



A-23

McDonough & Rea Associates, Inc.

Traffic and Transportation Consulting

Kevin P. McDonough (1953-1994)
John H. Rea, P.E.
Jay S. Troutman, Jr., P.E.
Scott T. Kennel

November 19, 2019

Marlboro Township Zoning Board of Adjustment
Town Hall
1979 Township Drive
Marlboro, NJ 07746

Re: Improvements at Marlboro Mall
Lots 2 & 3 in Block 351
Marlboro Township, Monmouth County
MRA File No. 18-144

Dear Board Members:

McDonough & Rea Associates (MRA) has been asked to provide the Zoning Board of Adjustment with a *Traffic Impact Analysis* to improve and expand the *Marlboro Mall*, located on the southwest corner of New Jersey State Route 79 and School Road in Marlboro Township, as shown on *Figure 1*, a *Site Location Map* in the *Appendix*.

Plans prepared by French & Parrello Associates (FPA) show the following changes:

- A 12,000 SF 1-story building addition which will be added to the existing 24,272 SF main shopping center building.
- A 10,000 SF day care center.
- An automated tunnel car wash.

Access to the property will continue to be gained from a right-in/right-out driveway from and to the southbound lanes of Route 79 as well as a full access driveway to School Road West which lines up with the aisle in front of the main building as well as a driveway to School Road West that lines up with the loading zone behind the building.

Please reply to:

- 1431 Lakewood Road, Suite C, Manasquan, NJ 08736 • (732) 528-7076 • Fax (732) 528-6673
- 105 Elm Street, Lower Level, Westfield, NJ 07090 • (908) 789-7180 • Fax (908) 789-7181



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Marlboro Township Zoning Board of Adj. -2-

November 19, 2019

SCOPE OF STUDY

In order to prepare a thorough *Traffic Impact Analysis* for this project, MRA conducted the following tasks:

1. Made field visits to the site to establish existing roadway and traffic conditions in the area.
2. Conducted peak hour traffic counts during the weekday PM peak street hour and mid-day Saturday peak hour at the site access points to the *Marlboro Mall*.
3. Prepared estimates of additional traffic to be generated by the expansion of the mall based upon Institute of Transportation Engineers (ITE) data.
4. Distributed new site generated trips to the access points in accordance with anticipate origins and destinations of site traffic.
5. Prepared estimates of future traffic volume demand for the design year of the project (2022) including background traffic growth.
6. Conducted level of service capacity analyses for the site driveways for the 2022 design year.
7. Reviewed the *Site Plan* with respect to availability and accessibility of the parking supply and conformance to proper traffic engineering principles.

The following report sets forth the database accumulated and the conclusions reached with respect to the improvements at the *Marlboro Mall*.

EXISTING CONDITIONS

The subject property is located generally in the southwest quadrant of the intersection of Route 79 at School Road in Marlboro Township. The property wraps around an existing gas station which is located immediately at the southwest quadrant of the intersection. The property currently contains a 24,272 SF 1-story retail building and a 3,000 SF 1-story bank pad with drive-up windows. The property currently has a right-in/right-out driveway from and to the southbound lanes of Route 79 and 2 driveways to School Road West.



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Marlboro Township Zoning Board of Adj. -3-

November 19, 2019

The intersection of Route 79 at School Road is a signalized intersection under the jurisdiction of the New Jersey Department of Transportation (NJDOT). School Road West is a 2-lane east/west Municipal roadway providing for 1 lane in each direction across the property frontage.

EXISTING TRAFFIC VOLUMES

Traffic volume data was collected at the site access points by conducting manual turning movement counts in March and April 2018 during the weekday PM peak street hour (4:00 PM-7:00 PM) and the mid-day Saturday peak hour (11:00 AM-2:00 PM). Existing traffic volumes utilizing the site access points to the shopping center are shown in *Figure 2* in the *Appendix*.

TRIP GENERATION/DISTRIBUTION

Estimates of traffic to be generated by the expansion of the *Marlboro Mall* were made after consulting the *10th Edition* of the *ITE Trip Generation Manual*. The additional space to be provided within the mall (a total of 12,000 SF of retail space, a 10,000 SF day care center and a tunnel car wash) were analyzed as per the ITE data and NJDOT methodology. *Table I* illustrates the anticipated additional traffic that will be generated by the retail space, day care space and car wash.

**TABLE I
TRIP GENERATION
MARLBORO MALL EXPANSION**

<u>USE</u>	<u>PM PSH</u>			<u>SAT PH</u>		
	<u>IN</u>	<u>OUT</u>	<u>TOTAL</u>	<u>IN</u>	<u>OUT</u>	<u>TOTAL</u>
12,000 SF retail	35	35	70	49	36	75
10,000 SF Daycare	52	59	111	11	6	17
Tunnel Car Wash	39	39	78	30	30	60
Totals	126	133	259	81	72	153

With respect to the distribution of site generated traffic, a review was made of population surrounding the site, traffic volumes on the adjacent roadway network and existing traffic patterns exhibited by the retail uses on the site. Based upon that review, traffic was distributed as follows:



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Marlboro Township Zoning Board of Adj. -4-

November 19, 2019

TABLE II
TRAFFIC DISTRIBUTION

<u>DIRECTION</u>	<u>PERCENTAGE</u>
To/from the north	20%
To/from the east	20%
To/from the west	20%
To/from the south	<u>40%</u>
	100%

Site generated and distributed traffic is shown on *Figure 3* in the *Appendix*.

ANALYSIS OF FUTURE TRAFFIC

A design year of 2022 was assumed for analysis. The NJDOT's *Background Traffic Growth Rate* data for the area was consulted and 4 years' worth of background traffic growth was added to existing traffic volumes in order to arrive at design year 2022 *no-build* traffic volumes which are shown on *Figure 4* in the *Appendix*. New site generated and distributed traffic volumes were then surcharged onto design year 2022 *no-build* volumes and are shown on *Figure 5* in the *Appendix*, entitled *Design Year 2022 Build Traffic Volumes*.

It should be noted that in order to prepare a conservative analysis, MRA did not take any pass-by credits for traffic generated by the retail expansion on the property, although ITE data permits such a credit.

Traffic engineers calculate levels of service of unsignalized intersections which relate to the quality of traffic flow. Level of service is a measure of average control delay. Average control delay is the time lost due to deceleration and the amount of time from when a vehicle is stopped for a traffic control device (or at the end of the queue) to when the vehicle departs the intersection. Delay is a relative quantity of driver discomfort, frustration, fuel consumption, and loss in travel time.

Levels of service range from "A" to "F" with "A" being the highest or best attainable level of service. Level of service "E" with average control delays of not more than 50 seconds per vehicle at an unsignalized intersection indicates near to or at capacity conditions and is generally considered the limit of acceptable level of service and delay.



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Marlboro Township Zoning Board of Adj. -5-

November 19, 2019

Full definitions of levels of service for unsignalized intersections and level of service summaries are included in the *Appendix*. The intersections studied by this report were analyzed according to the procedures set forth in the *Highway Capacity Manual 2010*, using the *Highway Capacity Software (HCS7 version 7.5)*.

ROUTE 79 DRIVEWAY

Exiting movements to southbound Route 79 at the right-in/right out Route 79 driveway were evaluated for the 2022 design year. Findings were that exiting movements would operate at level of service “C” for the PM peak street hour and level of service “D” for the mid-day Saturday peak hour. Both levels of service are considered to be within acceptable traffic engineering parameters.

SCHOOL ROAD WEST/WEST ACCESS

At the west access to the shopping center from School Road West, which generally lines up with the service/loading aisle behind the buildings, findings were that exiting movements to School Road West at this location would do so at level of service “B” for both the PM peak street hour and mid-day Saturday peak hour. Therefore, this intersection will operate within acceptable traffic engineering parameters.

SCHOOL ROAD WEST/EAST ACCESS

At the main access to the shopping center from School Road West, which lines up with the access and circulation aisle in front of the larger retail building, findings were that exiting movements will do so at level of service “B” for the PM peak street hour and level of service “C” for the mid-day Saturday peak hour. Therefore, this intersection will operate within acceptable traffic engineering parameters.

SITE PLAN AND PARKING

The *Site Plan*, prepared by FPA, shows a reorientation of existing parking stalls and maintaining the 3 existing access points to the shopping center in their current configuration. The following expansion to the shopping center is proposed:

- A 12,000 SF expansion to the existing 1-story masonry building in a southerly direction.
- A 10,000 SF day care center along the southern boundary of the property.
- An automated tunnel car wash adjacent to Route 79.



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Marlboro Township Zoning Board of Adj. -6-

November 19, 2019

Based on the plans prepared by FPA, approximately 30 vehicles can be stacked prior to entering the car wash tunnel. Based on MRA's experience in conducting traffic studies for car washes, we have typically found that vehicle stacking for 24-26 vehicles is usually adequate. Therefore, the revised plans which show stacking for approximately 30 vehicles, meets and exceeds this requirement.

Customers will proceed directly to the car wash tunnel without having employees vacuum the vehicles prior to the car wash tunnel. Upon exiting the car wash tunnel, customers can proceed to 1 of 5 vacuum stations where they can self-vacuum their vehicles.

The 3 access points to the shopping center will provide for adequate every day and emergency vehicle access. A parking supply of 270 spaces is proposed to serve the site and the parking is deemed to be more than adequate. Overall, MRA finds that the circulation system within the shopping center meets accepted traffic engineering practices.

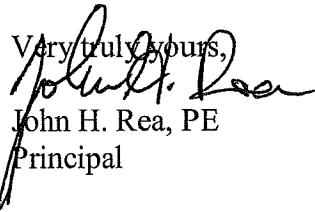
CONCLUSIONS

It is concluded, based on the analysis set forth in this report, that plans to improve and expand the *Marlboro Mall* shopping center located in the southwest quadrant of Route 79/School Road, can be approved and operate compatibly with existing and future traffic conditions in the area. An analysis of the 3 unsignalized driveways serving the property from Route 79 and School Road West shows that these driveways will operate within accepted traffic engineering parameters for the 2022 design year.

The parking supply of 270 parking spaces is well distributed and is deemed adequate to support the site. The circulation system throughout the shopping center is sound and logical and will operate safely and efficiently in our opinion.

A representative from MRA will be in attendance at an upcoming Marlboro Township Zoning Board of Adjustment meeting to provide expert testimony and to answer any questions board members, board experts or the public may have.

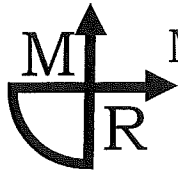
Very truly yours,


John H. Rea, PE
Principal


Scott T. Kennel
Sr. Associate

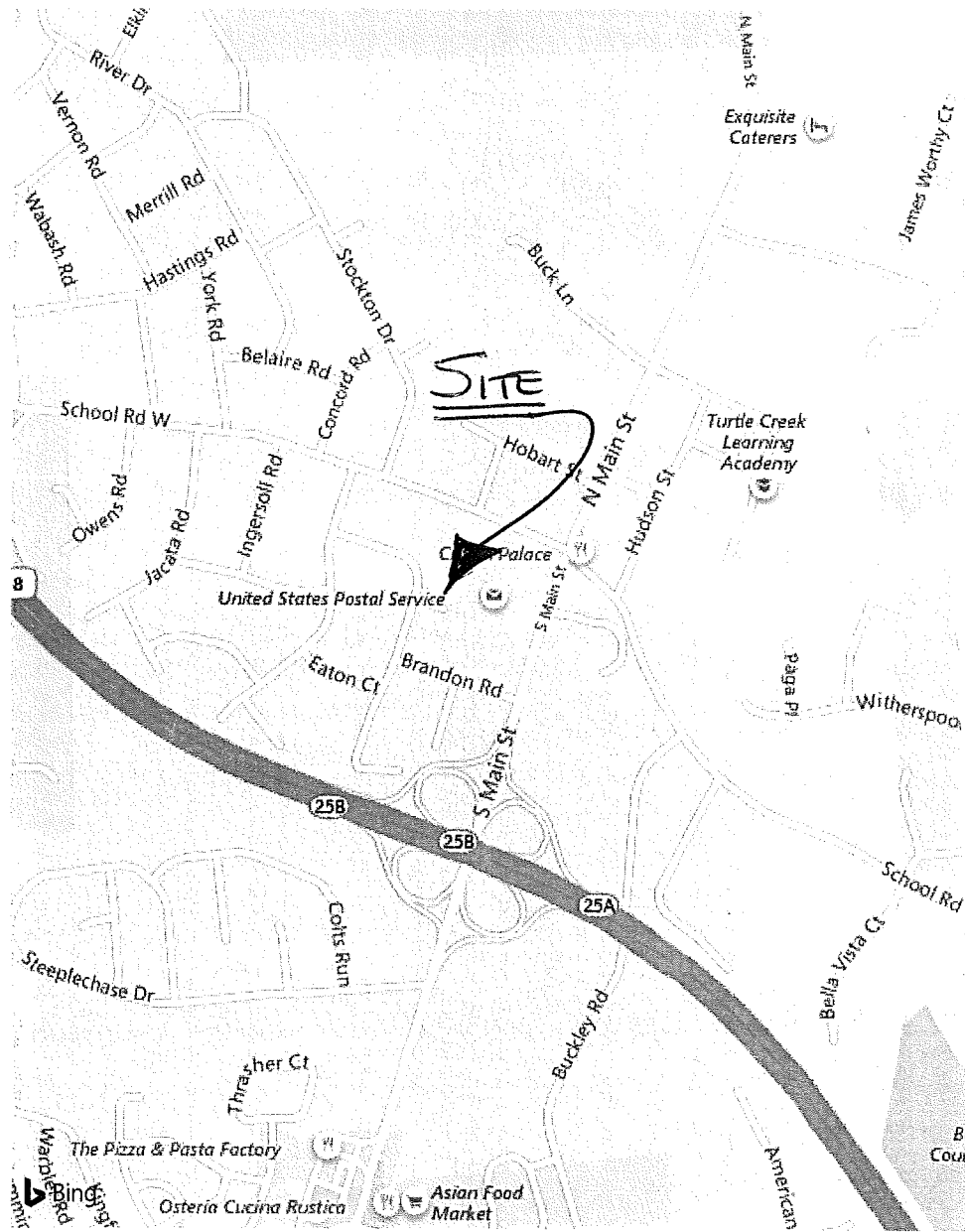
cc: Brian Decina, PE
Ken Pape, Esq.
Peter Passarella
Chris Frew

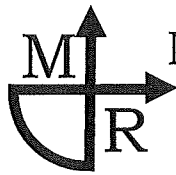
APPENDIX



SUBJECT:

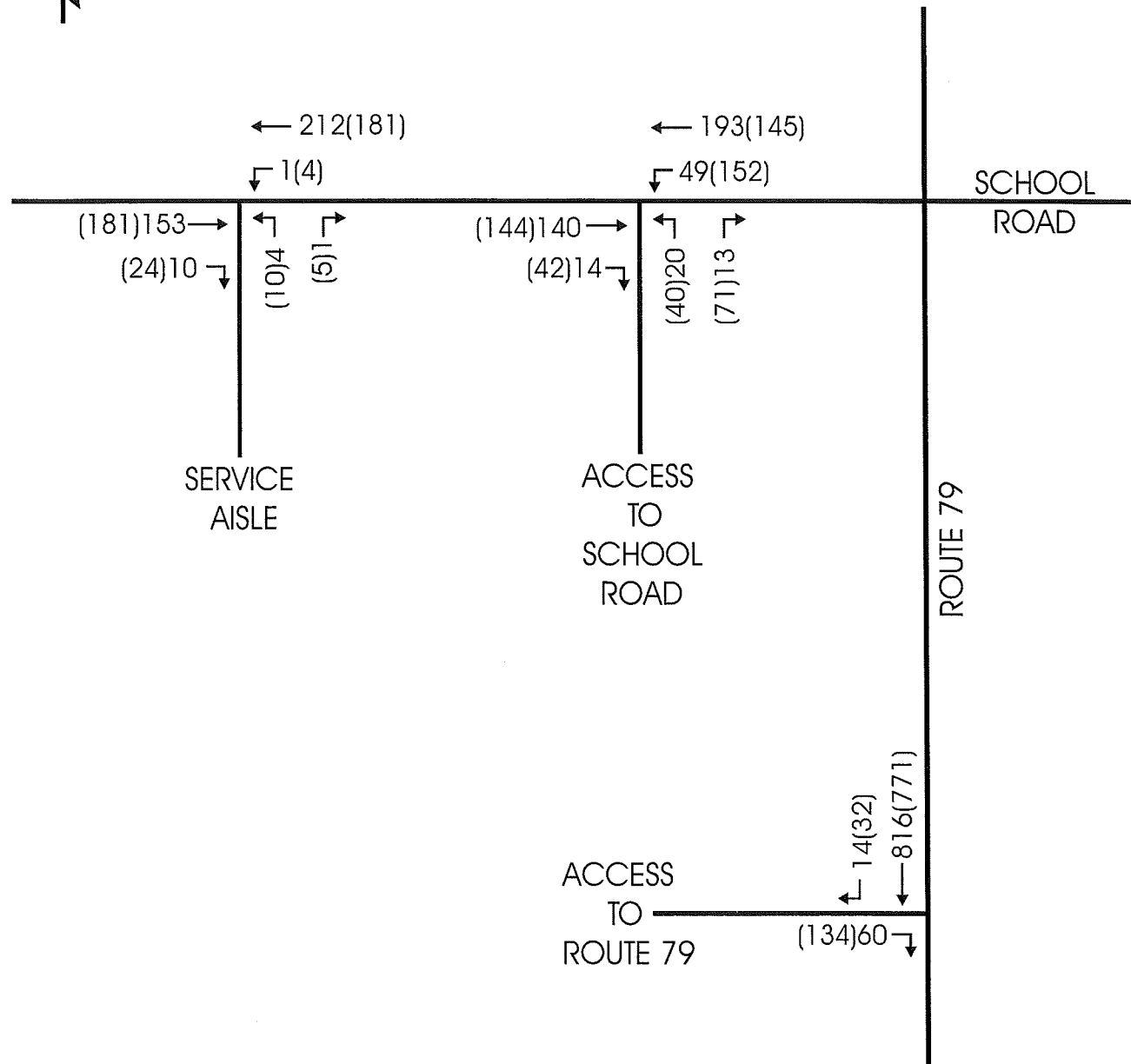
NORTHEASTERN DEVELOPMENT - MARLBORO S. C.
SITE LOCATION MAP



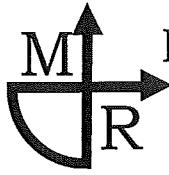


SUBJECT:

NORTHEASTERN DEVELOPMENT - MARLBORO S. C.
EXISTING PM PSH(SAT PSH) TRAFFIC VOLUMES

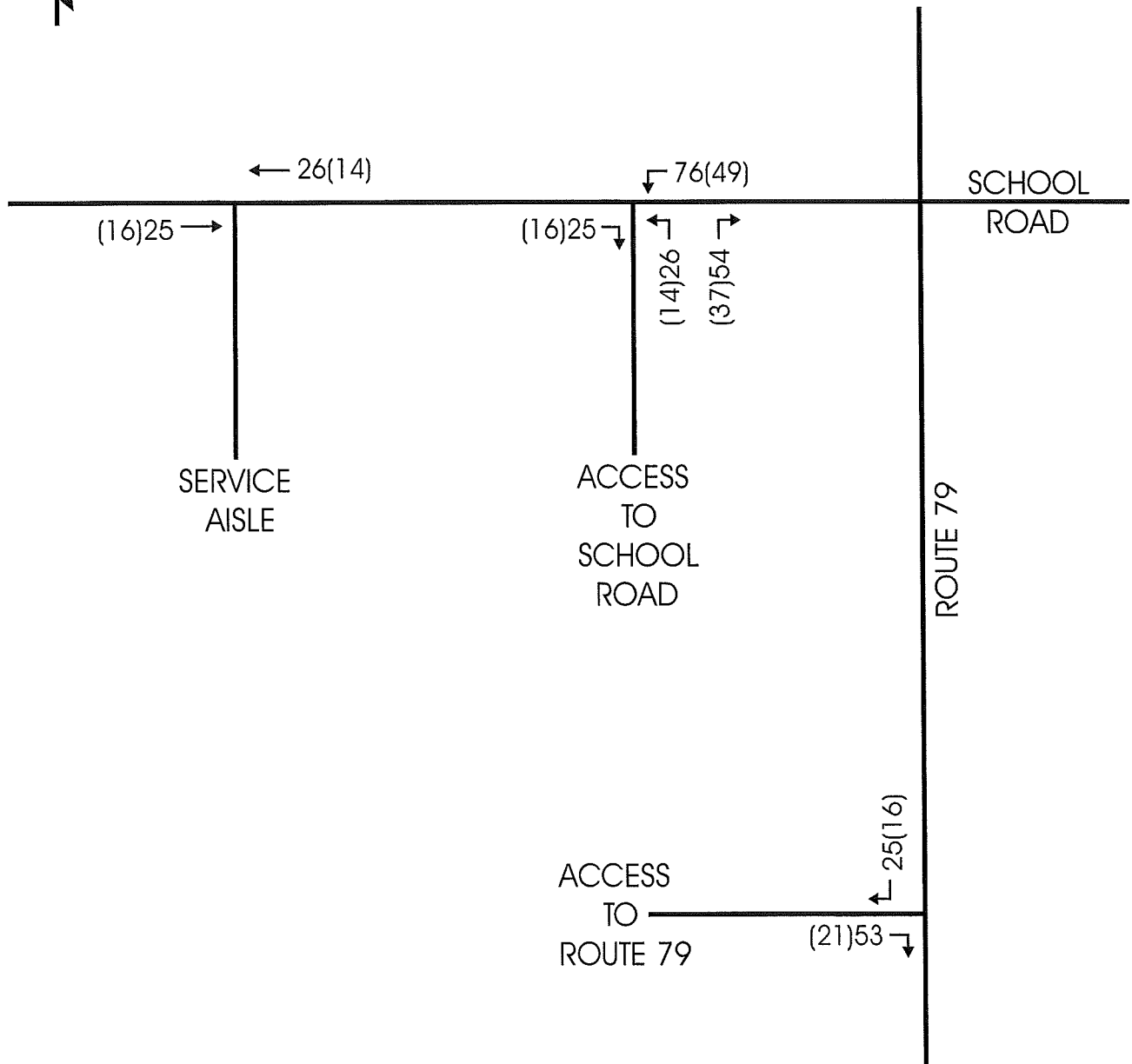


LEGEND: ← PM PSH(SAT PSH)

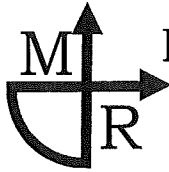


SUBJECT:

NORTHEASTERN DEVELOPMENT - MARLBORO S. C.
SITE GENERATED TRAFFIC VOLUMES

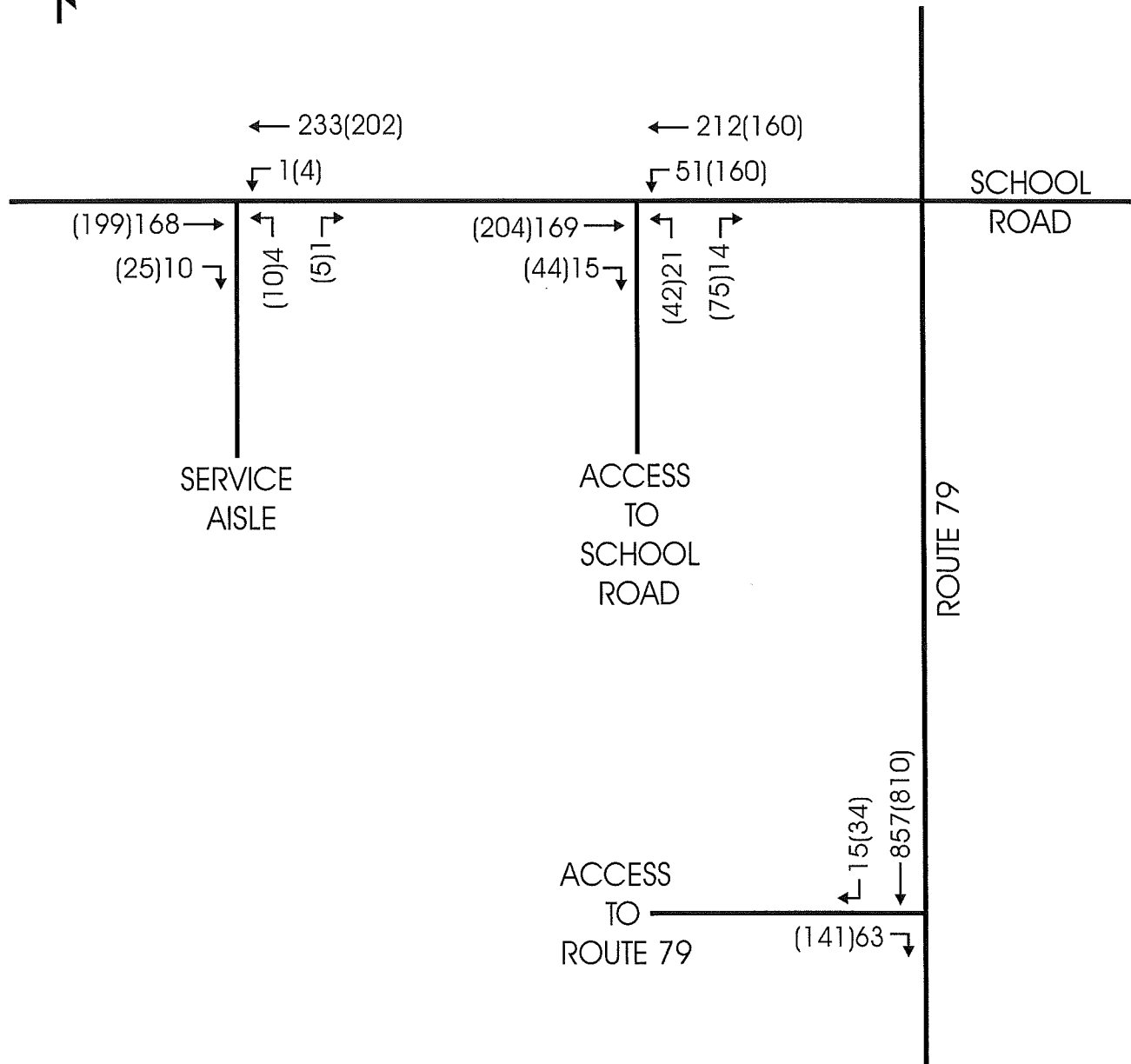


LEGEND: ← PM PSH(SAT PSH)

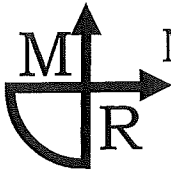


SUBJECT:

NORTHEASTERN DEVELOPMENT - MARLBORO S. C.
2022 NO - BUILD TRAFFIC VOLUMES

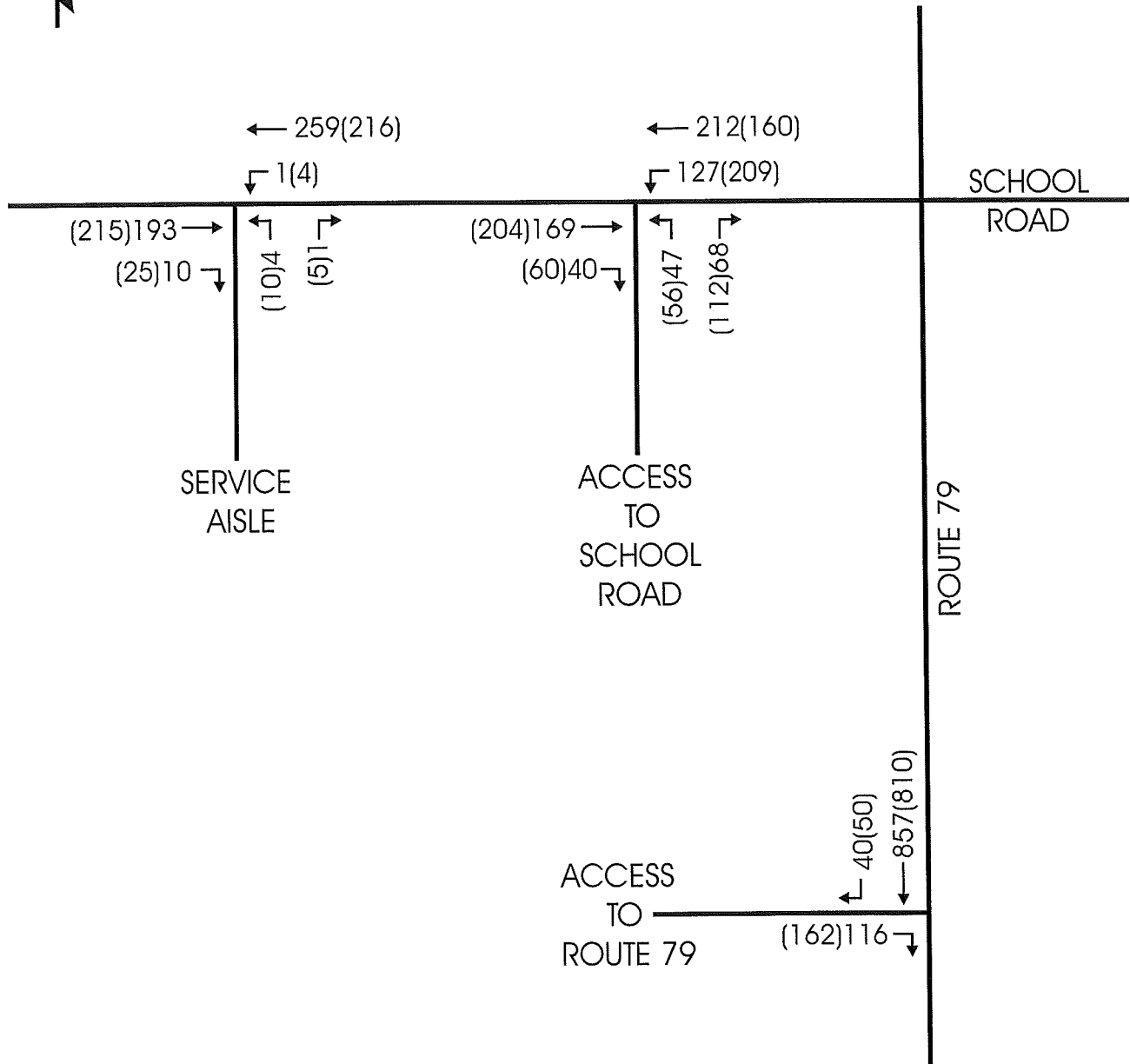


LEGEND: ← PM PSH(SAT PSH)



SUBJECT:

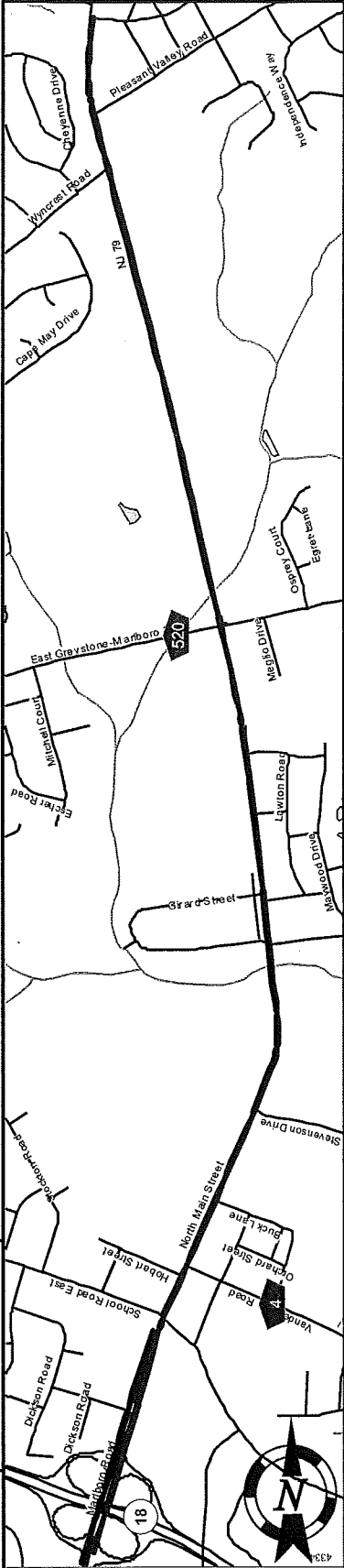
NORTHEASTERN DEVELOPMENT - MARLBORO S. C.
2022 BUILD TRAFFIC VOLUMES



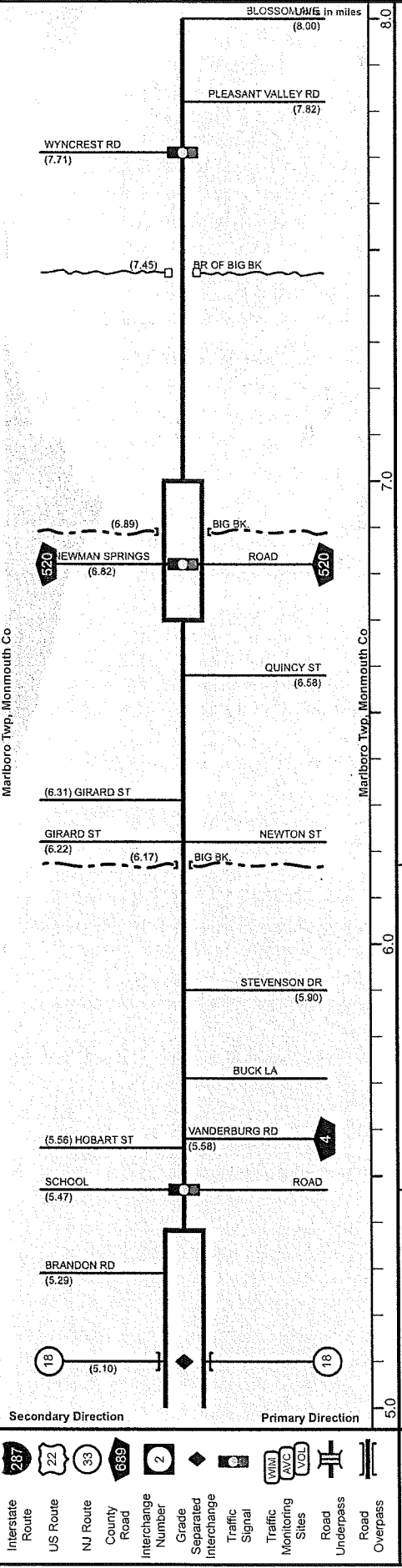
LEGEND: ← PM PSH(SAT PSH)

Mile Posts: 5.000 - 8.000

NJ 79 (South to North)



Pavement	24
Shoulder	10
Number of Lanes	2
Speed Limit	50
Street Name	Marboro Road



Street Name	Marboro Road	North Main Street	NJ 79
Jurisdiction	N.J.D.O.T.		
Functional Class	Urban Principal Arterial		
Federal Aid - NHS Sy	NHS		
Control Section	1322		
Speed Limit	50	40	50
Number of Lanes	2	2	1
Med. Type	Positive	None	Painted/Unprotected
Med. Width	8	0	VAR
Pavement	12	10	12
Shoulder	10	8	6
Traffic Volume			
Traffic Sta. ID	1322161	1322152	1322153
Structure No.			N/A
Enlarged Views			

SRI = 0000079

Date last inventoried: July 2014

NORTHEASTERN DEVELOPMENT
 ROUTE 79 & MARLBORO MALL
 MARLBORO TOWNSHIP, MONMOUTH COUNTY
 MRA JOB 18-144 THURSDAY PM COUNT

McDonough & Rea Associates
 1431 Lakewood Road Suite C
 Manasquan NJ 08736
 (732) 528-7076

File Name : 18144 rt 79 & marlboro ctr pm1
 Site Code : 00018144
 Start Date : 4/5/2018
 Page No : 1

Groups Printed- CARS - TRUCKS - SCHOOL BUS

Start Time	Route 79 Southbound			Marlboro Mall Eastbound		
	Thru	Right	App. Total	Right	App. Total	Int. Total
04:00 PM	193	3	196	15	15	211
04:15 PM	188	1	189	17	17	206
04:30 PM	219	2	221	10	10	231
04:45 PM	175	5	180	13	13	193
Total	775	11	786	55	55	841
05:00 PM	221	4	225	18	18	243
05:15 PM	201	3	204	19	19	223
05:30 PM	176	2	178	14	14	192
05:45 PM	214	0	214	13	13	227
Total	812	9	821	64	64	885
06:00 PM	208	3	211	8	8	219
06:15 PM	178	2	180	13	13	193
06:30 PM	187	1	188	9	9	197
06:45 PM	161	2	163	8	8	171
Total	734	8	742	38	38	780
Grand Total	2321	28	2349	157	157	2506
Approch %	98.8	1.2		100.0		
Total %	92.6	1.1	93.7	6.3	6.3	

Start Time	Route 79 Southbound			Marlboro Mall Eastbound		
	Thru	Right	App. Total	Right	App. Total	Int. Total
04:30 PM	816	14	830	60	60	890
05:00 PM	98.3	1.7		100.0		
Peak Factor	221	4	225	18	18	243
High Int. Volume						0.916
05:00 PM	221	4	225	19	19	
Peak Factor			0.922		0.789	

NORTHEASTERN DEVELOPMENT
 ROUTE 79 & MARLBORO MALL
 MARLBORO TOWNSHIP, MONMOUTH COUNTY
 MRA JOB 18-144 SATURDAY COUNT

McDonough & Rea Associates
 1431 Lakewood Road Suite C
 Manasquan NJ 08736
 (732) 528-7076

File Name : 18144 rt 79 & marlboro ctr sat1
 Site Code : 00018144
 Start Date : 4/7/2018
 Page No : 1

Groups Printed- CARS - TRUCKS

Start Time	Route 79 Southbound		Marlboro Mall Eastbound		Int. Total
	Thru	Right	Right	App. Total	
11:00 AM	196	9	36	205	241
11:15 AM	183	8	30	191	221
11:30 AM	201	8	31	209	240
11:45 AM	191	7	37	198	235
Total	771	32	134	803	937
12:00 PM	206	4	27	210	237
12:15 PM	203	4	17	207	224
12:30 PM	175	2	25	177	202
12:45 PM	176	6	21	182	203
Total	760	16	90	776	866
01:00 PM	169	1	19	170	189
01:15 PM	201	7	29	208	237
01:30 PM	191	3	22	194	216
01:45 PM	175	2	20	177	197
Total	736	13	90	749	839
Grand Total	2267	61	314	2328	2642
Apprch %	97.4	2.6	100.0		
Total %	85.8	2.3	11.9	88.1	11.9

Start Time	Route 79 Southbound		Marlboro Mall Eastbound		Int. Total
	Thru	Right	Right	App. Total	
11:00 AM	771	32	134	803	937
Volume	96.0	4.0	100.0		
Percent	196	9	36	205	241
11:00 Volume					0.972
Peak Factor					
High Int. Volume	201	8	37	209	
Peak Factor				0.961	

NORTHEASTERN DEVELOPMENT
 SCHOOL ROAD WEST & MARLBORO MALL
 MARLBORO TOWNSHIP, MONMOUTH COUNTY
 MRA JOB 18-144 SATURDAY COUNT

McDonough & Rea Associates
 1731 Lakewood Road Suite C
 Manasquan NJ 08736
 (732) 528-7076

File Name : 18144 school w & marlboro mall sat1
 Site Code : 00018144
 Start Date : 3/24/2018
 Page No : 1

Groups Printed- CARS - TRUCKS

Start Time	School Road West Westbound			Marlboro Mall Northbound			School Road West Eastbound		
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total
11:00 AM	36	44	80	11	18	29	42	18	60
11:15 AM	40	35	75	13	15	28	39	7	46
11:30 AM	46	34	80	10	19	29	25	8	33
11:45 AM	30	32	62	6	19	25	38	9	47
Total	152	145	297	40	71	111	144	42	186
12:00 PM	39	48	87	7	13	20	39	7	46
12:15 PM	34	45	79	10	13	23	36	13	49
12:30 PM	25	31	56	10	15	25	25	6	31
12:45 PM	25	26	51	14	9	23	49	10	59
Total	123	150	273	41	50	91	149	36	185
01:00 PM	33	47	80	11	13	24	41	6	47
01:15 PM	21	42	63	7	13	20	40	6	46
01:30 PM	23	27	50	6	11	17	43	2	45
01:45 PM	20	57	77	4	9	13	42	3	45
Total	97	173	270	28	46	74	166	17	183
Grand Total	372	468	840	109	167	276	459	95	554
Approch %	44.3	55.7		39.5	60.5		82.9	17.1	
Total %	22.3	28.0	50.3	6.5	10.0	16.5	27.5	5.7	33.2

Start Time	School Road West Westbound			Marlboro Mall Northbound			School Road West Eastbound		
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total
Peak Hour From 11:00 AM to 01:45 PM - Peak 1 of 1									
Intersection	152	145	297	40	71	111	144	42	186
Volume	51.2	48.8	80	36.0	64.0	29	77.4	22.6	60
Percent	36	44	80	11	18	29	42	18	60
11:00 Volume									
Peak Factor									0.879
High Int. Volume	11:00 AM	44	80	11:00 AM	18	29	42	18	60
Peak Factor			0.928			0.957			0.775



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 1431 Lakewood Road Suite C
 Manasquan NJ 08736
 (732) 528-7076

File Name : 18144 service & school w pm1
 Site Code : 00018144
 Start Date : 4/4/2018
 Page No : 1

NORTHEASTERN DEVELOPMENT
 SCHOOL ROAD W & MARLBORO MALL SERVICE
 MARLBORO TOWNSHIP, MONMOUTH COUNTY
 MRA JOB 18-144 WEDNESDAY PM COUNT

Groups Printed- CARS - TRUCKS - SCHOOL BUS

Start Time	School Road West Westbound			Marlboro Mall Service Rd Northbound			School Road West Eastbound				
	Left	App. Total	Right	Left	App. Total	Right	Left	App. Total	Right	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	1	1	1
04:15 PM	1	1	0	1	1	0	2	2	2	2	4
04:30 PM	0	0	0	0	0	0	1	1	5	5	6
04:45 PM	0	0	0	0	0	0	2	2	2	2	2
Total	1	1	0	2	2	0	10	10	10	10	13
05:00 PM	0	0	0	2	2	1	1	1	1	1	4
05:15 PM	1	1	0	0	0	0	2	2	2	2	3
05:30 PM	0	0	0	2	2	0	3	3	3	3	5
05:45 PM	0	0	0	1	1	0	1	1	1	1	2
Total	1	1	0	5	5	1	7	7	7	7	14
06:00 PM	0	0	0	0	0	1	1	1	1	1	2
06:15 PM	0	0	0	0	0	0	1	1	1	1	1
06:30 PM	0	0	0	0	0	0	2	2	2	2	2
06:45 PM	0	0	0	0	0	0	2	2	2	2	2
Total	0	0	0	0	0	1	6	6	6	6	7
Grand Total	2	2	2	7	9	2	23	23	23	23	34
Approch %	100.0			77.8	22.2	100.0					
Total %	5.9	5.9	5.9	20.6	26.5	67.6					

Start Time	School Road West Westbound			Marlboro Mall Service Rd Northbound			School Road West Eastbound				
	Left	App. Total	Right	Left	App. Total	Right	Left	App. Total	Right	App. Total	Int. Total
04:00 PM to 06:45 PM - Peak 1 of 1	1	1	1	4	5	1	10	10	10	10	16
Intersection Volume	100.0			80.0	20.0	100.0					
04:30 Volume	0	0	0	1	1	5	5	5	5	5	6
Peak Factor											0.667
High Int. Volume	1	1	1	2	3	5	5	5	5	5	
Peak Factor		0.250			0.417						0.500

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NORTHEASTERN DEVELOPMENT
 SCHOOL ROAD W & MARLBORO MALL SERVICE
 MARLBORO TOWNSHIP, MONMOUTH COUNTY
 MRA JOB 18-144 SATURDAY COUNT

File Name : 18144 service & school w sat1
 Site Code : 00018144
 Start Date : 3/24/2018
 Page No : 1

Groups Printed- CARS - TRUCKS

Start Time	School Road West Westbound			Marlboro Mall Service Rd Northbound			School Road West Eastbound		
	Left	Right	App. Total	Left	Right	App. Total	Left	Right	App. Total
11:00 AM	0	0	0	5	0	5	10	0	10
11:15 AM	0	0	0	0	0	0	5	0	5
11:30 AM	0	0	0	2	0	2	3	0	3
11:45 AM	1	1	1	1	0	1	4	0	4
Total	1	1	1	8	0	8	22	0	22
12:00 PM	1	1	1	0	1	1	8	0	8
12:15 PM	0	0	0	2	0	2	2	0	2
12:30 PM	2	2	2	1	1	2	5	0	5
12:45 PM	0	0	0	3	1	4	10	0	10
Total	3	3	3	6	3	9	25	0	25
01:00 PM	2	2	2	5	2	7	6	0	6
01:15 PM	0	0	0	1	1	2	3	0	3
01:30 PM	0	0	0	3	1	4	7	0	7
01:45 PM	1	1	1	2	0	2	1	0	1
Total	3	3	3	11	4	15	17	0	17
Grand Total	7	7	7	25	7	32	64	0	64
Approch %	100.0			78.1	21.9		100.0		
Total %	6.8		6.8	24.3	6.8	31.1	62.1		62.1

Start Time	School Road West Westbound			Marlboro Mall Service Rd Northbound			School Road West Eastbound		
	Left	Right	App. Total	Left	Right	App. Total	Left	Right	App. Total
01:00 Volume	4	5	15	10	5	15	24	0	24
01:00 Percent	100.0	33.3		66.7	33.3		100.0	0	
01:00 Peak Factor	2	2	7	5	2	7	6	0	6
High Int. Volume	2	2	7	5	2	7	10	0	10
Peak Factor			0.500			0.536			0.600

Peak Hour From 11:00 AM to 01:45 PM - Peak 1 of 1

Intersection 12:30 PM

0.717

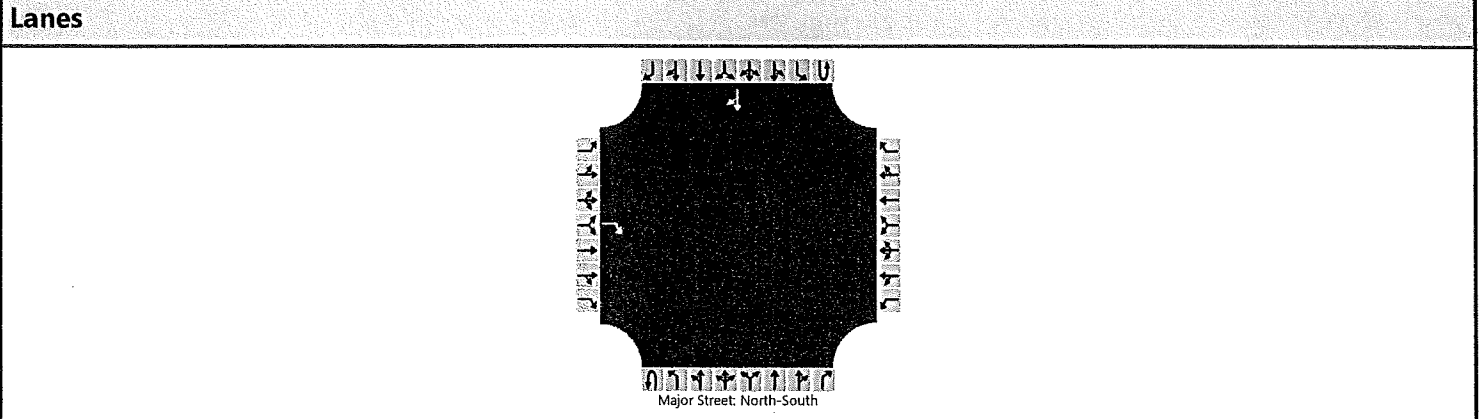
**LEVEL OF SERVICE CRITERIA
FOR
TWO-WAY STOP-CONTROLLED INTERSECTIONS¹**

<u>Level of Service</u>	<u>Average Control Delay</u>
A	≤ 10.0 Seconds Per Vehicle
B	> 10.0 and ≤ 15.0 Seconds Per Vehicle
C	> 15.0 and ≤ 25.0 Seconds Per Vehicle
D	> 25.0 and ≤ 35.0 Seconds Per Vehicle
E	> 35.0 and ≤ 50.0 Seconds Per Vehicle
F	> 50.0 Seconds Per Vehicle

¹ Transportation Research Board, Highway Capacity Manual 2010, National Research Council, Washington, DC, 2010.

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	ROUTE 79 & SITE ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	7/21/2018			East/West Street	SITE ACCESS		
Analysis Year	2018			North/South Street	ROUTE 79		
Time Analyzed	PM			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	18-144PE-1EXIST						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	1	0	
Configuration				R													TR
Volume (veh/h)				60												816	14
Percent Heavy Vehicles (%)				3													
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized		No															
Median Type Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)				6.2													
Critical Headway (sec)				6.23													
Base Follow-Up Headway (sec)				3.3													
Follow-Up Headway (sec)				3.33													

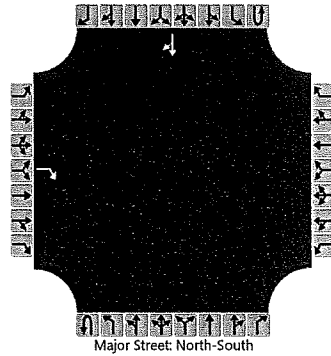
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				65													
Capacity, c (veh/h)				338													
v/c Ratio				0.19													
95% Queue Length, Q ₉₅ (veh)				0.7													
Control Delay (s/veh)				18.2													
Level of Service (LOS)				C													
Approach Delay (s/veh)		18.2															
Approach LOS		C															

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	STK	Intersection	ROUTE 79 & SITE ACCESS
Agency/Co.	MRA	Jurisdiction	
Date Performed	11/11/2019	East/West Street	SITE ACCESS
Analysis Year	2022	North/South Street	ROUTE 79
Time Analyzed	PM	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	18-144PFB-1BUILD		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	1	0
Configuration				R												TR
Volume (veh/h)				116											857	40
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type Storage	Undivided															

Critical and Follow-up Headways

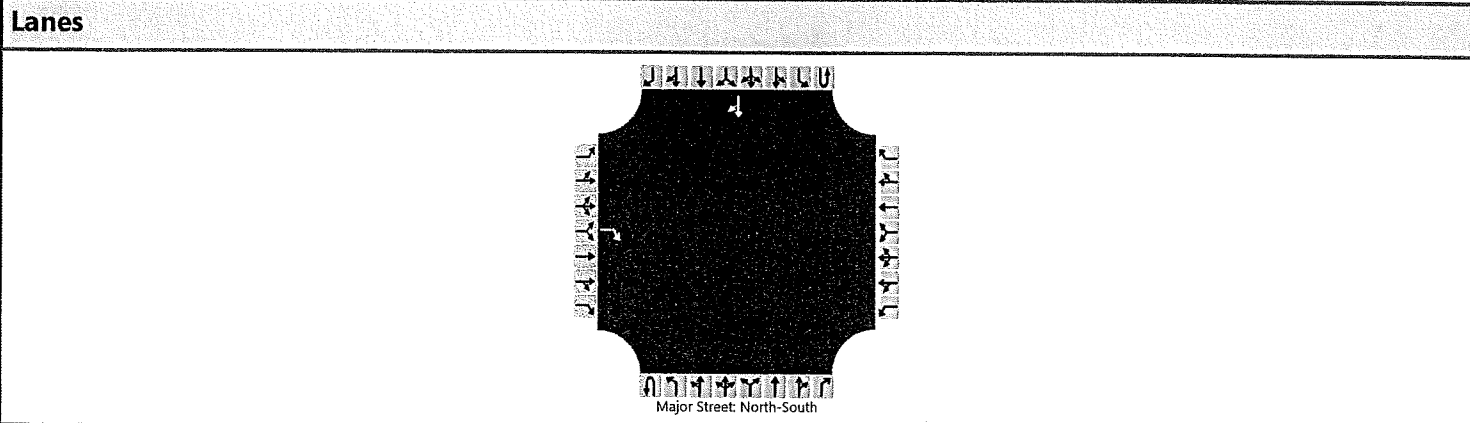
Base Critical Headway (sec)				6.2												
Critical Headway (sec)				6.23												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				126												
Capacity, c (veh/h)				313												
v/c Ratio				0.40												
95% Queue Length, Q ₉₅ (veh)				1.9												
Control Delay (s/veh)				24.1												
Level of Service (LOS)				C												
Approach Delay (s/veh)	24.1															
Approach LOS	C															

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK	Intersection	RTOUTE 79 & SITE ACCESS				
Agency/Co.	MRA	Jurisdiction					
Date Performed	7/21/2018	East/West Street	SITE ACCESS				
Analysis Year	2018	North/South Street	ROUTE 79				
Time Analyzed	SAT	Peak Hour Factor	0.92				
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25				
Project Description	18-144SE-1EXIST						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	1	0	
Configuration				R													TR
Volume (veh/h)				134											771	32	
Percent Heavy Vehicles (%)				3													
Proportion Time Blocked																	
Percent Grade (%)	0																
Right Turn Channelized	No																
Median Type Storage	Undivided																

Critical and Follow-up Headways

Base Critical Headway (sec)				6.2													
Critical Headway (sec)				6.23													
Base Follow-Up Headway (sec)				3.3													
Follow-Up Headway (sec)				3.33													

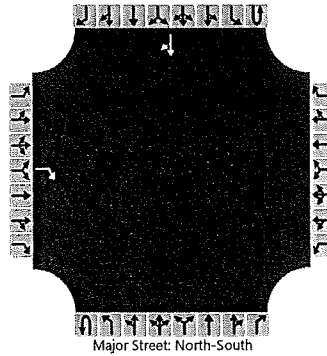
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				146													
Capacity, c (veh/h)				356													
v/c Ratio				0.41													
95% Queue Length, Q ₉₅ (veh)				1.9													
Control Delay (s/veh)				21.9													
Level of Service (LOS)				C													
Approach Delay (s/veh)	21.9																
Approach LOS	C																

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	ROUTE 79 & SITE ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	11/11/2019			East/West Street	SITE ACCESS		
Analysis Year	2022			North/South Street	ROUTE 79		
Time Analyzed	SAT			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	18-144SFB-1BUILD						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	1	0
Configuration				R												TR
Volume (veh/h)				162											810	50
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type Storage	Undivided															

Critical and Follow-up Headways

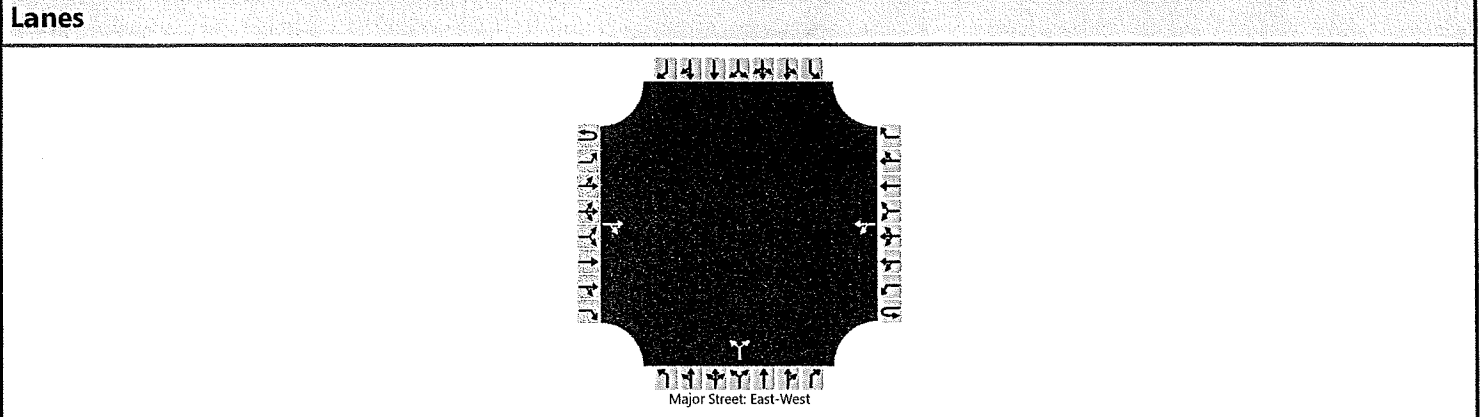
Base Critical Headway (sec)				6.2												
Critical Headway (sec)				6.23												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				176												
Capacity, c (veh/h)				332												
v/c Ratio				0.53												
95% Queue Length, Q ₉₅ (veh)				2.9												
Control Delay (s/veh)				27.4												
Level of Service (LOS)				D												
Approach Delay (s/veh)	27.4															
Approach LOS	D															

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK	Intersection	SCHOOL & WEST ACCESS				
Agency/Co.	MRA	Jurisdiction					
Date Performed	7/21/2018	East/West Street	SCHOOL ROAD				
Analysis Year	2018	North/South Street	SITE ACCESS- WEST				
Time Analyzed	PM	Peak Hour Factor	0.92				
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25				
Project Description	18-144PE-2						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			153	10		1	212			4		1				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1					7.1		6.2			
Critical Headway (sec)						4.13					6.43		6.23			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.23					3.53		3.33			

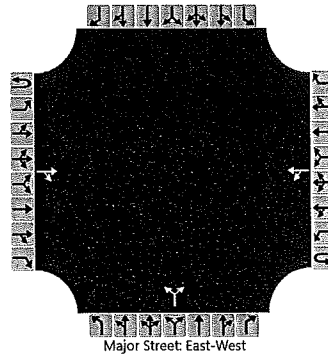
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1					5					
Capacity, c (veh/h)						1393					640					
v/c Ratio						0.00					0.01					
95% Queue Length, Q ₉₅ (veh)						0.0					0.0					
Control Delay (s/veh)						7.6					10.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.0				10.7							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	SCHOOL & WEST ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	11/11/2019			East/West Street	SCHOOL ROAD		
Analysis Year	2022			North/South Street	SITE ACCESS- WEST		
Time Analyzed	PM			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	18-144PFB-2-BUILD						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			193	10		1	259			4		1				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)					4.1					7.1		6.2				
Critical Headway (sec)					4.13					6.43		6.23				
Base Follow-Up Headway (sec)					2.2					3.5		3.3				
Follow-Up Headway (sec)					2.23					3.53		3.33				

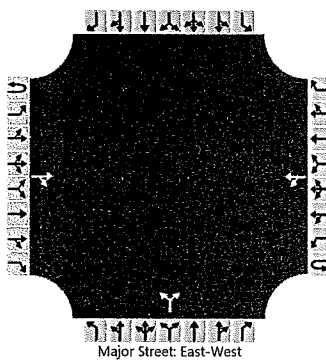
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					1					5						
Capacity, c (veh/h)					1343					570						
v/c Ratio					0.00					0.01						
95% Queue Length, Q ₉₅ (veh)					0.0					0.0						
Control Delay (s/veh)					7.7					11.4						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					0.0				11.4							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	SCHOOL & WEST ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	7/21/2018			East/West Street	SCHOOL ROAD		
Analysis Year	2018			North/South Street	SITE ACCESS- WEST		
Time Analyzed	SAT			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	18-144SE-2						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			181	24		4	181			10		5				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1					7.1		6.2			
Critical Headway (sec)						4.13					6.43		6.23			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.23					3.53		3.33			

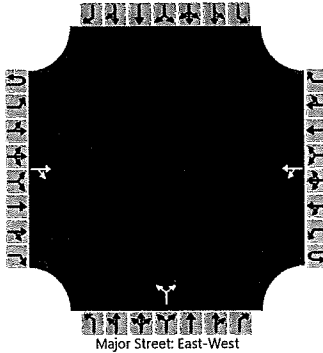
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4					16					
Capacity, c (veh/h)						1340					652					
v/c Ratio						0.00					0.02					
95% Queue Length, Q ₉₅ (veh)						0.0					0.1					
Control Delay (s/veh)						7.7					10.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.2				10.7							
Approach LOS					A				B							

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	SCHOOL & WEST ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	11/11/2019			East/West Street	SCHOOL ROAD		
Analysis Year	2022			North/South Street	SITE ACCESS- WEST		
Time Analyzed	SAT			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	18-144SFB-2-BUILD						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			215	25		4	216			10		5				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1					7.1		6.2			
Critical Headway (sec)						4.13					6.43		6.23			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.23					3.53		3.33			

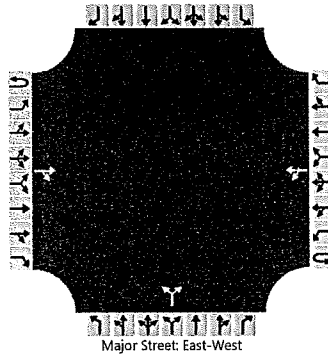
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4					16					
Capacity, c (veh/h)						1298					598					
v/c Ratio						0.00					0.03					
95% Queue Length, Q ₉₅ (veh)						0.0					0.1					
Control Delay (s/veh)						7.8					11.2					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.2				11.2							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	SCHOOL & EAST ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	7/21/2018			East/West Street	SCHOOL ROAD		
Analysis Year	2018			North/South Street	SITE ACCESS- EAST		
Time Analyzed	PM			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	18-144PE-3 EXIST						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			140	14		49	193			20		13				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

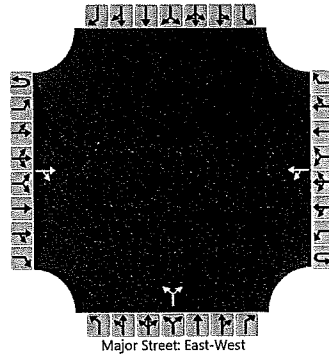
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						53					36					
Capacity, c (veh/h)						1404					625					
v/c Ratio						0.04					0.06					
95% Queue Length, Q ₉₅ (veh)						0.1					0.2					
Control Delay (s/veh)						7.7					11.1					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.8				11.1							
Approach LOS					A				B							

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK			Intersection	SCHOOL & EAST ACCESS		
Agency/Co.	MRA			Jurisdiction			
Date Performed	11/11/19			East/West Street	SCHOOL ROAD		
Analysis Year	2022			North/South Street	SITE ACCESS- EAST		
Time Analyzed	PM			Peak Hour Factor	0.92		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	18-144PFB-3BUILD						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			169	40		127	212			47		68				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

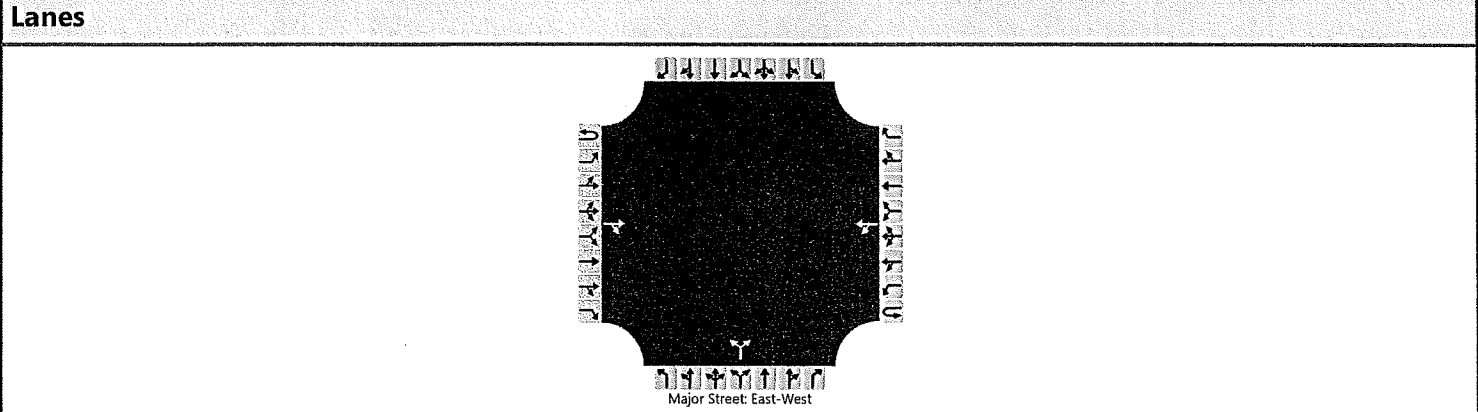
Base Critical Headway (sec)					4.1					7.1		6.2				
Critical Headway (sec)					4.13					6.43		6.23				
Base Follow-Up Headway (sec)					2.2					3.5		3.3				
Follow-Up Headway (sec)					2.23					3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					138					125						
Capacity, c (veh/h)					1335					539						
v/c Ratio					0.10					0.23						
95% Queue Length, Q ₉₅ (veh)					0.3					0.9						
Control Delay (s/veh)					8.0					13.7						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					3.6				13.7							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	STK	Intersection	SCHOOL & EAST ACCESS
Agency/Co.	MRA	Jurisdiction	
Date Performed	7/21/2018	East/West Street	SCHOOL ROAD
Analysis Year	2018	North/South Street	SITE ACCESS- EAST
Time Analyzed	SAT	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	18-144SE-3 EXIST		



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			144	42		152	145			40		71				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1					7.1		6.2			
Critical Headway (sec)						4.13					6.43		6.23			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.23					3.53		3.33			

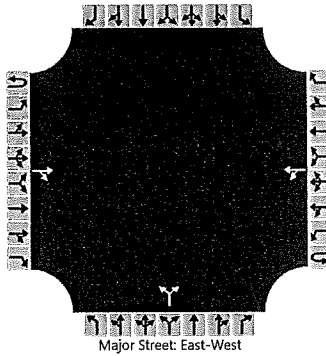
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						165					121					
Capacity, c (veh/h)						1364					583					
v/c Ratio						0.12					0.21					
95% Queue Length, Q ₉₅ (veh)						0.4					0.8					
Control Delay (s/veh)						8.0					12.8					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					4.6				12.8							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	STK	Intersection	SCHOOL & EAST ACCESS				
Agency/Co.	MRA	Jurisdiction					
Date Performed	11/11/19	East/West Street	SCHOOL ROAD				
Analysis Year	2022	North/South Street	SITE ACCESS- EAST				
Time Analyzed	SAT	Peak Hour Factor	0.92				
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25				
Project Description	18-144SFB-3BUILD						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			204	60		209	160			56		112				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)					4.1					7.1		6.2				
Critical Headway (sec)					4.13					6.43		6.23				
Base Follow-Up Headway (sec)					2.2					3.5		3.3				
Follow-Up Headway (sec)					2.23					3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					227					183						
Capacity, c (veh/h)					1269					467						
v/c Ratio					0.18					0.39						
95% Queue Length, Q ₉₅ (veh)					0.7					1.8						
Control Delay (s/veh)					8.5					17.6						
Level of Service (LOS)					A					C						
Approach Delay (s/veh)					5.5				17.6							
Approach LOS									C							