07:15 AM	46	8	6	62	2	1	125
07:30 AM	60	7	5	78	1	0	151
07:45 AM	112	3	3	68	1	0	187
Total	240	20	16	277	6	1	560
08:00 AM	103	8	3	89	9	0	212
08:15 AM	64	14	6	84	2	2	172
08:30 AM	67	9	10	88	5	0	179
08:45 AM	66	15	8	77	4	2	172
Total	300	46	27	338	20	4	735
Grand Total	540	66	43	615	26	5	1295
Apprch %	89.1	10.9	6.5	93.5	83.9	16.1	
Total %	41.7	5.1	3.3	47.5	2	0.4	
Cars	532	66	43	614	26	5	1286
% Cars	98.5	100	100	99.8	100	100	99.3
Trucks	8	0	0	1	0	0	9
% Trucks	1.5	0	0	0.2	0	0	0.7

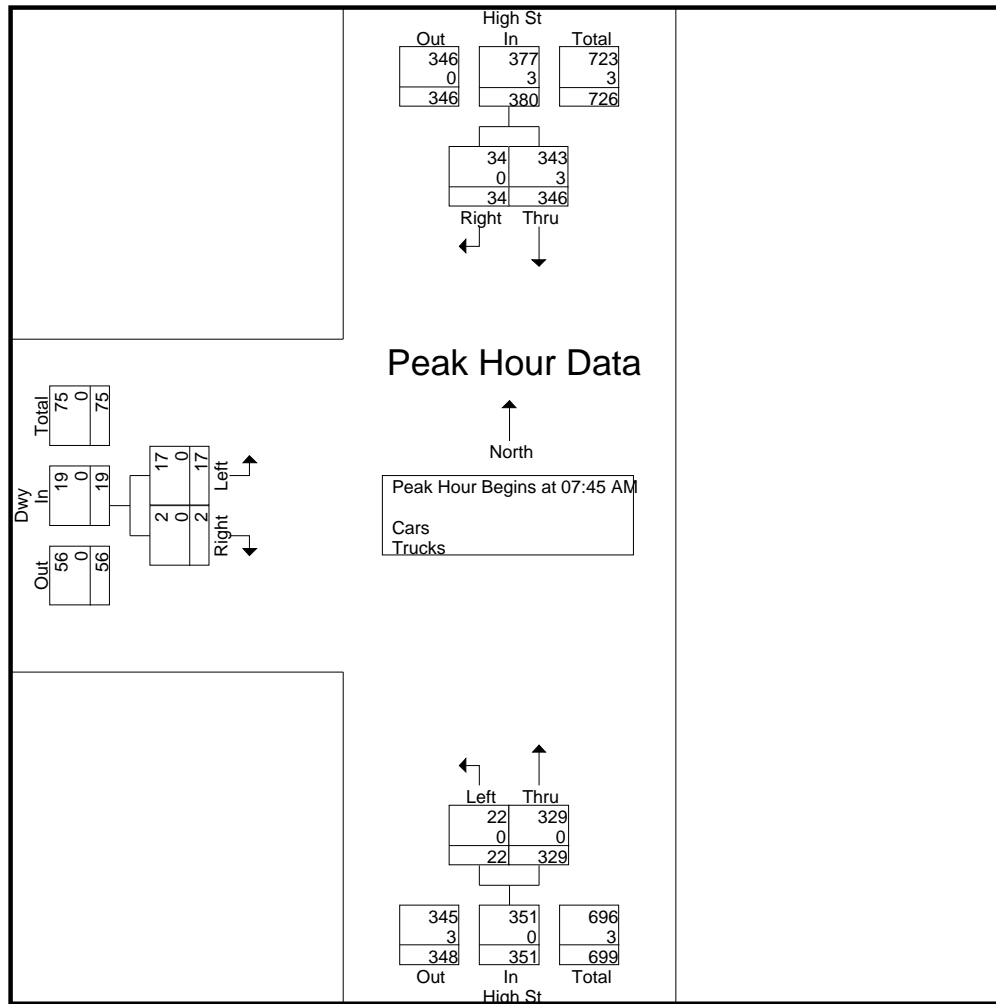
	High St From North			High St From South			Dwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	112	3	115	3	68	71	1	0	1	187
08:00 AM	103	8	111	3	89	92	9	0	9	212
08:15 AM	64	14	78	6	84	90	2	2	4	172
08:30 AM	67	9	76	10	88	98	5	0	5	179
Total Volume	346	34	380	22	329	351	17	2	19	750
% App. Total	91.1	8.9		6.3	93.7		89.5	10.5		
PHF	.772	.607	.826	.550	.924	.895	.472	.250	.528	.884
Cars	343	34	377	22	329	351	17	2	19	747
% Cars	99.1	100	99.2	100	100	100	100	100	100	99.6
Trucks	3	0	3	0	0	0	0	0	0	3
% Trucks	0.9	0	0.8	0	0	0	0	0	0	0.4

Accurate Counts

978-664-2565

N/S Street : High Street
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City/State : Norwell, MA
Weather : Clear

File Name : 88900001
Site Code : 88900001
Start Date : 9/21/2021
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:45 AM			08:00 AM			08:00 AM		
+0 mins.	112	3	115	3	89	92	9	0	9
+15 mins.	103	8	111	6	84	90	2	2	4
+30 mins.	64	14	78	10	88	98	5	0	5
+45 mins.	67	9	76	8	77	85	4	2	6
Total Volume	346	34	380	27	338	365	20	4	24
% App. Total	91.1	8.9		7.4	92.6		83.3	16.7	
PHF	.772	.607	.826	.675	.949	.931	.556	.500	.667
Cars	343	34	377	27	338	365	20	4	24
% Cars	99.1	100	99.2	100	100	100	100	100	100
Trucks	3	0	3	0	0	0	0	0	0
% Trucks	0.9	0	0.8	0	0	0	0	0	0

Accurate Counts

978-664-2565

N/S Street : High Street
E/W Street : Driveway
City/State : Norwell, MA
Weather : Clear

File Name : 88900001
Site Code : 88900001
Start Date : 9/21/2021
Page No : 1

Groups Printed- Cars - Trucks

	High St From North		High St From South		Dwy From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	80	4	1	71	11	5	172
04:15 PM	106	1	0	59	9	11	186
04:30 PM	68	1	3	75	18	7	172
04:45 PM	81	2	2	65	18	4	172
Total	335	8	6	270	56	27	702
05:00 PM	99	2	0	76	12	3	192
05:15 PM	88	1	0	86	13	5	193
05:30 PM	90	3	0	80	6	3	182
05:45 PM	77	3	0	60	4	2	146
Total	354	9	0	302	35	13	713
Grand Total	689	17	6	572	91	40	1415
Apprch %	97.6	2.4	1	99	69.5	30.5	
Total %	48.7	1.2	0.4	40.4	6.4	2.8	
Cars	686	17	6	568	91	40	1408
% Cars	99.6	100	100	99.3	100	100	99.5
Trucks	3	0	0	4	0	0	7
% Trucks	0.4	0	0	0.7	0	0	0.5

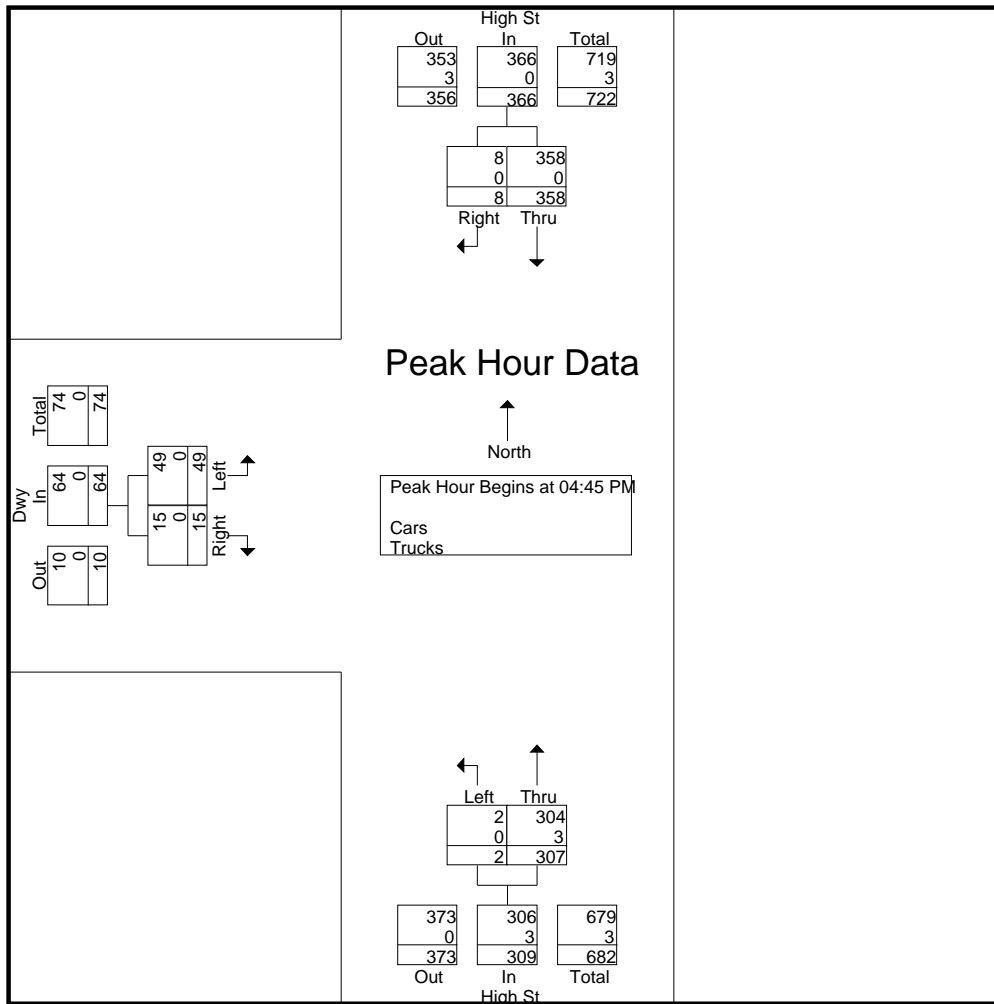
	High St From North			High St From South			Dwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	81	2	83	2	65	67	18	4	22	172
05:00 PM	99	2	101	0	76	76	12	3	15	192
05:15 PM	88	1	89	0	86	86	13	5	18	193
05:30 PM	90	3	93	0	80	80	6	3	9	182
Total Volume	358	8	366	2	307	309	49	15	64	739
% App. Total	97.8	2.2		0.6	99.4		76.6	23.4		
PHF	.904	.667	.906	.250	.892	.898	.681	.750	.727	.957
Cars	358	8	366	2	304	306	49	15	64	736
% Cars	100	100	100	100	99.0	99.0	100	100	100	99.6
Trucks	0	0	0	0	3	3	0	0	0	3
% Trucks	0	0	0	0	1.0	1.0	0	0	0	0.4

Accurate Counts

978-664-2565

N/S Street : High Street
E/W Street : Driveway
City/State : Norwell, MA
Weather : Clear

File Name : 88900001
Site Code : 88900001
Start Date : 9/21/2021
Page No : 2



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

Peak Hour for Each Approach Begins at:

	04:45 PM			04:45 PM			04:00 PM		
+0 mins.	81	2	83	2	65	67	11	5	16
+15 mins.	99	2	101	0	76	76	9	11	20
+30 mins.	88	1	89	0	86	86	18	7	25
+45 mins.	90	3	93	0	80	80	18	4	22
Total Volume	358	8	366	2	307	309	56	27	83
% App. Total	97.8	2.2		0.6	99.4		67.5	32.5	
PHF	.904	.667	.906	.250	.892	.898	.778	.614	.830
Cars	358	8	366	2	304	306	56	27	83
% Cars	100	100	100	100	99	99	100	100	100
Trucks	0	0	0	0	3	3	0	0	0
% Trucks	0	0	0	0	1	1	0	0	0

AUTOMATIC TRAFFIC RECORDER DATA

88900001

[illegible]

Location : High Street
 Location : South of Driveway
 City/State: Norwell, MA

88900001

9/21/2021	NB,		Hour Totals		SB,		Hour Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	1	90			0	78				
12:15	2	84			2	75				
12:30	0	83			1	64				
12:45	0	82	3	339	1	99	4	316	7	655
1:00	0	54			1	71				
1:15	0	51			0	84				
1:30	0	48			0	63				
1:45	0	59	0	212	0	91	1	309	1	521
2:00	1	45			0	61				
2:15	0	48			0	83				
2:30	0	57			0	99				
2:45	0	64	1	214	0	100	0	343	1	557
3:00	0	70			0	106				
3:15	2	97			0	105				
3:30	0	93			0	87				
3:45	0	86	2	346	0	105	0	403	2	749
4:00	0	73			2	89				
4:15	2	58			0	118				
4:30	6	78			2	83				
4:45	2	68	10	277	1	83	5	373	15	650
5:00	2	79			0	104				
5:15	3	88			3	97				
5:30	13	81			4	97				
5:45	13	59	31	307	4	82	11	380	42	687
6:00	18	45			6	73				
6:15	23	47			7	60				
6:30	31	37			14	38				
6:45	52	44	124	173	18	43	45	214	169	387
7:00	72	33			22	55				
7:15	69	29			46	49				
7:30	83	25			64	42				
7:45	71	20	295	107	109	33	241	179	536	286
8:00	93	18			108	43				
8:15	89	10			66	28				
8:30	101	15			68	33				
8:45	89	5	372	48	67	19	309	123	681	171
9:00	68	14			44	22				
9:15	47	3			43	9				
9:30	35	3			33	22				
9:45	40	6	190	26	55	2	175	55	365	81
10:00	49	2			35	7				
10:15	52	6			57	4				
10:30	56	3			49	8				
10:45	46	2	203	13	55	6	196	25	399	38
11:00	55	0			54	6				
11:15	60	1			59	2				
11:30	59	1			46	4				
11:45	68	0	242	2	67	3	226	15	468	17
Total	1473	2064			1213	2735			2686	4799
Percent	41.6%	58.4%			30.7%	69.3%			35.9%	64.1%

Location : High Street
 Location : South of Driveway
 City/State: Norwell, MA

88900001

9/22/2021		NB,		Hour Totals		SB,		Hour Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	
12:00	0	90			1	77					
12:15	1	79			0	92					
12:30	0	73			1	87					
12:45	0	50	1	292	2	92	4	348	5	640	
1:00	0	48			0	70					
1:15	0	57			1	82					
1:30	2	49			1	83					
1:45	0	65	2	219	1	89	3	324	5	543	
2:00	0	47			0	92					
2:15	1	55			0	95					
2:30	0	60			0	84					
2:45	0	78	1	240	0	97	0	368	1	608	
3:00	0	69			0	118					
3:15	1	94			3	102					
3:30	1	98			0	104					
3:45	0	76	2	337	0	101	3	425	5	762	
4:00	1	89			2	104					
4:15	1	59			1	106					
4:30	4	81			1	108					
4:45	3	73	9	302	1	94	5	412	14	714	
5:00	3	78			1	128					
5:15	3	70			2	95					
5:30	15	69			1	95					
5:45	17	68	38	285	5	78	9	396	47	681	
6:00	16	44			5	75					
6:15	22	41			8	60					
6:30	36	43			15	40					
6:45	56	40	130	168	19	43	47	218	177	386	
7:00	76	33			27	67					
7:15	61	20			44	49					
7:30	62	16			62	31					
7:45	65	20	264	89	104	30	237	177	501	266	
8:00	79	17			115	27					
8:15	94	16			73	32					
8:30	77	14			63	26					
8:45	82	14	332	61	83	8	334	93	666	154	
9:00	50	13			55	26					
9:15	59	6			37	15					
9:30	38	2			41	14					
9:45	51	6	198	27	46	13	179	68	377	95	
10:00	50	7			49	13					
10:15	43	5			47	7					
10:30	49	3			44	9					
10:45	65	2	207	17	47	3	187	32	394	49	
11:00	48	0			53	3					
11:15	49	3			63	1					
11:30	55	0			58	3					
11:45	59	1	211	4	65	4	239	11	450	15	
Total	1395	2041			1247	2872			2642	4913	
Percent	40.6%	59.4%			30.3%	69.7%			35.0%	65.0%	
Grand Total	2868	4105			2460	5607			5328	9712	
Percent	41.1%	58.9%			30.5%	69.5%			35.4%	64.6%	

ADT

ADT: 7,520

AADT: 7,520

VEHICLE TRAVEL SPEED DATA

1

88900001

9/21/2021	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	0	0	1	1	0	1	0	0	3
1:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3:00	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
4:00	0	0	0	0	0	0	1	0	1	3	2	1	1	1	10
5:00	0	0	0	0	1	0	0	3	5	8	11	2	1	0	31
6:00	0	0	0	1	0	0	0	6	20	37	46	10	3	1	124
7:00	0	0	0	1	1	6	10	20	51	84	85	27	8	2	295
8:00	0	0	7	6	11	9	15	44	98	115	50	10	3	4	372
9:00	0	0	0	3	2	6	4	20	30	75	34	14	2	0	190
10:00	0	0	1	1	12	9	6	23	34	65	36	11	5	0	203
11:00	0	0	0	2	18	11	6	16	63	72	41	7	5	1	242
12:00 PM	0	0	34	21	38	29	20	47	66	56	23	4	0	1	339
1:00	0	0	0	0	19	11	6	15	39	62	45	10	5	0	212
2:00	0	0	0	3	20	10	5	18	45	58	37	11	6	1	214
3:00	0	0	3	4	15	21	15	45	81	88	60	12	2	0	346
4:00	0	0	1	7	14	12	19	24	50	80	50	14	6	0	277
5:00	0	0	1	0	29	10	15	35	60	79	63	9	4	2	307
6:00	0	0	0	0	13	8	3	11	25	56	44	10	0	3	173
7:00	0	0	0	1	7	8	5	10	21	32	18	5	0	0	107
8:00	0	0	0	0	3	4	0	2	17	11	10	1	0	0	48
9:00	0	0	0	0	0	1	0	3	5	7	8	1	1	0	26
10:00	0	0	0	0	0	0	0	1	3	4	3	2	0	0	13
11:00	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
Total	0	0	47	50	203	156	131	344	716	994	666	162	52	16	3537
Percentile				15th	50th	85th	95th								
Speed				19.8	27.2	31	33.5								
Mean Speed (Average)				26.6											
10 MPH Pace Speed				23-32											
Number in Pace				2480											
Percent in Pace				70.1%											
Number > 45 MPH				16											
Percent > 45 MPH				0.5%											

88900001

9/22/2021	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
1:00	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
2:00	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
3:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
4:00	0	0	0	0	0	0	0	0	1	0	6	1	1	0	9
5:00	0	0	0	0	0	0	0	0	6	11	8	7	4	2	38
6:00	0	0	0	0	1	0	0	7	10	40	49	16	4	3	130
7:00	0	0	0	3	2	5	13	17	40	79	67	20	15	3	264
8:00	0	0	0	0	8	7	11	25	74	102	72	24	4	5	332
9:00	0	0	0	0	9	11	6	12	37	66	43	10	4	0	198
10:00	0	0	1	2	11	13	7	19	49	49	32	19	5	0	207
11:00	0	0	1	2	18	11	9	18	55	59	27	8	3	0	211
12:00 PM	0	0	1	1	21	19	11	24	53	94	52	12	4	0	292
1:00	0	0	0	1	19	19	5	16	45	51	44	14	2	3	219
2:00	0	0	1	3	19	13	10	13	46	62	57	10	3	3	240
3:00	0	0	28	28	31	36	23	28	67	51	39	5	0	1	337
4:00	0	0	0	2	23	14	15	20	65	85	63	12	2	1	302
5:00	0	0	0	5	25	20	15	22	53	66	52	23	4	0	285
6:00	0	0	0	1	15	13	5	7	37	41	35	10	3	1	168
7:00	0	0	0	0	4	5	4	5	21	23	20	4	2	1	89
8:00	0	0	0	0	4	4	2	4	15	18	10	3	1	0	61
9:00	0	0	0	0	2	2	0	2	8	5	5	3	0	0	27
10:00	0	0	0	0	0	0	0	1	0	3	8	4	1	0	17
11:00	0	0	0	0	0	0	0	0	0	1	3	0	0	0	4
Total	0	0	32	48	212	192	138	240	682	909	693	205	62	23	3436
Percentile															
Speed				15th	50th	85th	95th								
Mean Speed (Average)				17.9	27.9	31.6	34.1								
10 MPH Pace Speed				27.1											
Number in Pace				24-33											
Percent in Pace				2354											
Number > 45 MPH				68.5%											
Percent > 45 MPH				22											
				0.6%											
Grand Total	0	0	79	98	415	348	269	584	1398	1903	1359	367	114	39	6973
Stats															
Percentile				15th	50th	85th	95th								
Speed				18.5	27.2	31.6	34.1								
Mean Speed (Average)				26.8											
10 MPH Pace Speed				23-32											
Number in Pace				4829											
Percent in Pace				69.3%											
Number > 45 MPH				38											
Percent > 45 MPH				0.5%											

Location : High Street
 Location : South of Driveway
 City/State: Norwell, MA
 Direction: SB,

88900001

9/21/2021	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	1	1	4
1:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	1	1	1	2	0	0	0	5
5:00	0	0	0	0	1	0	0	0	0	4	4	2	0	0	11
6:00	0	0	0	0	0	1	0	1	4	11	8	12	6	2	45
7:00	0	0	0	2	3	5	3	4	15	50	88	48	20	3	241
8:00	0	0	3	7	7	5	6	19	44	61	83	48	21	5	309
9:00	0	0	6	5	7	8	7	5	12	35	49	25	12	4	175
10:00	0	0	2	7	12	14	9	11	20	36	55	21	8	1	196
11:00	0	0	1	12	14	17	13	5	19	56	44	32	8	5	226
12:00 PM	0	0	13	23	27	18	18	20	34	65	70	15	10	3	316
1:00	0	0	6	13	19	16	16	17	35	53	74	41	15	4	309
2:00	0	0	2	15	22	21	16	13	44	63	70	54	21	2	343
3:00	0	0	9	25	33	27	29	17	42	67	91	46	15	2	403
4:00	0	0	3	13	16	20	16	16	29	77	109	48	24	2	373
5:00	0	0	11	11	32	28	13	19	39	63	99	41	21	3	380
6:00	0	0	2	5	17	12	7	5	16	33	68	26	19	4	214
7:00	0	0	0	9	8	8	7	4	12	51	55	15	8	2	179
8:00	0	0	1	1	7	2	1	0	10	24	45	21	8	3	123
9:00	0	0	0	2	3	2	1	0	3	10	20	9	5	0	55
10:00	0	0	0	0	2	0	0	0	2	5	7	6	2	1	25
11:00	0	0	0	0	0	0	0	0	1	2	6	1	5	0	15
Total	0	0	59	150	230	204	162	157	382	768	1048	512	229	47	3948

Percentile	15th
Speed	16.7
	29.7
Mean Speed (Average)	28.7
10 MPH Pace Speed	26-35
Number in Pace	2451
Percent in Pace	62.1%
Number > 45 MPH	46
Percent > 45 MPH	1.2%

88900001

9/22/2021	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	0	0	0	0	1	2	1	0	4
1:00	0	0	0	0	0	0	0	0	1	1	0	0	1	0	3
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	1	0	1	1	0	3
4:00	0	0	0	0	0	0	0	0	1	2	1	1	0	0	5
5:00	0	0	0	0	0	1	0	0	0	5	1	2	0	0	9
6:00	0	0	0	0	0	0	0	0	2	7	19	9	8	2	47
7:00	0	0	0	2	4	7	6	9	13	59	68	43	24	2	237
8:00	0	0	0	0	8	5	8	17	31	88	100	47	26	4	334
9:00	0	0	3	4	15	8	10	13	14	34	44	22	8	4	179
10:00	0	0	1	2	9	14	5	5	18	44	52	23	12	2	187
11:00	0	0	0	12	23	17	15	9	22	30	68	23	15	5	239
12:00 PM	0	0	5	10	21	22	12	13	25	77	96	38	27	2	348
1:00	0	0	3	7	21	20	12	7	31	62	96	31	28	6	324
2:00	0	0	8	20	31	29	13	16	53	66	79	35	15	3	368
3:00	0	0	20	23	46	25	38	35	50	73	78	20	15	2	425
4:00	0	0	2	10	41	23	26	16	35	86	108	45	16	4	412
5:00	0	0	7	10	30	32	24	17	49	64	94	48	18	3	396
6:00	0	0	2	1	23	6	10	4	14	36	66	33	14	9	218
7:00	0	0	1	8	15	14	4	5	13	33	48	27	7	2	177
8:00	0	0	0	3	6	3	1	1	4	19	30	18	3	5	93
9:00	0	0	0	0	2	2	0	1	5	16	25	9	5	3	68
10:00	0	0	0	1	0	0	0	0	4	5	14	4	3	1	32
11:00	0	0	0	0	0	0	0	0	2	3	4	0	1	1	11
Total	0	0	52	113	295	228	184	168	387	811	1092	481	248	60	4119
			Percentile	15th	50th	85th	95th								
			Speed	16.7	29.7	34.1	35.9								
			Mean Speed (Average)	28.9											
			10 MPH Pace Speed	26-35											
			Number in Pace	2510											
			Percent in Pace	60.9%											
			Number > 45 MPH	58											
			Percent > 45 MPH	1.4%											
Grand Total	0	0	111	263	525	432	346	325	769	1579	2140	993	477	107	8067

Location : High Street
 Location : South of Driveway
 City/State: Norwell, MA
 Direction: Combined

88900001

9/21/2021	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	0	0	1	2	1	1	1	1	7
1:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:00	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3:00	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
4:00	0	0	0	0	0	0	1	1	2	4	4	1	1	1	15
5:00	0	0	0	0	2	0	0	3	5	12	15	4	1	0	42
6:00	0	0	0	1	0	1	0	7	24	48	54	22	9	3	169
7:00	0	0	0	3	4	11	13	24	66	134	173	75	28	5	536
8:00	0	0	10	13	18	14	21	63	142	176	133	58	24	9	681
9:00	0	0	6	8	9	14	11	25	42	110	83	39	14	4	365
10:00	0	0	3	8	24	23	15	34	54	101	91	32	13	1	399
11:00	0	0	1	14	32	28	19	21	82	128	85	39	13	6	468
12:00 PM	0	0	47	44	65	47	38	67	100	121	93	19	10	4	655
1:00	0	0	6	13	38	27	22	32	74	115	119	51	20	4	521
2:00	0	0	2	18	42	31	21	31	89	121	107	65	27	3	557
3:00	0	0	12	29	48	48	44	62	123	155	151	58	17	2	749
4:00	0	0	4	20	30	32	35	40	79	157	159	62	30	2	650
5:00	0	0	12	11	61	38	28	54	99	142	162	50	25	5	687
6:00	0	0	2	5	30	20	10	16	41	89	112	36	19	7	387
7:00	0	0	0	10	15	16	12	14	33	83	73	20	8	2	286
8:00	0	0	1	1	10	6	1	2	27	35	55	22	8	3	171
9:00	0	0	0	2	3	3	1	3	8	17	28	10	6	0	81
10:00	0	0	0	0	2	0	0	1	5	9	10	8	2	1	38
11:00	0	0	0	0	0	0	1	0	1	3	6	1	5	0	17
Total	0	0	106	200	433	360	293	501	1098	1762	1714	674	281	63	7485

Percentile 15th
 Speed 17.9

50th 28.5

85th 32.8

95th 35.3

Mean Speed (Average) 27.7

10 MPH Pace Speed 24-33

Number in Pace 4793

Percent in Pace 64.0%

Number > 45 MPH 61

Percent > 45 MPH 0.8%

88900001

9/22/2021	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total	
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH		
12:00 AM	0	0	0	0	0	0	0	0	0	1	1	2	1	0	5	
1:00	0	0	0	0	0	0	0	0	1	2	1	0	1	0	5	
2:00	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
3:00	0	0	0	0	0	0	2	0	0	1	0	1	1	0	5	
4:00	0	0	0	0	0	0	0	0	2	2	7	2	1	0	14	
5:00	0	0	0	0	0	1	0	0	6	16	9	9	4	2	47	
6:00	0	0	0	0	1	0	0	7	12	47	68	25	12	5	177	
7:00	0	0	0	5	6	12	19	26	53	138	135	63	39	5	501	
8:00	0	0	0	0	16	12	19	42	105	190	172	71	30	9	666	
9:00	0	0	3	4	24	19	16	25	51	100	87	32	12	4	377	
10:00	0	0	2	4	20	27	12	24	67	93	84	42	17	2	394	
11:00	0	0	1	14	41	28	24	27	77	89	95	31	18	5	450	
12:00 PM	0	0	6	11	42	41	23	37	78	171	148	50	31	2	640	
1:00	0	0	3	8	40	39	17	23	76	113	140	45	30	9	543	
2:00	0	0	9	23	50	42	23	29	99	128	136	45	18	6	608	
3:00	0	0	48	51	77	61	61	63	117	124	117	25	15	3	762	
4:00	0	0	2	12	64	37	41	36	100	171	171	57	18	5	714	
5:00	0	0	7	15	55	52	39	39	102	130	146	71	22	3	681	
6:00	0	0	2	2	38	19	15	11	51	77	101	43	17	10	386	
7:00	0	0	1	8	19	19	8	10	34	56	68	31	9	3	266	
8:00	0	0	0	3	10	7	3	5	19	37	40	21	4	5	154	
9:00	0	0	0	0	4	4	0	3	13	21	30	12	5	3	95	
10:00	0	0	0	1	0	0	0	1	4	8	22	8	4	1	49	
11:00	0	0	0	0	0	0	0	0	2	4	7	0	1	1	15	
Total	0	0	84	161	507	420	322	408	1069	1720	1785	686	310	83	7555	
Percentile				15th	50th	85th	95th									
Speed				17.3	28.5	32.8	35.9									
Mean Speed (Average)				28.1												
10 MPH Pace Speed				24-33												
Number in Pace				4793												
Percent in Pace				63.4%												
Number > 45 MPH				81												
Percent > 45 MPH				1.1%												
Grand Total	0	0	190	361	940	780	615	909	2167	3482	3499	1360	591	146	15040	
Stats				Percentile	15th	50th	85th	95th								
Speed				17.3	28.5	32.8	35.3									
Mean Speed (Average)				27.9												
10 MPH Pace Speed				24-33												
Number in Pace				9586												
Percent in Pace				63.7%												
Number > 45 MPH				142												
Percent > 45 MPH				0.9%												

REZONING TRAFFIC INCREASES

Traffic Volume increases South of Queen Anne Plaza Driveway on Washington Street									
						Percentage of Increase/Decrease			
	NB 2026	2026 Build Scenario 1	2026 Build Scenario 2	2026 Build Scenario 2 (Industrial Only)	2026 Build Scenario 2 (Industrial Only)	2026 Build Scenario 1 over NoBuild	2026 Build Scenario 2 NoBuild	2026 Build Scenario 2 (Industrial Only) NoBuild	2026 Build Scenario 2 (Industrial Only) NoBuild
AM	2081	2084	1960	2081	2081	0%	-6%	0%	0%
PM	2685	2624	2514	2688	2688	-2%	-6%	0%	0%
						Trip Increas/Decrease			
AM						3	-121	0	0
PM						-61	-171	3	3

Source: CTPS-Community Transportation Technical Assistance Program: Norwell Traffic Impact Study

CAPACITY ANALYSIS

Washington Street (Route 53) at High Street/Grove Street
























Washington Street (Route 53) at High Street/Grove Street

Lanes, Volumes, Timings

2021 Existing Condition Weekday Morning

8890: Washington Street (Route 53) & High Street/Grove Street

10/07/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	261	72	32	88	124	537	264	471	245	22	493	71
Future Volume (vph)	261	72	32	88	124	537	264	471	245	22	493	71
Satd. Flow (prot)	1752	1933	0	1694	1818	1742	1719	1845	1708	1805	3397	0
Flt Permitted	0.366			0.684			0.950			0.950		
Satd. Flow (perm)	675	1933	0	1220	1818	1742	1719	1845	1708	1805	3397	0
Satd. Flow (RTOR)		19				562			192		11	
Lane Group Flow (vph)	287	114	0	105	148	639	284	506	263	24	613	0
Turn Type	pm+pt	NA		Perm	NA	Free	Prot	NA	Free	Prot	NA	
Protected Phases	7	4			8		1	6		5	2	
Permitted Phases	4			8		Free			Free			
Detector Phase	7	4		8	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		10.0	23.0		23.0	22.5	
Total Split (s)	23.0	46.0		23.0	23.0		28.0	33.0		23.0	28.0	
Total Split (%)	18.4%	36.8%		18.4%	18.4%		22.4%	26.4%		18.4%	22.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	4.5	
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		Max	Max	
Act Effect Green (s)	35.8	35.8		13.3	13.3	101.3	21.2	28.4	101.3	18.2	25.9	
Actuated g/C Ratio	0.35	0.35		0.13	0.13	1.00	0.21	0.28	1.00	0.18	0.26	
v/c Ratio	0.68	0.16		0.66	0.62	0.37	0.79	0.98	0.15	0.07	0.70	
Control Delay	35.9	20.4		63.3	54.9	0.6	56.1	73.3	0.2	40.2	40.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	35.9	20.4		63.3	54.9	0.6	56.1	73.3	0.2	40.2	40.9	
LOS	D	C		E	D	A	E	E	A	D	D	
Approach Delay		31.5			17.0			50.4			40.9	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	131	38		62	87	0	162	308	0	12	182	
Queue Length 95th (ft)	#292	100		133	170	0	#390	#720	0	44	#373	
Internal Link Dist (ft)		303			471			360			285	
Turn Bay Length (ft)	150			140		140	280		280	200		
Base Capacity (vph)	432	803		219	327	1742	395	516	1708	324	877	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.66	0.14		0.48	0.45	0.37	0.72	0.98	0.15	0.07	0.70	

Intersection Summary

Cycle Length: 125

Actuated Cycle Length: 101.3

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Lanes, Volumes, Timings
8890: Washington Street (Route 53) & High Street/Grove Street

2021 Existing Condition Weekday Morning

10/07/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	23.0
Total Split (s)	23.0
Total Split (%)	18%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

Intersection Signal Delay: 35.8

Intersection LOS: D

Intersection Capacity Utilization 67.8%









ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 8890: Washington Street (Route 53) & High Street/Grove Street
























 Ø1	 Ø2	 Ø4	 Ø9
28 s	28 s	46 s	23 s
 Ø5	 Ø6	 Ø7	 Ø8
23 s	33 s	23 s	23 s

Lanes, Volumes, Timings

2028 No Build Condition Weekday Morning

3: Washington Street (Route 53) & High Street/Grove Street

10/08/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	280	77	35	96	133	576	283	509	263	24	532	77
Future Volume (vph)	280	77	35	96	133	576	283	509	263	24	532	77
Satd. Flow (prot)	1752	1933	0	1694	1818	1742	1719	1845	1708	1805	3397	0
Flt Permitted	0.355			0.678			0.950			0.950		
Satd. Flow (perm)	655	1933	0	1209	1818	1742	1719	1845	1708	1805	3397	0
Satd. Flow (RTOR)		19				551			192		11	
Lane Group Flow (vph)	308	123	0	114	158	686	304	547	283	26	662	0
Turn Type	pm+pt	NA		Perm	NA	Free	Prot	NA	Free	Prot	NA	
Protected Phases	7	4			8		1	6		5	2	
Permitted Phases	4			8		Free			Free			
Detector Phase	7	4		8	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		10.0	23.0		23.0	22.5	
Total Split (s)	23.0	46.0		23.0	23.0		28.0	33.0		23.0	28.0	
Total Split (%)	18.4%	36.8%		18.4%	18.4%		22.4%	26.4%		18.4%	22.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	4.5	
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		Max	Max	
Act Effect Green (s)	37.0	37.0		14.2	14.2	102.5	22.6	28.3	102.5	18.2	24.5	
Actuated g/C Ratio	0.36	0.36		0.14	0.14	1.00	0.22	0.28	1.00	0.18	0.24	
v/c Ratio	0.72	0.17		0.68	0.63	0.39	0.80	1.07	0.17	0.08	0.81	
Control Delay	37.9	20.7		64.4	54.6	0.7	56.5	98.3	0.2	40.5	46.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.9	20.7		64.4	54.6	0.7	56.5	98.3	0.2	40.5	46.7	
LOS	D	C		E	D	A	E	F	A	D	D	
Approach Delay		33.0			17.2			62.6			46.5	
Approach LOS		C			B			E			D	
Queue Length 50th (ft)	143	42		68	94	0	179	~376	0	14	204	
Queue Length 95th (ft)	#284	108		#144	181	0	#427	#792	0	47	#419	
Internal Link Dist (ft)		303			471			360			285	
Turn Bay Length (ft)	150			140		140	280		280	200		
Base Capacity (vph)	431	793		214	323	1742	390	509	1708	320	818	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.71	0.16		0.53	0.49	0.39	0.78	1.07	0.17	0.08	0.81	

Intersection Summary

Cycle Length: 125

Actuated Cycle Length: 102.5

Natural Cycle: 135

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.07

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	23.0
Total Split (s)	23.0
Total Split (%)	18%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

Intersection Signal Delay: 41.6

Intersection LOS: D

Intersection Capacity Utilization 71.6%

ICU Level of Service C

Analysis Period (min) 15









~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Washington Street (Route 53) & High Street/Grove Street
























 Ø1	 Ø2	 Ø4	 Ø9
28 s	28 s	46 s	23 s
 Ø5	 Ø6	 Ø7	 Ø8
23 s	33 s	23 s	23 s

Lanes, Volumes, Timings

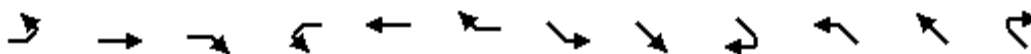
2028 Build Condition Weekday Morning

3: Washington Street (Route 53) & High Street/Grove Street

10/07/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	293	79	37	96	134	576	283	509	265	25	532	77
Future Volume (vph)	293	79	37	96	134	576	283	509	265	25	532	77
Satd. Flow (prot)	1752	1929	0	1694	1818	1742	1719	1845	1708	1805	3397	0
Flt Permitted	0.349			0.675			0.950			0.950		
Satd. Flow (perm)	644	1929	0	1204	1818	1742	1719	1845	1708	1805	3397	0
Satd. Flow (RTOR)		20				546			192		11	
Lane Group Flow (vph)	322	128	0	114	160	686	304	547	285	27	662	0
Turn Type	pm+pt	NA		Perm	NA	Free	Prot	NA	Free	Prot	NA	
Protected Phases	7	4			8		1	6		5	2	
Permitted Phases	4			8		Free			Free			
Detector Phase	7	4		8	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		10.0	23.0		23.0	22.5	
Total Split (s)	23.0	46.0		23.0	23.0		28.0	33.0		23.0	28.0	
Total Split (%)	18.4%	36.8%		18.4%	18.4%		22.4%	26.4%		18.4%	22.4%	
Maximum Green (s)	18.0	41.0		18.0	18.0		23.0	28.0		18.0	23.5	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	4.5	
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effect Green (s)	37.4	37.4		14.3	14.3	102.9	22.6	28.3	102.9	18.2	24.4	
Actuated g/C Ratio	0.36	0.36		0.14	0.14	1.00	0.22	0.28	1.00	0.18	0.24	
v/c Ratio	0.75	0.18		0.68	0.63	0.39	0.81	1.08	0.17	0.08	0.81	
Control Delay	39.5	20.6		64.7	55.1	0.7	56.8	99.8	0.2	40.6	47.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	39.5	20.6		64.7	55.1	0.7	56.8	99.8	0.2	40.6	47.1	
LOS	D	C		E	E	A	E	F	A	D	D	
Approach Delay		34.2			17.3			63.3			46.8	
Approach LOS		C			B			E			D	
Queue Length 50th (ft)	151	44		68	95	0	179	~377	0	14	204	
Queue Length 95th (ft)	#313	111		#145	183	0	#427	#792	0	48	#419	
Internal Link Dist (ft)		303			471			360			285	
Turn Bay Length (ft)	150			140		140	280		280	200		
Base Capacity (vph)	430	789		213	321	1742	388	507	1708	319	814	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	23.0
Total Split (s)	23.0
Total Split (%)	18%
Maximum Green (s)	18.0
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Reduced v/c Ratio	0.75	0.16		0.54	0.50	0.39	0.78	1.08	0.17	0.08	0.81	

Intersection Summary

Cycle Length: 125

Actuated Cycle Length: 102.9

Natural Cycle: 135

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 42.1

Intersection LOS: D

Intersection Capacity Utilization 72.4%

ICU Level of Service C

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Washington Street (Route 53) & High Street/Grove Street

Ø1	Ø2	Ø4	Ø9
28 s	28 s	46 s	23 s
Ø5	Ø6	Ø7	Ø8
23 s	33 s	23 s	23 s