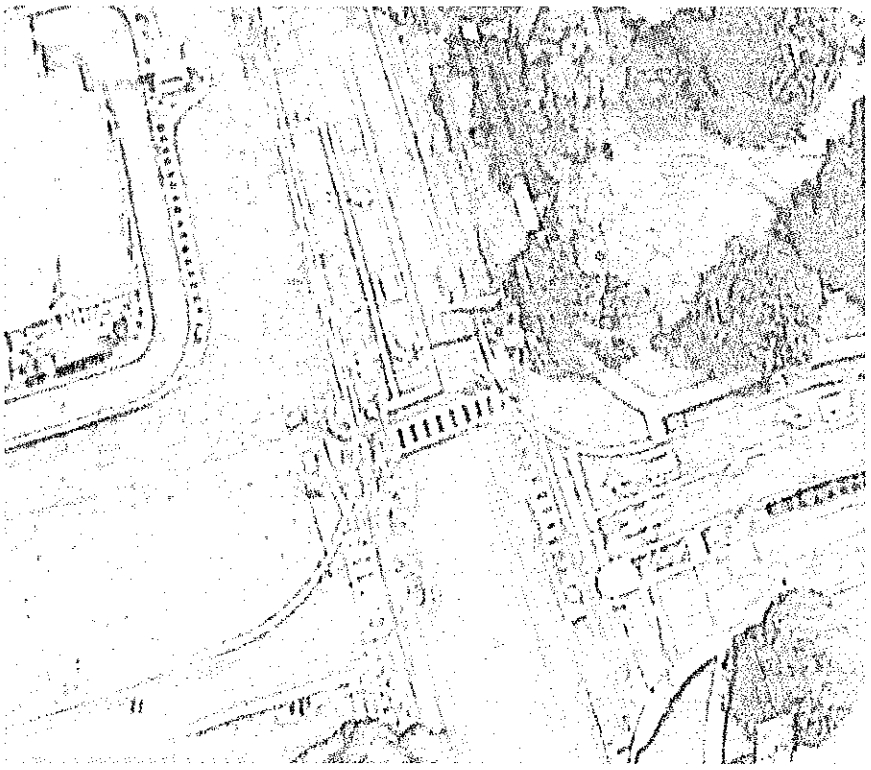
TRAFFIC IMPACT ASSESSMENT



PROPOSED APARTMENTS

CC 1377, LLC
Site Plan Application

Montgomery Township
Somerset County, NJ

August 20, 2019

Elizabeth Dolan, PE
NJ License #37074

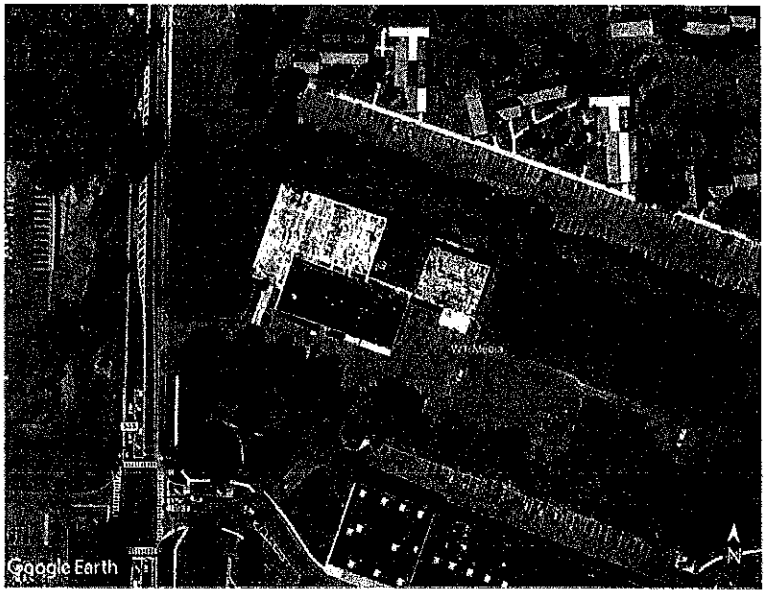
Gary W. Dean, PE, PP
NJ License #33722

DOLAN&DEAN
CONSULTING ENGINEERS, LLC

INTRODUCTION

This traffic engineering evaluation has been prepared for a Site Plan application that will be submitted for a new 115-unit residential development on a currently vacant property located along northbound Route 206, just north of Montgomery Center (Figure 1). The site was previously was previously developed for a 38,000± square foot office/warehouse/flex-space building that was razed in 2014. The former site development is shown below. The residential units will replace the former building.

Access will continue to be provided via the exiting full-movement driveway along Route 206. Also, the egress interconnection to the adjacent Montgomery Center will remain allowing egress vehicles to use the existing signalized intersection principally for left turn egress to Route 206 south. No ingress is allowed at the interconnection.



This study considers the estimated changes in traffic movements along Route 206 that may occur as a result of the development. As will be demonstrated, the change in use will yield limited traffic increases compared to the former uses, thus the access design features will continue to safely and efficiently serve site traffic without the need for any roadway or intersection improvements.

EXISTING CONDITIONS

EXISTING ROADWAY CONDITIONS

The subject property is located along US Route 206, north of County Route 518 and adjacent to the Montgomery Center shopping plaza, which is anchored by a ShopRite supermarket.

US Route 206 is defined by the New Jersey Department of Transportation (NJDOT) per the Highway Access Management Code as an accessible urban principal arterial highway. US Route 206 serves as one of the primary north/south arterial highways in Somerset County linking the Bridgewater/Somerville area to the north with the Princeton and Trenton areas further to the south. The highway serves as an important commuter travel route, as well for commerce and carries considerable traffic during peak hours. The road currently is configured with a single lane in each direction of travel within the site vicinity with turning lanes provided at select intersections.

Route 206 forms a 4-leg signalized intersection with the Montgomery Center and Village Shopper driveways. The northbound/southbound Route 206 approaches to the intersection both provide an exclusive left-turn lane and a shared through/right-turn. The westbound Montgomery Center access provides a shared left-turn/through lane and an exclusive right-turn lane. The eastbound Village Shopper approach to the intersection provides one lane for left, through, and right turning movements to be processed.

EXISTING TRAFFIC VOLUMES

To examine the existing traffic conditions in the site vicinity, updated manual turning movement counts were recently conducted during the weekday morning and evening hours, during those times when traffic through the area is typically at peak levels and would represent commuting times for residential uses.

Manual counts were made on Tuesday, July 30, 2019 from 4:00 p.m. to 6:30 p.m. and on Wednesday, July 31, 2019 from 7:00 a.m. to 9:00 a.m. Traffic was counted at the intersection of Route 206 and the Montgomery Center and Village Shopper driveways.

The traffic counts show that there is a one-hour time interval during both the morning and evening periods when overall street traffic reaches its highest levels. The morning peak hour was found to occur from 7:15 a.m. to 8:15 a.m., and the evening peak hour occurred from 5:00 p.m. to 6:00 p.m. Appended Figure 2 illustrates the traffic volumes and patterns found during peak hours.

As will be noted below, given the time of year the traffic counts were conducted, adjustments to the traffic counts were made to reflect "typical" non-summer month traffic volumes as obtained from prior traffic studies conducted for the Village Shopper site redevelopment, among other traffic studies completed along Route 206.

ANALYSIS OF EXISTING TRAFFIC VOLUMES

A volume/capacity Level of Service analysis was conducted for the existing traffic volumes at the signalized intersection using the Highway Capacity Manual (HCM) computer software. This type of analysis is performed to assess intersection operations and to identify any areas of excessive delay or congestion.

Figure 3 illustrates the existing Levels of Service at the subject intersection for the peak hours previously discussed. Based on the analysis, all movements operate at Level of Service "D" or better at the signalized intersection during both peak hours.

TRAFFIC CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Estimates of peak hour trip generation were developed using the 10th Edition of the Trip Generation Manual by the Institute of Transportation Engineers (ITE). For this development, the ITE land use "Multifamily Housing (Low-Rise)" is applicable and the ITE data worksheets are appended to this report. The following trip generation is estimated for the site redevelopment for residential apartments:

TABLE I
TRIP GENERATION ESTIMATES
115-UNIT RESIDENTIAL DEVELOPMENT

Period	Enter	Exit	Total
Morning Peak Hour	12	42	54
Evening Peak Hour	42	25	67

As noted, the site was previously occupied by 38,000 square feet of office/warehouse/flex-space space. A comparison of the previous building development and the proposed residential development reveals that the current proposal generates only slightly more traffic than was experienced at the site, though the directions are travel would be reversed for a residential use (i.e., exiting during the morning and returning in the evening) and there would be no regular truck traffic associated with the change in use.

TABLE II
TRIP GENERATION COMPARISON
PRIOR USE VS. PROPOSED 115-UNIT RESIDENTIAL DEVELOPMENT

Land Use	Morning Peak Hour	Evening Peak Hour
Former Office/Warehouse/Flex	44	46
Proposed Residential Apartments	54	67
Traffic Volume Change	+10	+21

As noted, the change in use will generate, one additional trip every 3 minutes during the peak hours. Such an impact is immaterial from a traffic engineering perspective.

The projected apartment site traffic shown in Table I has been assigned to the adjacent roadway system based on the site location and existing commuter patterns as observed along Route 206. Site generated traffic is shown on appended Figure 4.

FUTURE TRAFFIC CONDITIONS

FUTURE TRAFFIC VOLUMES

It is recognized that traffic routinely fluctuates along various state and county roadways, as well as local streets, and varies not only day-to-day, but also on a monthly and yearly basis. Normal "background" traffic increases regularly occur as attributed to continued regional growth and changes in driver demographics. There may also be additional traffic generated by specific projects that will lead to increased demands on the roadways in the site vicinity (at least to some degree), even if no changes were to occur on the subject property.

Given the time required for the approval process and site construction, it is reasonable to expect that the full site development can be completed allowing occupancy by the end of 2021. Therefore, to gauge the cumulative effects of the traffic generated by the proposed project, it is necessary to develop composite future traffic volumes that include the new site activity.

Regional traffic growth patterns as compiled by the NJDOT were examined for this analysis. Based on NJDOT growth patterns for Somerset County, traffic volumes at the study intersection are estimated by NJDOT to increase by a modest 1.00% on an annual basis during the peak hours. For a conservative traffic analysis, the assumed traffic growth factor was applied to the existing (2019) volumes to create a 2021 "no-build" year.

In addition, traffic to/from the Montgomery Center plaza was increased by 3% to account for vacancies, and traffic from the following approved projects (as shown from the respective traffic studies) was also included in the projection of future traffic volumes:

- Madison Marquette – 281,000 SF shopping center, 61,000 SF movie theater, 10,000 SF day care center, and 34 single family homes to be located in the southwest quadrant of Route 206 and Route 518.

- Village Walk at Montgomery – 52 apartments and 56,000 SF of office space to replace Village Shopper II across from the Montgomery Center Plaza.
- Sharbell – 107 townhomes, 40 condominiums, and 80 apartments to be located west of Village walk at Montgomery and north of Route 518.
- Kings Interest LLC Redevelopment – 48,240 SF of retail space to be located in the northeast quadrant of Route 206 & Route 518

Figures 5 and 6 show the future traffic volume scenarios with and without the traffic from the proposed residential development.

FUTURE "NO BUILD" & "BUILD" TRAFFIC ANALYSES

Levels of Service analyses based on the future "no-build" and "build" traffic volumes were conducted at the subject intersection and site driveway along Route 206. The results are shown on Figures 7 and 8.

In accordance with the Township Master Plan and to be implemented as part of the noted redevelopments, the signalized intersection of Route 206 & the driveways for Montgomery Center and Village Shopper will be modified to facilitate the construction of a "loop road" the will connect Route 206 to County Route 518 to the west. Consequently, "no-build" and "build" conditions at the signalized intersection were analyzed based on the pending signal improvements. Specifically, southbound Route 206 was analyzed with an additional lane providing right turn only access into the Village Shopper plaza, and the eastbound/westbound retail driveways were analyzed with a left turn only lane, and a shared through/right lane.

Under the future "no-build" and "build" conditions operations at the signalized Route 206 shopping center intersection will operate at satisfactory Level of Service "D" or better conditions during both peak hours. This indicates that the new apartments site-generated traffic will not have a negative impact on the signal operations.

Movements directly at the site driveway will operate at Level of Service "D" or better during both peak hours indicating that the site will operate with safe and efficient ingress and egress and delays that are typical for driveways along Route 206. In conclusion, the proposed residential development will not have any detrimental impacts on adjacent roadway operations.

SITE ACCESS AND CIRCULATION

The Site Plan prepared by Van Cleef Engineering Associates was reviewed with particular attention focused on the site circulation scheme, sufficiency of the proposed internal driveway circulation and parking supply, and overall access to the site. The following items address on-site design characteristics:

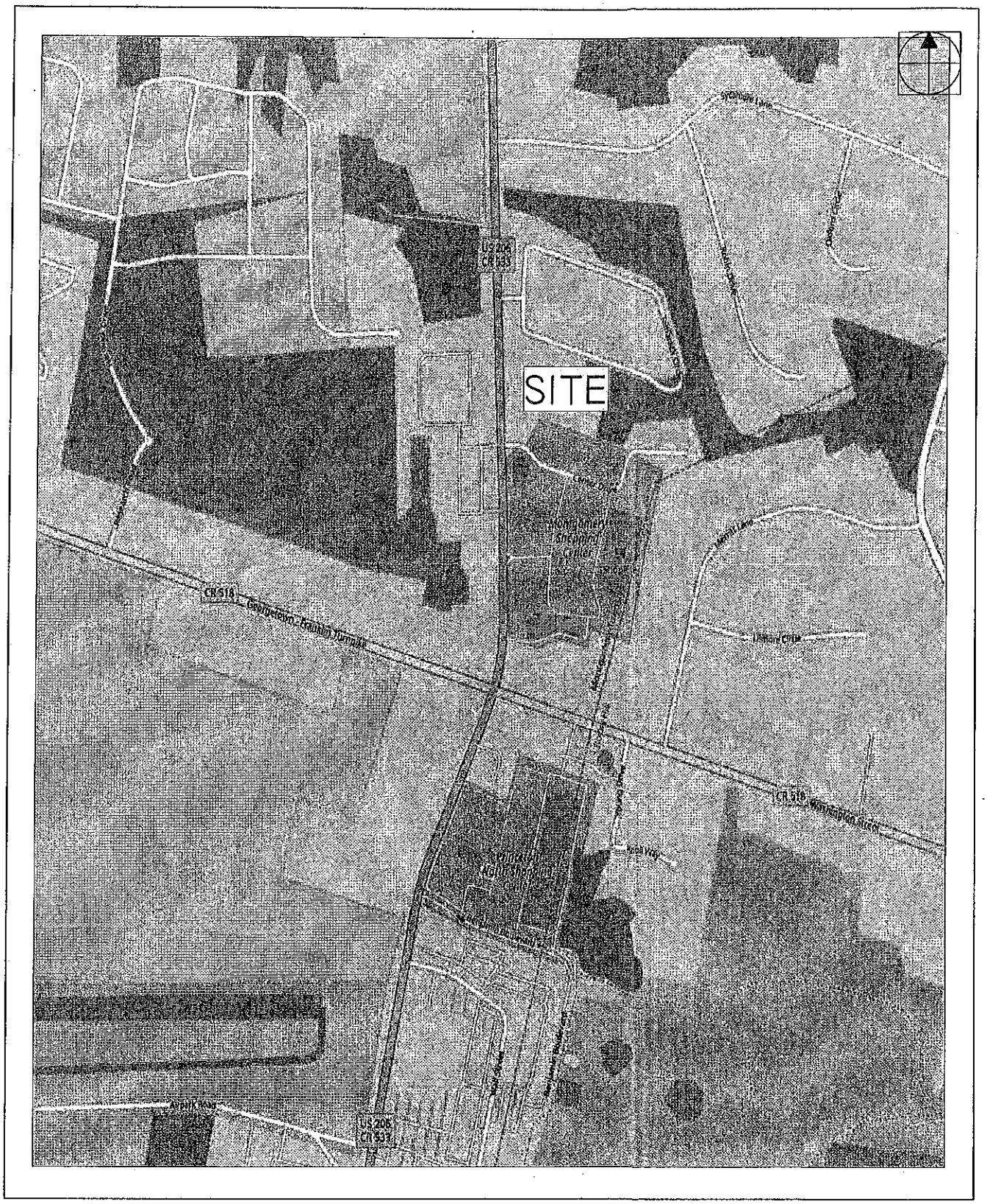
- Access will be provided via the existing STOP-controlled full-movement driveway along Route 206 northbound and an egress only interconnection to the Montgomery Center Shopping Plaza.

- The proposed parking lot will provide regular 9-foot wide by 18-foot deep parking spaces served by minimum 24-foot wide two-way access aisles, consistent with RSIS design standards. Complete two-way flow will be provided throughout the main parking fields and will afford convenient circulation through the site for all vehicle types.

- Based upon the Residential Site Improvement Standards (RSIS), 225 parking spaces are required for the proposed residential development. The plan proposes 227 parking spaces which will easily accommodate the anticipated demand and exceeds the required supply.

From the review, it is concluded that the access design will continue to provide and efficient ingress for the proposed apartments allowing access for all vehicle type anticipated at the site on a regular basis, including resident vehicle, service/delivery trucks and emergency apparatus.

TECHNICAL APPENDIX



PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 1

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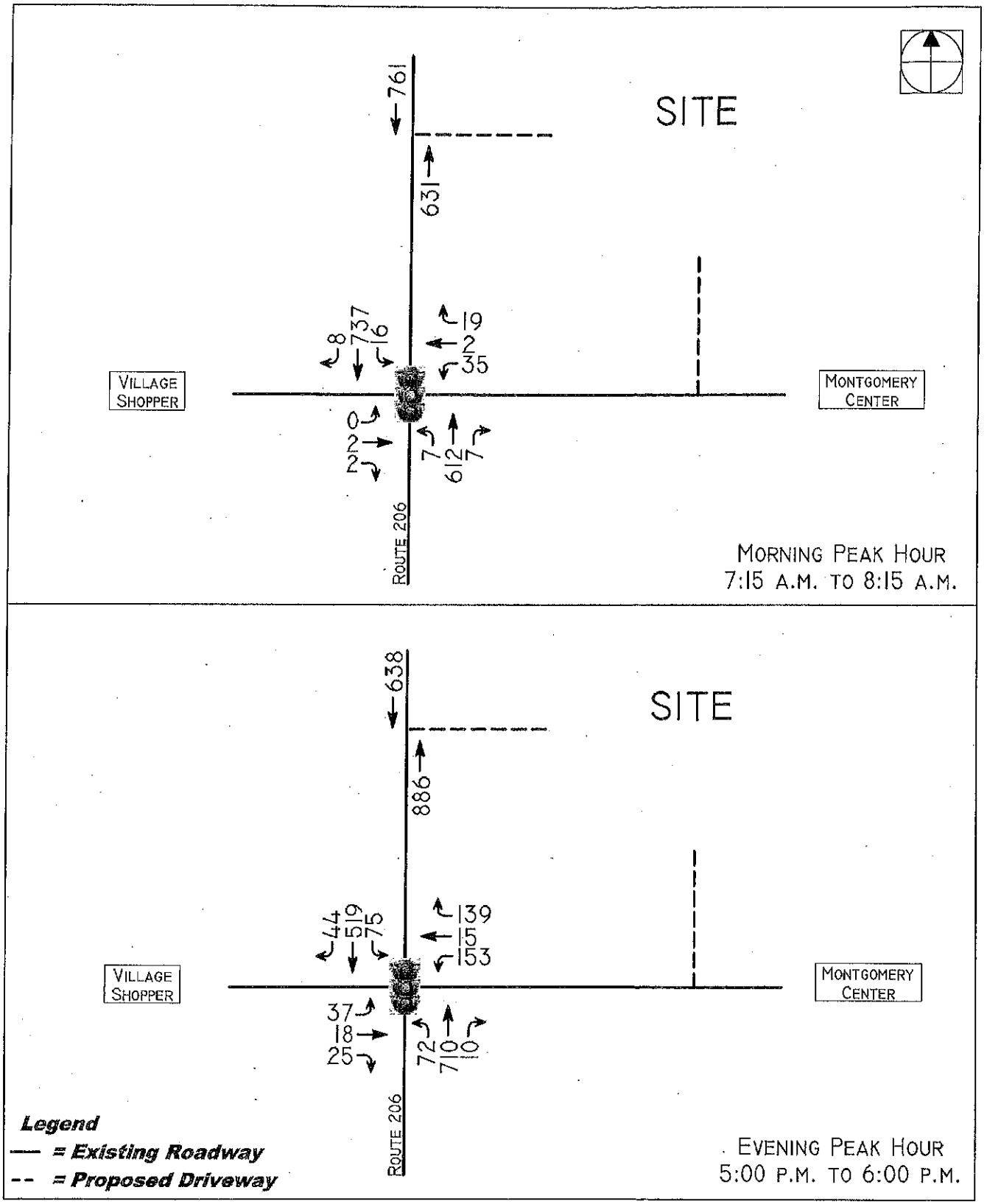
SITE LOCATION MAP

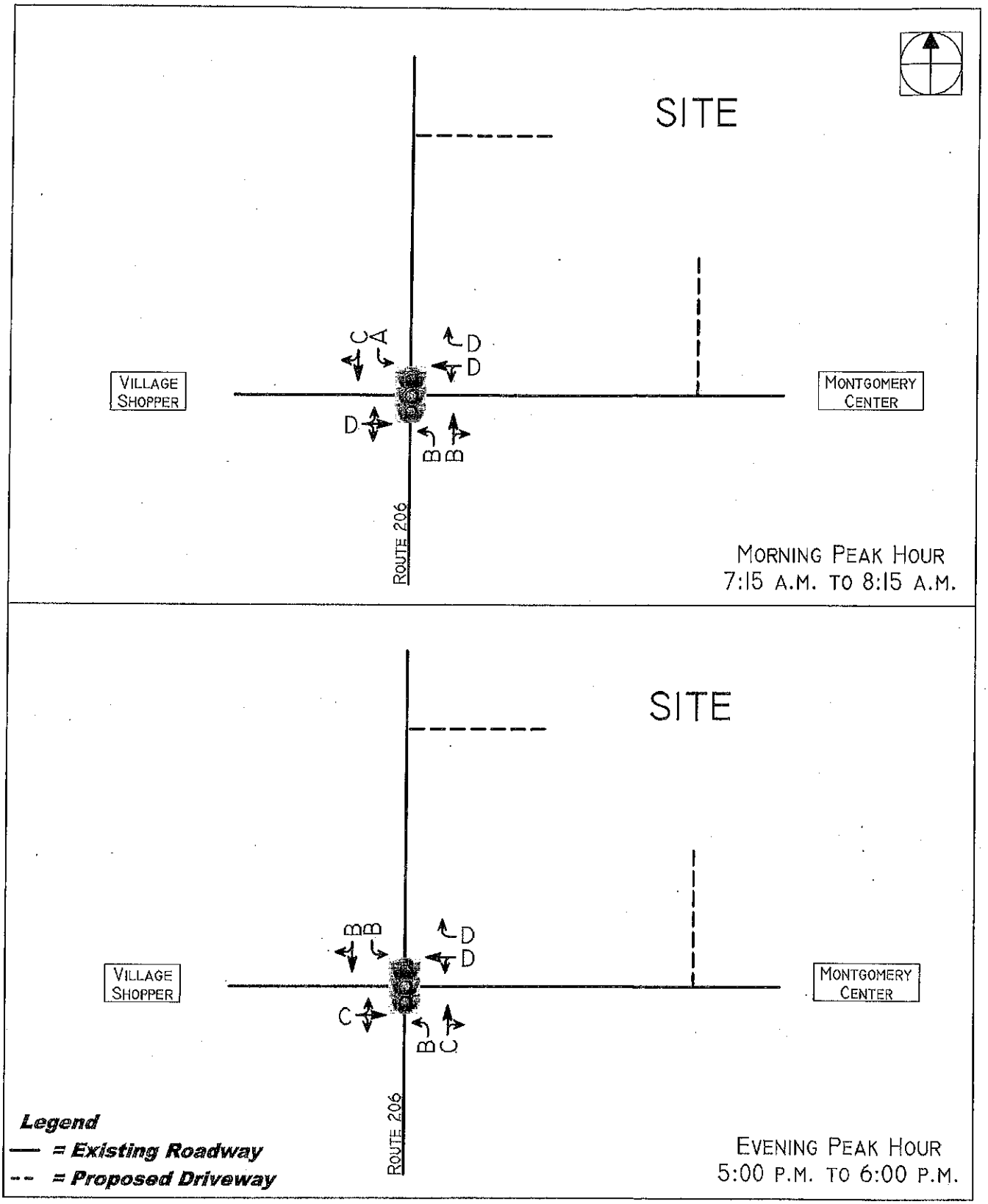


PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 2

DOLAN&DEAN
CONSULTING ENGINEERS, LLC

EXISTING TRAFFIC VOLUMES

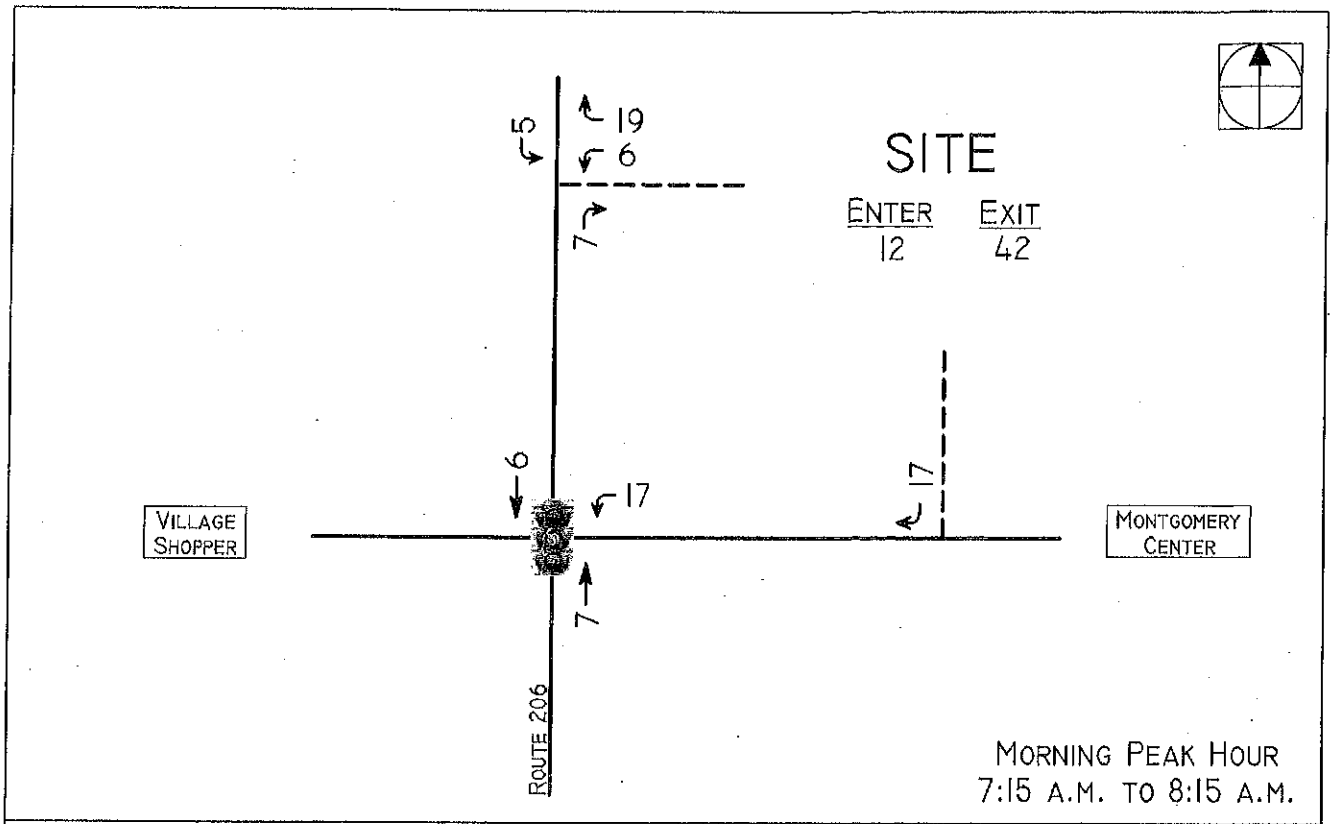


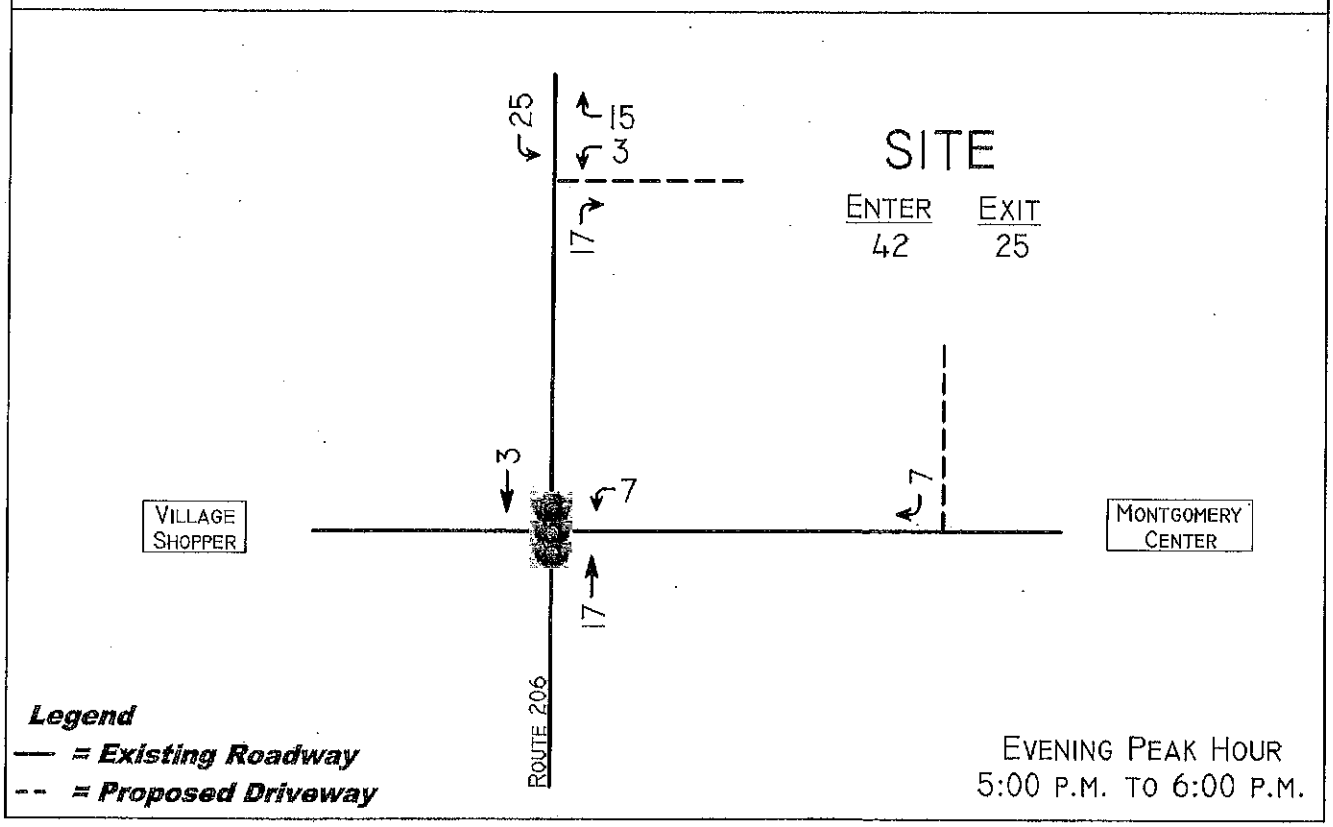
PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 3

DOLAN&DEAN
CONSULTING ENGINEERS, LLC

EXISTING LEVELS OF SERVICE



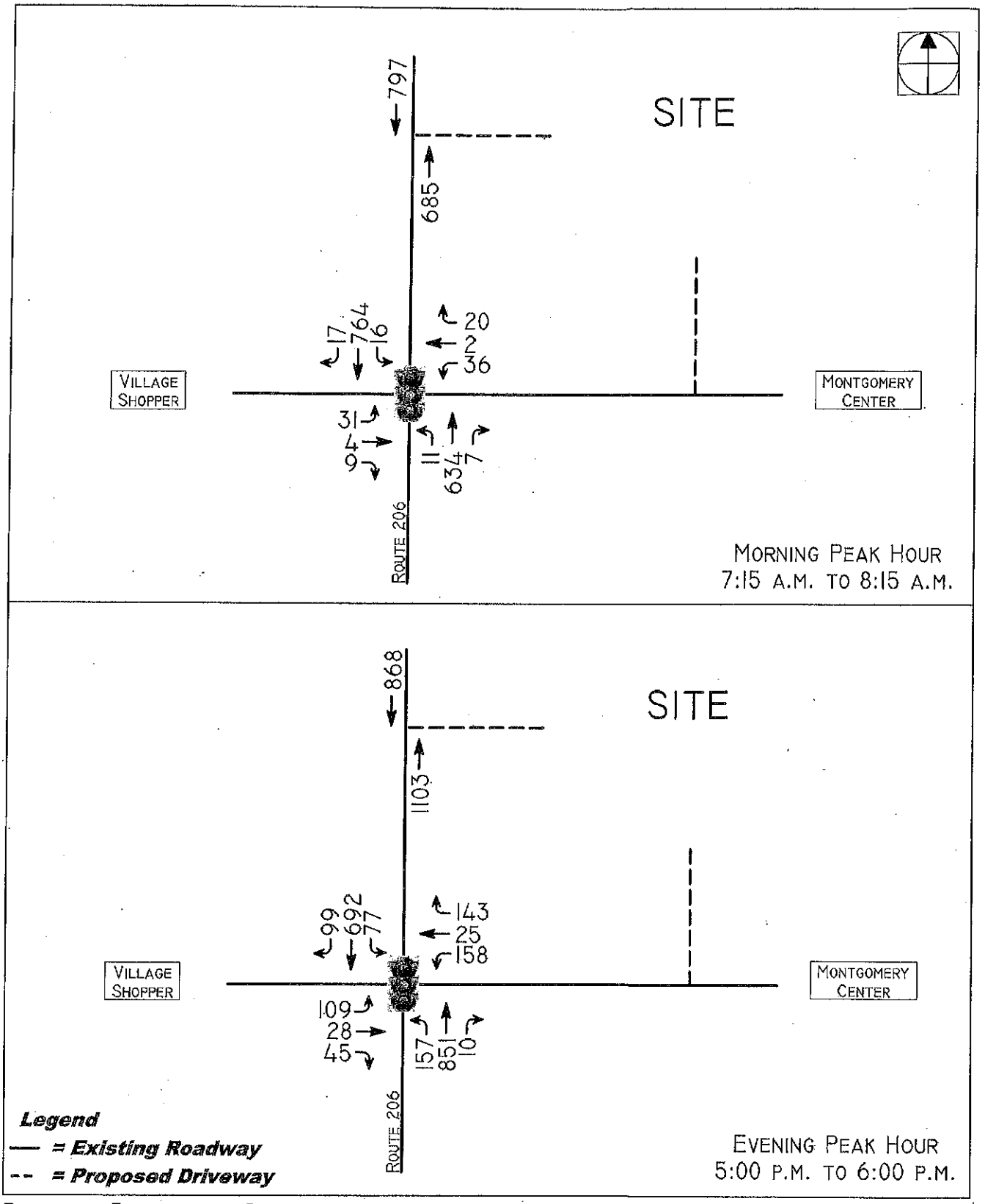


PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 4

DOLAN&DEAN CONSULTING ENGINEERS, LLC

SITE GENERATED TRAFFIC VOLUMES

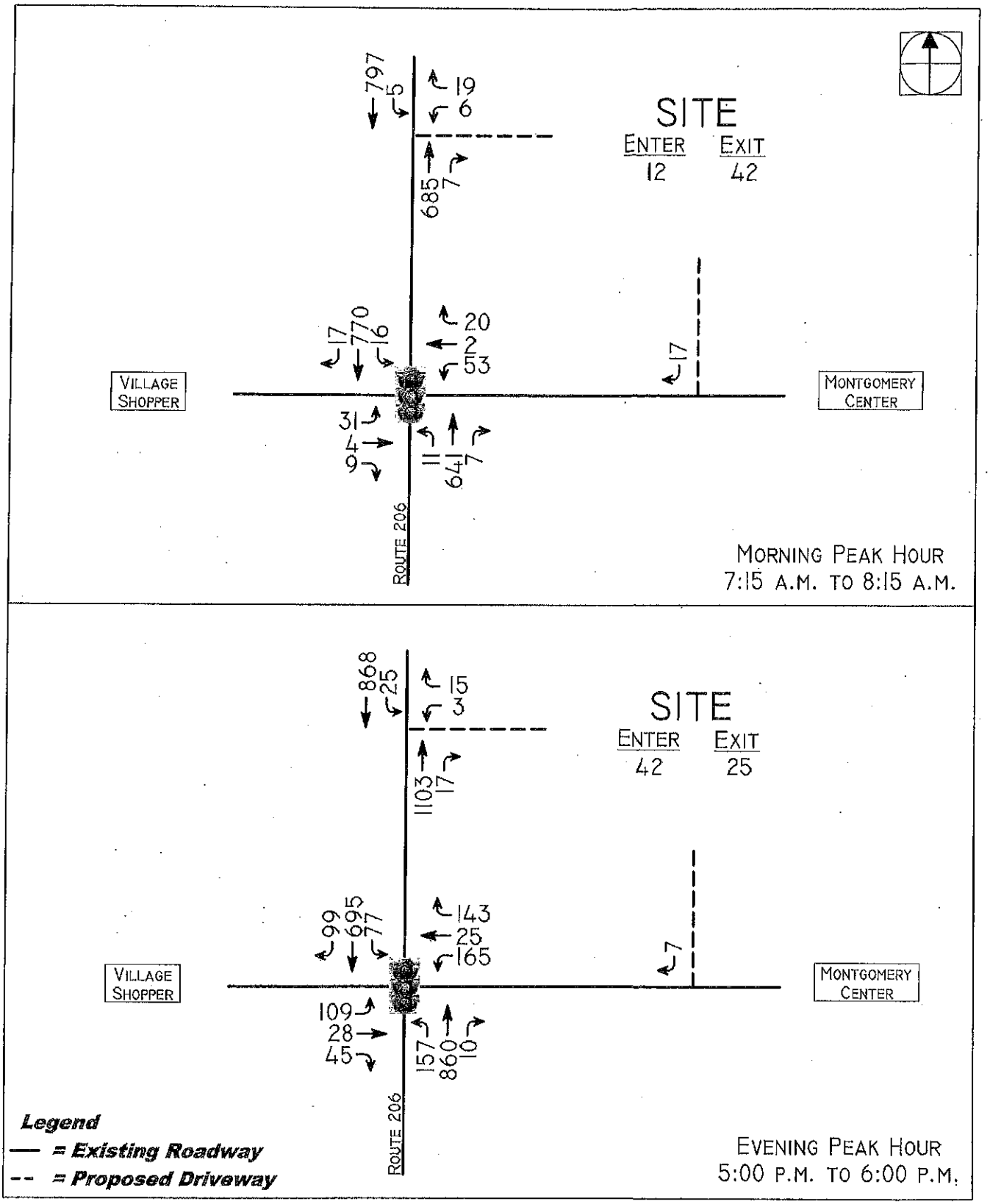


PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 5

DOLAN&DEAN CONSULTING ENGINEERS, LLC

NO-BUILD TRAFFIC VOLUMES

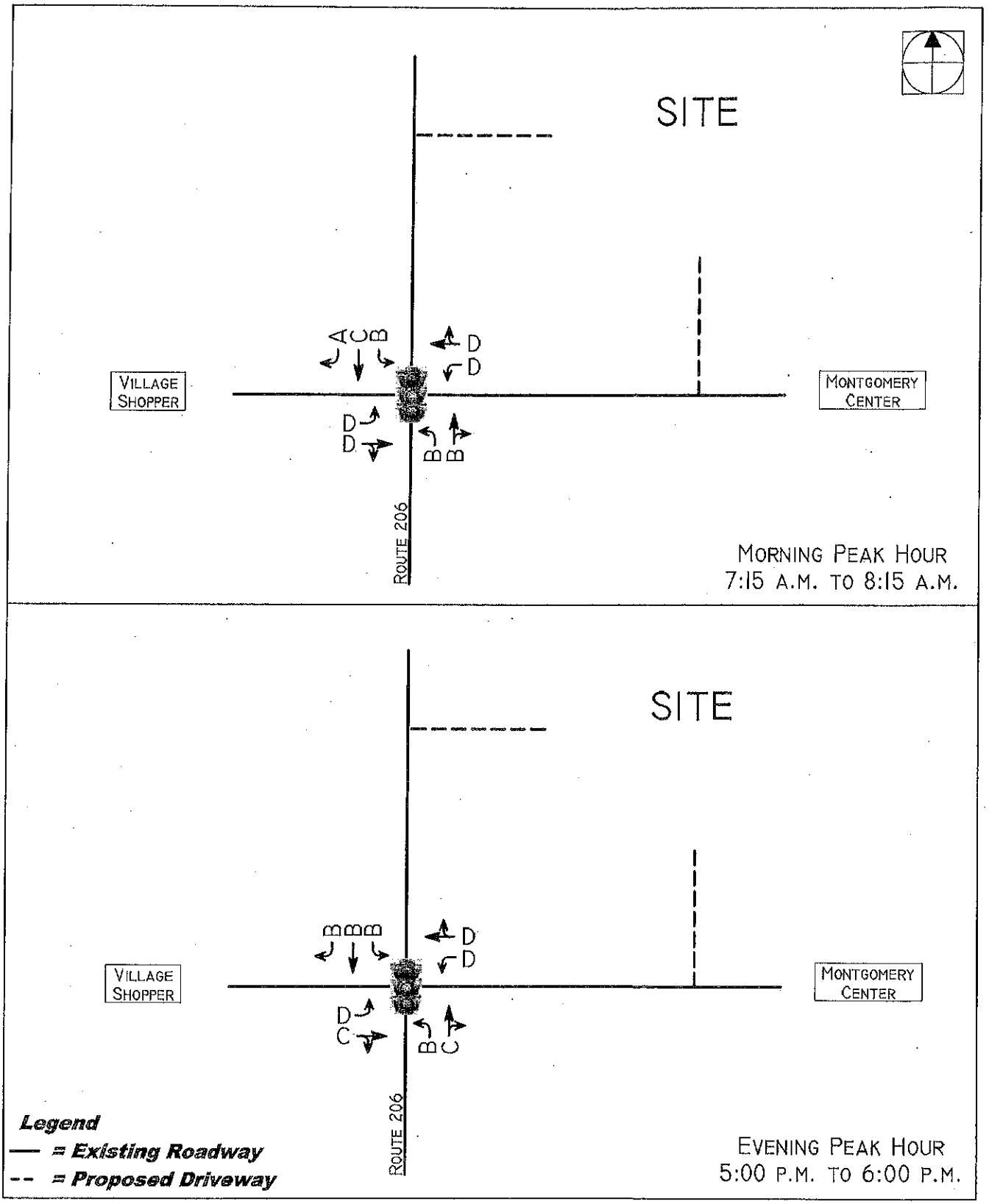


PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 6

DOLAN&DEAN CONSULTING ENGINEERS, LLC

BUILD TRAFFIC VOLUMES

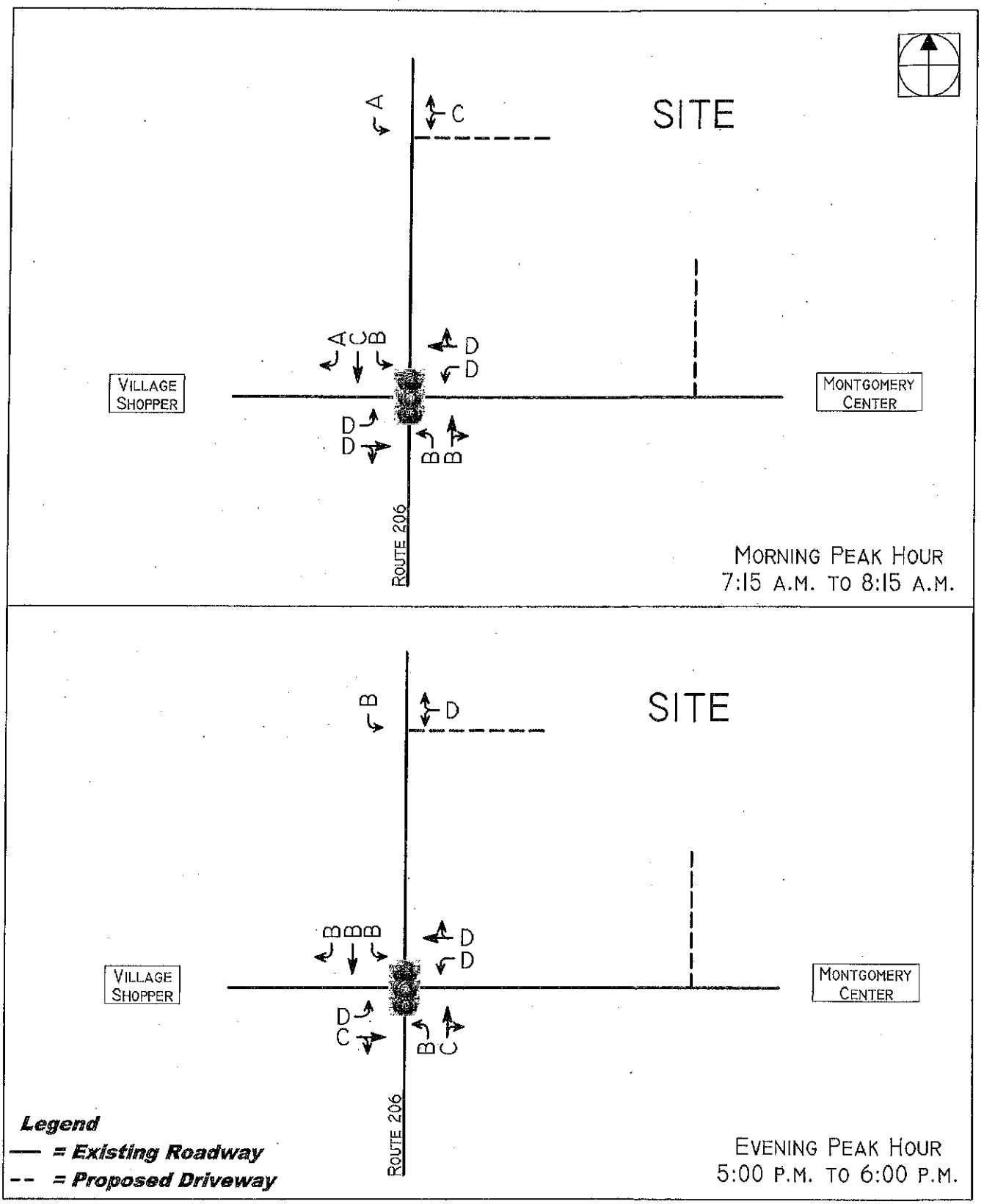


PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

FIGURE 7

DOLAN&DEAN CONSULTING ENGINEERS, LLC

NO-BUILD LEVELS OF SERVICE



PROPOSED RESIDENTIAL DEVELOPMENT
MONTGOMERY TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

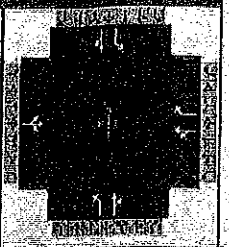
FIGURE 8

DOLAN&DEAN
CONSULTING ENGINEERS, LLC

BUILD LEVELS OF SERVICE

HCS7 Signalized Intersection Results Summary

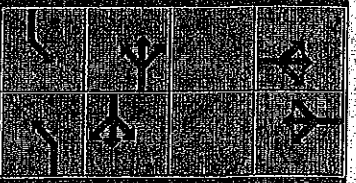
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	8/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Rt. 206 & Driveway for...	File Name	Retail Driveway & Rt 206 Am Existing.xus		
Project Description	Am Existing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (V), veh/h	0	2	2	35	2	19	7	612	7	16	737	8

Signal Information			
Cycle, s	135.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB		WB		NB	
Green	9.0	87.0	24.0	0.0	0.0	0.0
Yellow	3.0	5.0	3.0	0.0	0.0	0.0
Red	0.0	2.0	2.0	0.0	0.0	0.0



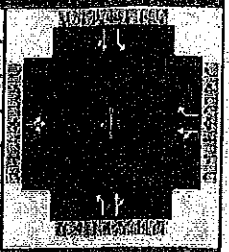
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		7.0	1.1	4.0	1.1	4.0
Phase Duration, s		29.0		29.0	12.0	94.0	12.0	94.0
Change Period, (Y+Rc), s		5.0		5.0	3.0	7.0	3.0	7.0
Max Allow Headway (MAH), s		3.2		3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (gs), s		2.3		5.6	2.2		2.4	
Green Extension Time (ge), s		0.1		0.1	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		0			40	21	8	673		17	810	
Adjusted Saturation Flow Rate (s), veh/h/ln		0			1320	1472	1554	1733		1654	1734	
Queue Service Time (gs), s		0.0			3.3	1.6	0.2	30.4		0.4	42.1	
Cycle Queue Clearance Time (gc), s		0.0			3.6	1.6	0.2	30.4		0.4	42.1	
Green Ratio (g/C)					0.18	0.18	0.71	0.64		0.71	0.64	
Capacity (c), veh/h					267	262	362	1117		451	1117	
Volume-to-Capacity Ratio (X)		0.000			0.140	0.079	0.021	0.602		0.039	0.725	
Back of Queue (Q), ft/ln (50 th percentile)		0.			31.4	18.9	1.9	325.8		3.7	456.8	
Back of Queue (Q), veh/ln (50 th percentile)		0.0			1.2	0.6	0.1	12.0		0.1	16.8	
Queue Storage Ratio (RQ) (50 th percentile)		0.00			0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d1), s/veh					47.2	46.3	12.9	13.9		9.7	16.0	
Incremental Delay (d2), s/veh		0.0			0.1	0.0	0.0	2.4		0.0	4.1	
Initial Queue Delay (d3), s/veh		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh					47.3	46.3	13.0	16.4		9.7	20.1	
Level of Service (LOS)					D	D	B	B		A	C	
Approach Delay, s/veh / LOS	45.8	D		46.9	D		16.3	B		19.9	B	
Intersection Delay, s/veh / LOS	19.5						B					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	8/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.97
Urban Street		Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Rt. 206 & Driveway for...	File Name	Retail Driveway & Rt 206 Pm Existing.xus		
Project Description	Pm Existing				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	37	18	25	153	15	139	72	710	10	75	619	44

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	63.0	25.0	0.0	0.0	0.0						
Yellow	3.0	5.0	3.0	0.0	0.0	0.0						
Red	0.0	2.0	2.0	0.0	0.0	0.0						

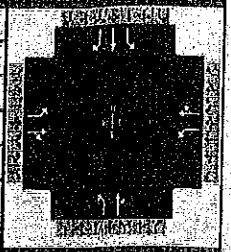
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		7.0	11	4.0	11	4.0
Phase Duration, s		30.0		30.0	10.0	70.0	10.0	70.0
Change Period ($Y+R_c$), s		5.0		5.0	3.0	7.0	3.0	7.0
Max Allow Headway (MAH), s		3.2		3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		6.3		14.0	3.7		3.8	
Green Extension Time (g_e), s		0.7		0.6	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.01	0.81		0.91	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		82			173	143	74	742		77	580	
Adjusted Saturation Flow Rate (s), veh/h/ln		1593			1895	1585	1781	1866		1761	1844	
Queue Service Time (g_s), s		0.0			7.7	8.4	1.7	31.1		1.8	21.6	
Cycle Queue Clearance Time (g_c), s		4.3			12.0	8.4	1.7	31.1		1.8	21.6	
Green Ratio (g/C)		0.23			0.23	0.23	0.64	0.57		0.64	0.57	
Capacity (c), veh/h		410			380	360	476	1069		374	1056	
Volume-to-Capacity Ratio (X)		0.201			0.456	0.398	0.155	0.695		0.207	0.549	
Back of Queue (Q), ft/ln (50 th percentile)		45.4			103.6	82.7	15.8	339.2		16.5	229.1	
Back of Queue (Q), veh/ln (50 th percentile)		1.8			4.1	3.3	0.6	13.4		0.7	9.0	
Queue Storage Ratio (RQ) (50 th percentile)		0.00			0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		34.5			37.5	36.1	10.4	16.7		13.2	14.7	
Incremental Delay (d_2), s/veh		0.1			0.3	0.3	0.1	3.7		0.1	2.1	
Initial Queue Delay (d_3), s/veh		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh		34.6			37.8	36.4	10.4	20.4		13.3	16.7	
Level of Service (LOS)		C			D	D	B	C		B	B	
Approach Delay, s/veh / LOS	34.6	C		37.2	D		19.5	B		16.3	B	
Intersection Delay, s/veh / LOS		22.0						C				

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS7 Signalized Intersection Results Summary

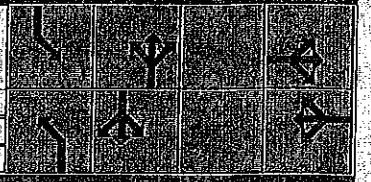
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	8/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Rt. 206 & Driveway for...	File Name	Retail Driveway & Rt 206 Am NoBuild.xus		
Project Description	Am NoBuild				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v_i), veh/h	81	4	9	36	2	20	11	634	7	16	764	17

Signal Information			
Cycle, s	135.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	87.0	24.0	0.0	0.0	0.0
Yellow	3.0	5.0	3.0	0.0	0.0	0.0
Red	0.0	2.0	2.0	0.0	0.0	0.0



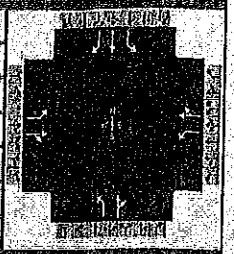
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		6.0		6.0	1.1	4.0	1.1	3.0
Phase Duration, s		29.0		29.0	12.0	94.0	12.0	94.0
Change Period, ($Y+R_c$), s		5.0		5.0	3.0	7.0	3.0	7.0
Max Allow Headway (MAH), s		3.2		3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		6.6		6.2	2.3		2.4	
Green Extension Time (g_e), s		0.2		0.2	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	34	14		39	24		12	697		17	830	18
Adjusted Saturation Flow Rate (s), veh/h/ln	1409	1546		1422	1493		1654	1734		1654	1737	1610
Queue Service Time (g_s), s	2.8	1.0		3.2	1.8		0.3	32.3		0.4	44.0	0.6
Cycle Queue Clearance Time (g_c), s	4.6	1.0		4.2	1.8		0.3	32.3		0.4	44.0	0.6
Green Ratio (g/C)	0.18	0.18		0.18	0.18		0.71	0.64		0.71	0.64	0.64
Capacity (c), veh/h	285	275		295	265		350	1117		435	1119	1038
Volume-to-Capacity Ratio (X)	0.118	0.051		0.133	0.090		0.034	0.624		0.040	0.742	0.018
Back of Queue (Q), ft/ln (50 th percentile)	24.5	10.8		28.3	18.4		3.2	345.9		3.7	480	5
Back of Queue (Q), veh/ln (50 th percentile)	1.0	0.4		1.1	0.7		0.1	12.7		0.1	17.6	0.2
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	48.3	46.1		47.8	46.4		13.7	14.3		10.2	16.4	8.6
Incremental Delay (d_2), s/veh	0.1	0.0		0.1	0.1		0.0	2.6		0.0	4.5	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (d), s/veh	48.4	46.1		47.9	46.4		13.7	16.9		10.2	20.8	8.7
Level of Service (LOS)	D	D		D	D		B	B		B	C	A
Approach Delay, s/veh / LOS	47.7	D		47.3	D		16.8	B		20.3	C	
Intersection Delay, s/veh / LOS	20.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS7 Signalized Intersection Results Summary

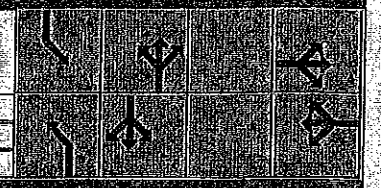
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	8/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.97
Urban Street		Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Rt. 206 & Driveway for...	File Name	Retail Driveway & Rt 206 Pm NoBuild.xus		
Project Description	Pm NoBuild				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	109	28	45	158	25	143	157	851	10	77	692	99

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	63.0	25.0	0.0	0.0	0.0	
Yellow	3.0	5.0	3.0	0.0	0.0	0.0	
Red	0.0	2.0	2.0	0.0	0.0	0.0	



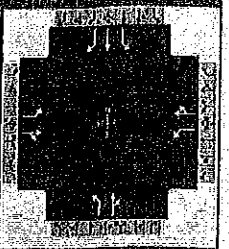
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		6.0		6.0	1.1	4.0	1.1	3.0
Phase Duration, s		30.0		30.0	10.0	70.0	10.0	70.0
Change Period, ($Y+R_c$), s		5.0		5.0	3.0	7.0	3.0	7.0
Max Allow Headway (MAH), s		3.3		3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		21.7		18.2	6.0		3.9	
Green Extension Time (g_e), s		0.5		0.7	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		1.00		0.15	1.00		0.98	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	112	75		163	173		162	888		79	713	102
Adjusted Saturation Flow Rate (s), veh/h/ln	1231	1684		1345	1622		1781	1866		1781	1870	1610
Queue Service Time (g_s), s	9.6	4.0		12.3	10.2		4.0	42.6		1.9	29.0	3.2
Cycle Queue Clearance Time (g_c), s	19.7	4.0		16.2	10.2		4.0	42.6		1.9	29.0	3.2
Green Ratio (g/C)	0.23	0.23		0.23	0.23		0.64	0.57		0.64	0.57	0.57
Capacity (c), veh/h	231	383		323	369		393	1069		288	1071	922
Volume-to-Capacity Ratio (X)	0.485	0.197		0.505	0.470		0.412	0.830		0.280	0.666	0.111
Back of Queue (Q), ft/ln (50 th percentile)	73	41.2		101.2	101.8		36.6	483.7		21.8	315.7	28.6
Back of Queue (Q), veh/ln (50 th percentile)	2.9	1.6		4.0	4.0		1.4	19.0		0.9	12.4	1.1
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	45.3	34.4		40.9	36.8		13.6	19.1		18.0	16.2	10.7
Incremental Delay (d_2), s/veh	0.6	0.1		0.5	0.3		0.3	7.5		0.2	3.3	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (d), s/veh	45.9	34.5		41.5	37.1		13.8	26.7		18.2	19.5	11.0
Level of Service (LOS)	D	C		D	D		B	C		B	B	B
Approach Delay, s/veh / LOS	41.3	D		39.2	D		24.7	C		18.4	B	
Intersection Delay, s/veh / LOS	25.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS7 Signalized Intersection Results Summary

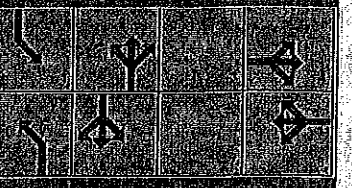
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	8/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Rt. 206 & Driveway for...	File Name	Retail Driveway & Rt 206 Am Build.xus		
Project Description	Am Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	31	4	9	53	2	20	11	641	7	16	770	17

Signal Information			
Cycle, s	135.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	87.0	24.0	0.0	0.0	0.0
Yellow	3.0	5.0	3.0	0.0	0.0	0.0
Red	0.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		6.0		6.0	1.1	4.0	1.1	3.0
Phase Duration, s		29.0		29.0	12.0	94.0	12.0	94.0
Change Period, ($Y+R_c$), s		5.0		5.0	3.0	7.0	3.0	7.0
Max Allow Headway (MAH), s		3.1		3.1	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		6.6		7.8	2.3		2.4	
Green Extension Time (g_e), s		0.2		0.2	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	34	14		58	24		12	704		17	837	18
Adjusted Saturation Flow Rate (s), veh/h/ln	1409	1545		1422	1493		1654	1734		1654	1737	1610
Queue Service Time (g_s), s	2.8	1.0		4.7	1.8		0.3	32.8		0.4	44.6	0.6
Cycle Queue Clearance Time (g_c), s	4.6	1.0		5.8	1.8		0.3	32.8		0.4	44.6	0.6
Green Ratio (g/C)	0.18	0.18		0.18	0.18		0.71	0.64		0.71	0.64	0.64
Capacity (c_m), veh/h	255	275		295	265		846	1117		430	1119	1038
Volume-to-Capacity Ratio (X)	0.118	0.051		0.195	0.090		0.035	0.630		0.040	0.748	0.018
Back of Queue (Q), ft/ln (50 th percentile)	24.5	10.8		42.3	18.4		3.3	362.2		3.7	487.7	5
Back of Queue (Q), veh/ln (50 th percentile)	1.0	0.4		1.7	0.7		0.1	13.0		0.1	17.9	0.2
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	48.3	46.1		48.4	46.4		13.9	14.4		10.3	16.5	8.6
Incremental Delay (d_2), s/veh	0.1	0.0		0.1	0.1		0.0	2.7		0.0	4.6	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (d), s/veh	48.4	46.1		48.6	46.4		13.9	17.1		10.3	21.0	8.7
Level of Service (LOS)	D	D		D	D		B	B		B	C	A
Approach Delay, s/veh / LOS	47.7	D		47.9	D		17.0	B		20.6	C	
Intersection Delay, s/veh / LOS	21.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS7 Two-Way Stop-Control Report

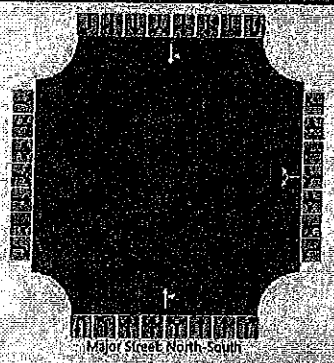
General Information

Analyst	EIC
Agency/Co.	DD
Date Performed	8/8/2019
Analysis Year	2019
Time Analyzed	Am Build
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Site Driveway & Rt. 206
Jurisdiction	
East/West Street	Site Driveway
North/South Street	Route 206
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						6		19			685	7		5	797	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized																
Median Type | Storage					Undivided											

Critical and Follow-up Headways

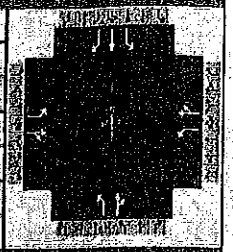
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							27							5		
Capacity, c (veh/h)							249							853		
v/c Ratio							0.11							0.01		
95% Queue Length, Q_{95} (veh)							0.4							0.0		
Control Delay (s/veh)							21.3							9.2		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)					21.3								0.2			
Approach LOS					C											

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	8/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.97
Urban Street		Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Rt. 206 & Driveway for...	File Name	Retail Driveway & Rt 206 Pm Build.xus		
Project Description	Pm Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	109	28	45	165	25	143	157	860	10	77	695	99

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB			WB			NB			SB		
Green		7.0	63.0	25.0	0.0	0.0	0.0					
Yellow		3.0	5.0	3.0	0.0	0.0	0.0					
Red		0.0	2.0	2.0	0.0	0.0	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		6.0		6.0	1.1	4.0	1.1	3.0
Phase Duration, s		30.0		30.0	10.0	70.0	10.0	70.0
Change Period, ($Y+R_c$), s		5.0		5.0	3.0	7.0	3.0	7.0
Max Allow Headway (MAH), s		3.3		3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		21.7		18.9	6.0		3.9	
Green Extension Time (g_e), s		0.5		0.7	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		1.00		0.22	1.00		0.98	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	112	75		170	173		162	897		79	716	102
Adjusted Saturation Flow Rate (s), veh/h/ln	1231	1684		1345	1622		1781	1866		1781	1870	1610
Queue Service Time (g_s), s	9.6	4.0		12.9	10.2		4.0	43.5		1.9	29.2	3.2
Cycle Queue Clearance Time (g_c), s	19.7	4.0		16.9	10.2		4.0	43.5		1.9	29.2	3.2
Green Ratio (g/C)	0.23	0.23		0.23	0.23		0.64	0.57		0.64	0.57	0.57
Capacity (c), veh/h	231	383		323	369		391	1069		276	1071	922
Volume-to-Capacity Ratio (X)	0.485	0.197		0.527	0.470		0.414	0.839		0.286	0.669	0.111
Back of Queue (Q), ft/ln (50 th percentile)	76	41.2		106.9	101.8		36.6	495.7		22.4	318.3	28.6
Back of Queue (Q), veh/ln (50 th percentile)	2.9	1.6		4.3	4.0		1.4	19.6		0.9	12.5	1.1
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	45.3	34.4		41.2	36.8		13.7	19.3		18.4	16.3	10.7
Incremental Delay (d_2), s/veh	0.6	0.1		0.8	0.3		0.3	7.9		0.2	3.3	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (d), s/veh	45.9	34.5		42.0	37.1		13.9	27.2		18.6	19.6	11.0
Level of Service (LOS)	D	C		D	D		B	C		B	B	B
Approach Delay, s/veh / LOS	41.3	D		39.5	D		25.2	C		18.5	B	
Intersection Delay, s/veh / LOS	26.0						C					

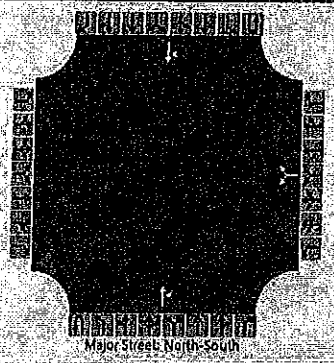
Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS7 Two-Way Stop-Control Report

General Information

Analyst	EIC	Intersection	Site Driveway & Rt. 206
Agency/Co.	DD	Jurisdiction	
Date Performed	8/8/2019	East/West Street	Site Driveway
Analysis Year	2019	North/South Street	Route 206
Time Analyzed	Pm Build	Peak Hour Factor	0.97
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						9		15			1103	17		25	868	
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)						7.1		6.2						4.1		
Critical Headway (sec)						6.48		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.58		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							19							26		
Capacity, c (veh/h)							151							601		
v/c Ratio							0.12							0.04		
95% Queue Length, Q_{95} (veh)							0.4							0.1		
Control Delay (s/veh)							32.2							11.3		
Level of Service (LOS)							D							B		
Approach Delay (s/veh)					32.2								1.2			
Approach LOS					D											