

LOCATION OF DRIVE THROUGH FACILITES  
BOROUGH OF BERGENFIELD, NJ  
Community Housing & Planning Associates, Inc.



275 SOUTH WASHINGTON AVENUE  
BOROUGH OF BERGENFIELD, NJ  
Community Housing & Planning Associates, Inc.

# TRAFFIC IMPACT STUDY

*For*



**Triple J. Family. Inc. D/B/A Dunkin' Baskin Robbins  
Proposed Dunkin' Drive-Thru**

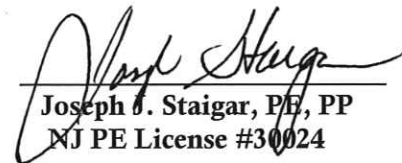
*Property Located at:*

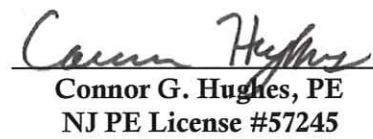
**275 South Washington Avenue (CR 39)  
Block 253 – Lot 17  
Borough of Bergenfield, Bergen County, NJ**

*Prepared by:*



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**4098-99-001TE**



## INTRODUCTION

It is proposed to construct a Dunkin' drive-thru lane on a parcel of land currently developed with a Dunkin' coffee shop, located at 275 South Washington Avenue (CR 39) in the Borough of Bergenfield, Bergen County, New Jersey (see Figure 1 in Appendix A). The site is designated as Block 253 – Lot 17 on the Borough of Bergenfield Tax Maps. The existing use consists of a 2,517 SF Dunkin' coffee shop. It is proposed to maintain the existing Dunkin' building and construct a drive-thru lane ("The Project"). The site is located within the B2 – Business and Professional District. Access to the site is currently provided via one (1) full movement driveway along South Washington Avenue and one (1) egress only driveway along Magnolia Street. It is proposed to re-construct the existing access points as well as construct one (1) ingress only driveway along South Washington Avenue which will serve the drive-thru lane. Parking will be provided via sixteen (16) on-site parking spaces.

Dynamic Traffic, LLC has been retained to prepare this study to assess the traffic impact associated with the construction of The Project on the adjacent roadway network. This study documents the methodology, analyses, findings and conclusions of our study and includes:

- A detailed field inspection was conducted to obtain an inventory of existing roadway geometry, traffic control, and location and geometry of existing driveways and intersections.
- Existing traffic data was collected via manual turning movement (MTM) counts during the weekday AM and PM peak periods at the intersections of South Washington Avenue with Magnolia Street and South Washington Avenue with the site driveway.
- Gap analyses were performed at the intersection of South Washington Avenue and Magnolia Street to evaluate the adequacy of gaps in the South Washington Avenue traffic stream to accommodate the left turns out of Magnolia Street.
- Projections of traffic to be generated by the proposed development were prepared utilizing trip generation data as published by the Institute of Transportation Engineers. Site traffic was then assigned to the adjacent street system based upon the anticipated directional distribution.
- Capacity analyses were conducted for the Existing, No Build, and Build conditions for the study intersections.
- The proposed points of ingress and egress were inspected for adequacy of geometric design, spacing and/or alignment to streets and driveways on the opposite side of the street, relationship to other driveways adjacent to the development, and conformance with accepted design standards.
- The site plan as designed was reviewed for sufficiency in accommodating large wheel base vehicles such as delivery trucks, refuse trucks, and emergency vehicles.
- The parking layout and supply was assessed based on accepted design standards, local requirements, and demand experienced at similar developments.



## EXISTING CONDITIONS

A review of the existing roadway conditions near the proposed site was conducted to provide the basis for assessing the traffic impact of the development. This included field investigations of the surrounding roadways and intersections, collection of traffic volume data, and extensive analyses.

### Existing Roadway Conditions

The following are descriptions of the roadways in the study area:

South Washington Avenue (CR 39) is an Urban Principal Arterial roadway under Bergen County jurisdiction with a general north/south orientation. In the vicinity of the site the posted speed limit is 30 MPH and the roadway provides one travel lane in each direction. Curb and sidewalk are provided along both sides of the roadway. South Washington Avenue provides straight horizontal alignment and a relatively flat vertical alignment. The land uses along South Washington Avenue in the vicinity of The Project are mixed residential and commercial.

Magnolia Street is a local roadway under the jurisdiction of the Borough of Bergenfield with a general east/west orientation. In the vicinity of the site the speed limit is unposted and the roadway provides one travel lane in each direction. Curb and sidewalk are provided along both sides of the roadway. Magnolia Street provides a straight horizontal alignment along the site frontage and a relatively flat vertical alignment. The land uses along Magnolia Street in the vicinity of The Project are primarily residential.

### Existing Traffic Volumes

Manual turning movement (MTM) counts were conducted on Thursday, June 16, 2022 from 7:00 – 9:00 AM and on Tuesday, August 16, 2022 from 4:30 – 6:30 PM at the intersections of South Washington Avenue with Magnolia Street and South Washington Avenue with the site driveway. Review of the collected traffic data reveals that the weekday morning peak street hour (PSH) occurs between 7:45 – 8:45 AM and the weekday evening PSH occurs between 5:15 – 6:15 PM. Figure 2, located in Appendix A, shows the existing peak hour traffic volumes at the study intersections. All traffic counts are contained in Appendix B.

### Existing Capacity Analysis

The methodology utilized in the capacity analyses is described in the *Highway Capacity Manual*, published by the Transportation Research Board. In general, the term Level of Service (LOS) is used to provide a “qualitative” evaluation of capacity based upon certain “quantitative” calculations related to empirical values, such as traffic volume and intersection control.

An unsignalized (STOP sign controlled) driveway or side street along a through route is seldom critical from an overall capacity standpoint, however, it may be of great significance to the capacity of the minor cross-route, and it may influence the quality of traffic flow on both. When analyzing an unsignalized intersection, it is assumed that both the major street through and right turn movements are unimpeded and have the right-of-way over all side street traffic and left turns from the major street. All other turning movements in the intersection cross, merge with, or are otherwise impeded by major street movements. Traffic delays at unsignalized intersections are determined by sequentially processing these impeded movements. Table I describes the Level of Service ranges for unsignalized (stop controlled) intersections.

**Table I**  
**Level of Service Criteria**  
**for Unsignalized Intersections**

Level of Service	Average Control Delay (seconds per vehicle)
A	0.0 to 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	greater than 50.0

It should be noted that the analyses within the *Highway Capacity Manual* assume a random arrival for all the movements, which may not be the case if an adjacent traffic signal is present that platoons vehicles.

All capacity analyses were performed utilizing Synchro 11 software. It should be noted that the existing percentage of trucks and peak hour factors were used in the existing analysis. Table II summarizes the existing Levels of Service (LOS) and delays. All capacity analysis calculation worksheets are contained in Appendix C.

**Table II**  
**Existing Levels of Service**

Intersection	Direction/ Movement		AM PSH	PM PSH
South Washington Avenue & Magnolia Street	WB	LR	C (20)	D (25)
	SB	LT	A (9)	A (10)
South Washington Avenue & Site Driveway	WB	LR	D (35)	D (28)
	SB	LT	A (9)	A (10)
Magnolia Street & Site Driveway	WB	LR	A (9)	A (9)

A (#) - Unsignalized Intersection Level of Service (seconds of delay per vehicle)

The following are discussions pertaining to each of the existing intersections analyzed.



#### **South Washington Avenue and Magnolia Street**

Magnolia Street intersects South Washington Avenue to form an unsignalized T-intersection with the Magnolia Street operating under stop control. The northbound approach of South Washington Avenue provides a shared through/right turn lane, while the southbound approach provides a shared left turn/through lane. The westbound approach of Magnolia Street provides a shared left turn/right turn lane.

A review of the existing analysis reveals that the individual intersection movements operate at Level of Service "D" or better during the analyzed peak period. See Table II for the individual movement Levels of Service and delays.

#### **South Washington Avenue and Site Driveway**

The site driveway intersects South Washington Avenue to form an unsignalized T-intersection with the site driveway operating under stop control. The northbound approach of South Washington Avenue provides a shared through/right turn lane, while the southbound approach provides a shared left turn/through lane. The westbound approach of the site driveway provides a shared left turn/right turn lane.

A review of the existing analysis reveals that the individual intersection movements operate at Level of Service "D" or better during the analyzed peak period. See Table II for the individual movement Levels of Service and delays.

#### **Magnolia Street and Site Driveway**

The site driveway intersects Magnolia Street to form an unsignalized T-intersection with the site driveway operating under stop control. The eastbound and westbound approaches of Magnolia Street each provide a dedicated through lane. The northbound approach of the site driveway provides a shared left turn/right turn lane.

A review of the existing analysis reveals that the individual intersection movements operate at Level of Service "A" during the analyzed peak period. See Table II for the individual movement Levels of Service and delays.



## FUTURE CONDITIONS

Traffic volumes and operational analyses were developed for both the Future No Build and Build conditions. The No Build conditions provide a baseline for assessing the impact of the site development traffic on the roadway system. The process of developing the No Build and Build traffic volumes and the subsequent analyses is outlined below.

Regardless of whether the subject site is developed or not, traffic volumes on the surrounding roadways are expected to increase as a result of developments throughout the region. A growth rate for roadways within the study area was obtained from the NJDOT Annual Background Growth Rate Table, which indicates a growth rate of 1.50% per year.

Through consultation with the Bergenfield Borough staff, there are no other developments in the vicinity of the site that have been approved but not yet constructed that are identified as significant traffic generators. It was assumed that the background growth rate was adequate to account for the traffic associated with all developments not listed.

Future No Build traffic volumes were developed by applying the background growth rate of 1.50% for two (2) years to the study area roadways existing traffic volumes. Figure 3, in Appendix A, shows the Future No Build traffic volumes.

### Traffic Generation

Trip generation projections for The Project were prepared utilizing trip generation research data as published under Land Use Code 937 – Coffee/Donut Shop with Drive Through Window in the Institute of Transportation Engineers' (ITE) publication, *Trip Generation, 11<sup>th</sup> Edition*. This publication sets forth trip generation rates based on empirical traffic count data conducted at numerous research sites.

According to studies conducted by ITE, traffic associated with LUC 937 is not 100% newly generated. Rather, a portion of the traffic is diverted from the existing traffic stream on the adjacent roadway network. This is because the Dunkin' is not exclusively a destination land use, instead patrons stop on their way to/from other locations such as home or work. ITE identifies a 63% passby traffic percentage, which is also accepted by NJDOT, and was used during the weekday morning peak hour. Table III below details the traffic volumes associated with the existing Dunkin' taking into account the passby credits. Therefore, of the trips generated by the site, the following breakdown of trips is made:

Table III  
Existing Trip Generation Considering Passby Traffic

Land Use	Trip Type	AM PSH			PM PSH		
		In	Out	Total	In	Out	Total
2,517 SF Dunkin' with Drive-Thru Lane	Total	80	80	160	23	23	46
	Passby	50	50	100	14	14	28
	New (Primary)	30	30	60	9	9	18

In this case, in terms of making projections of future traffic volumes, we have the benefit of an existing site that involves simply the inclusion of a drive-thru system. The main result of such a change to an existing Coffee/Donut Shop is the transfer of some existing customers who currently park and walk in to using the drive-thru system, thus reducing parking demand. There will be some component of new customers who will likely be attracted to the site given the convenience of using a drive-thru. Another purpose of implementing a drive-thru system to an existing restaurant is to ensure keeping their existing customer base and not losing them to a restaurant that has a drive-thru. The net result of the addition to the drive-thru will be a projected increase of trip generation of 15% to 20%. The conservative use of this increase is exemplified by the comparison of the ITE trip generation of a Coffee/Donut Shop without a Drive Through Window to a Coffee/Donut Shop with a Drive Through Window which shows no appreciable increase. Therefore, the following Table IV provides the future trip generation of the site and the differential increase in total trips based on a projected trip increase of 20%.

**Table IV**  
**Proposed Trip Generation Based on 20% Increase**

Land Use	AM PSH			PM PSH		
	In	Out	Total	In	Out	Total
Dunkin' with Drive-Thru (Proposed)	96	96	192	28	28	56

Of these additional trips, 63% will be pass-by trips and not new traffic to the surrounding roadway network. Therefore, of the maximum of sixteen (16) new customers to the proposed site during the AM peak hour, ten (10) will be pass-by and six (6) will be new or primary trips. In other words, the proposed site is projected to add only six (6) vehicles to the surrounding roadway network during the studied peak hours.

To be ultra-conservative and as a sensitivity analysis, the following Table V was prepared to indicate the trip generation of the proposed Coffee/Donut Shop with a Drive Through Window strictly using ITE trip generation rates.

**Table V**  
**Proposed Trip Generation Based on ITE Rates**

Land Use	AM PSH			PM PSH		
	In	Out	Total	In	Out	Total
Dunkin' with Drive-Thru (Proposed)	110	106	216	49	49	98

This projection is unrealistic because it does not take into consideration the local conditions of the trip generation characteristics of the existing use and represents an unrealistic increase of approximately 40% during the AM peak hour and 110% during the PM peak hour. As mentioned previously, it is made strictly for purposes of being ultra-conservative and as a sensitivity analysis.



### Trip Generation Comparison

As previously noted, the site is currently occupied by a Dunkin' coffee shop which has been counted to establish the existing trip generation. Tables VI and VII below provides a comparison between the total trips associated with the existing site and the total trips projected for the proposed site improvement based on the two (2) methods described above.

**Table VI**  
**Existing vs. Proposed Trip Generation Comparison Based on 20% Increase**

Land Use	AM PSH			PM PSH		
	In	Out	Total	In	Out	Total
Dunkin' Coffee Shop ( <i>Existing – As Counted</i> )	80	80	160	23	23	46
Dunkin' with Drive-Thru ( <i>Proposed</i> )	96	96	192	28	28	56
<b>Difference</b>	<b>+16</b>	<b>+16</b>	<b>+32</b>	<b>+5</b>	<b>+5</b>	<b>+10</b>

**Table VII**  
**Existing vs. Proposed Trip Generation Comparison based on ITE Rates**

Land Use	AM PSH			PM PSH		
	In	Out	Total	In	Out	Total
Dunkin' Coffee Shop ( <i>Existing – As Counted</i> )	80	80	160	23	23	46
Dunkin' with Drive-Thru ( <i>Proposed</i> )	110	106	216	49	49	98
<b>Difference</b>	<b>+30</b>	<b>+26</b>	<b>+56</b>	<b>+26</b>	<b>+26</b>	<b>+52</b>

As mentioned, Table V with the larger trip generation is used for further analysis to be ultra-conservative and as a sensitivity analysis. Once the magnitude of traffic to be generated by the site is known, it is necessary to assign that traffic to the adjacent street system. The distribution of new traffic to the surrounding roadways is based on the location of primary arterial roadways, major signalized intersections and existing traffic patterns. Located in Appendix A, Figures 4-8 illustrate the Primary Traffic Trip Distribution, Primary Site Generated Volumes, Passby Traffic Trip Distribution, Passby Site Generated Volumes, and the Total Site Generated Volumes, respectively. The Total Site Generated Volumes assigned to the study area network were added to the No Build traffic volumes to generate the Build traffic volumes, which are shown in Figure 9.

### Future Capacity Analysis

Operational conditions at the study intersections were analyzed under the No Build and Build conditions and are summarized in Table VIII below:



**Table VIII**  
**Future Levels of Service**

Intersection	Direction/ Movement		AM PSH		PM PSH	
			No Build	Build	No Build	Build
South Washington Avenue & Magnolia Street	WB	LR	C (21)	D (31)	D (26)	E (35)
	SB	LT	A (9)	A (9)	B (10)	A (10)
South Washington Avenue & Site Driveway	WB	LR	E (37)	D (27)	D (29)	D (33)
	SB	LT	A (9)	A (9)	B (10)	B (10)
Magnolia Street & Site Driveway	NB	LR	A (9)	A (9)	A (9)	A (9)
South Washington Avenue & Drive-Thru Entrance	SB	LT	-	A (9)	-	B (10)

A (#) - Unsignalized Intersection Level of Service (seconds of delay per vehicle)

#### South Washington Avenue and Magnolia Street

With the addition of site generated traffic, the individual intersection movements are anticipated to operate at Level of Service “E” or better during the analyzed peak hour. See Table VIII for the individual movement Levels of Service and delays.

#### South Washington Avenue and Site Driveway

With the addition of site generated traffic, the individual intersection movements are anticipated to continue operating at Level of Service “D” or better during the analyzed peak hour. See Table VIII for the individual movement Levels of Service and delays.

#### Magnolia Street and Site Driveway

With the addition of site generated traffic, the individual intersection movements are anticipated to continue operating at Level of Service “A” during the analyzed peak hour. See Table VIII for the individual movement Levels of Service and delays.

#### South Washington Avenue and Drive-Thru Entrance

The drive-thru entrance is proposed to intersect South Washington Avenue to form an unsignalized T-intersection with the drive-thru entrance operating as ingress only. The northbound approach of South Washington Avenue is proposed to provide a shared through/right turn lane, while the southbound approach is proposed to provide a shared left turn/through lane.

As designed, the individual intersection movements are anticipated to operate at Level of Service “B” or better during the studied peak hour. See Table VIII for the individual movement Levels of Service and delays.

#### Gap Analysis

A gap analysis was conducted for the intersection of South Washington Avenue and Magnolia Road to determine if there are sufficient gaps within the traffic stream to accommodate the proposed traffic volumes upon redevelopment of the subject property. The ITE publication *Transportation and Land Development, 2<sup>nd</sup> Edition* states:

*“A methodology to determine the level of traffic service provided at unsignalized intersections is available from the Transportation Research Board, or gap studies can be conducted in the vicinity of the site access points. These studies will determine if the number of acceptable gaps are sufficient to accommodate entering and exiting site traffic.”*

Gaps are created by the presence of traffic signals and other traffic conditions at upstream locations that cause vehicles to form into platoons and create breaks in traffic flow that can be utilized by vehicles to exit onto or off the roadway. These gaps will allow the driveways to operate more efficiently than projected by the capacity analyses.

A “Gap” is defined as *“the minimum time interval between vehicles in the major traffic stream that permits the side street vehicle at a STOP controlled intersection to enter the intersection under prevailing traffic and roadway conditions.”* For this analysis, the gap length was based on the criteria as indicated in the *Highway Capacity Manual* published by the Transportation Research Board, the gap length to complete a left-turn from a stop condition is 7.1 seconds with a follow-up time of 3.5 seconds for a left-turn if more than one vehicle is queued to turn.

Manual gap counts were conducted at the intersection of South Washington Avenue and Magnolia Street on Tuesday, August 16, 2022 between 7:00 – 9:00 AM and between 4:30 – 6:30 PM. The collected gap data was correlated to determine the number of gaps and vehicular gaps available in the traffic stream. It should be noted that the highest peak hour of the traffic was utilized to determine the hour of study for the gap analysis in order to provide the most conservative number of available gaps. A one-vehicle gap is a gap interval in the major road traffic stream permitting only one vehicle to complete a maneuver from a minor road or driveway, where a two-vehicle gap is of sufficient length to consecutively permit two vehicles to complete a maneuver from the minor road or driveway. It is assumed that a third vehicle would require the full one-vehicle gap time to determine if the roadway was still safe to enter. The following tables summarize the gap analysis for the Magnolia Street approach and the gap counts are contained in Appendix E.

**Table IX**  
**Number of Available Gaps in South Washington Avenue Combined Traffic Stream**  
**For Left Turn Out Movements**

Intersection	Gap Type	Peak Hour	
		AM	PM
South Washington Avenue & Magnolia Street	One-vehicle gaps	37	21
	Two-vehicle gaps	16	1
	Total vehicle gaps	69	23
	Gap demand	43	20

Based on the analysis of the collected gap data and the anticipated Build traffic volumes, there are enough gaps in the South Washington Avenue traffic stream spread throughout the peak hour to accommodate the left turns out of Magnolia Street and as such it will operate safely and efficiently with the addition of the site traffic. Important to note again is that the proposed gap demand shown in Table IX above is based on the more conservative ITE data.



## **SITE PLAN**

### **Site Access and Circulation**

The site plan was reviewed with respect to the site access and on-site circulation design. As noted previously, access to The Project will be provided via one (1) full movement driveway and one (1) ingress only driveway along South Washington Avenue as well as one (1) egress only driveway along Magnolia Street.

The parking lot will be serviced by parking aisles with a width of 10.5' for one-way circulation with access to parallel parking and 24' for two-way circulation with access to 90-degree parking, which are consistent with accepted engineering design standards. Review of the site plan design indicates that the site can sufficiently accommodate, within paved areas, the automobile traffic anticipated.

### **Drive-Thru**

The drive-thru will operate in a counterclockwise direction with the ability to stack eight (8) cars in the drive-thru lane with an additional capacity of five (5) cars in the mobile order lane. As shown in Table V, there is conservatively projected to be 110 entering vehicles during the AM peak hour. Through past experience and consultation with Dunkin' representatives, it is anticipated that 66% of the site traffic will utilize the drive-thru system, 30% of which will be mobile order customers. This equates to a total of 73 vehicles accessing the drive-thru system (66% x 110 cars), 22 of which will be mobile order customers (30% x 73 cars) thus the remaining 51 will be regular drive-thru customers.

Service times at the pick-up window average approximately 20 to 25 seconds. This equates to a capacity of 144 to 180 vehicles that could be processed in a single hour, whereas, the maximum number of vehicles anticipated to access the drive-thru system is 73. Additionally, a queuing analysis was performed which takes into account the hourly drive-thru demand, service time, available queue storage, among other factors. The queuing analysis resulted in a calculated 95<sup>th</sup> percentile queue length of four (4) vehicles which can be accommodated within the proposed drive-thru queue storage. The Queue Analysis calculations are contained in Appendix D.

As explained previously, the realistic projection of vehicles that will utilize the drive-thru system will be much less than that used for the queue analysis. Therefore, if the drive-thru system works for the ultra-conservative projections, it will work for the more realistic projections.

### **Parking**

The Borough of Bergenfield Ordinance sets forth a minimum parking requirement of 4 parking spaces per 1,000 SF for retail uses plus 1 parking space per three seats for restaurant uses. This equates to a parking requirement of 16 spaces for the proposed 2,517 SF Dunkin' with drive-thru inclusive of 16 seats. The site as proposed provides 16 parking spaces, inclusive of one handicap space, and as such the Ordinance requirement is satisfied.

It is proposed to provide parking stalls with dimensions of 9'x18' for 90-degree spaces and minimum dimensions of 8'x18' for parallel spaces, which do not meet the Ordinance minimum requirement of 9'x18'. However, it is important to note that the parallel spaces will be designated for employees, who will be very familiar with the site circulation patterns and maneuvers required to access the spaces. Therefore, the proposed dimensions will adequately accommodate the anticipated site traffic.



As previously indicated, 2/3 of the total site customer volume will use the drive-thru system and the remainder will utilize the parking. Thus, the reduction in parking demand of the site is reduced by the order of 2/3's.

## **FINDINGS & CONCLUSIONS**

### **Findings**

Based upon the detailed analyses as documented herein, the following findings are noted:

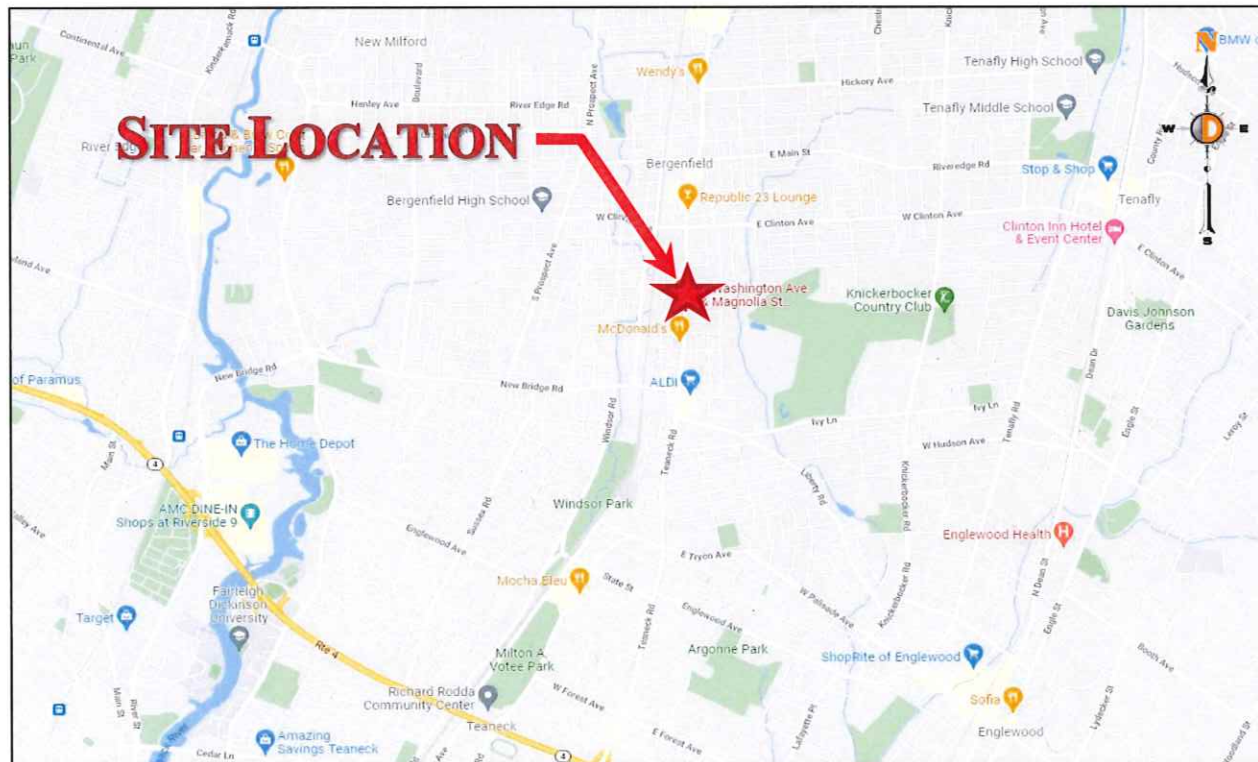
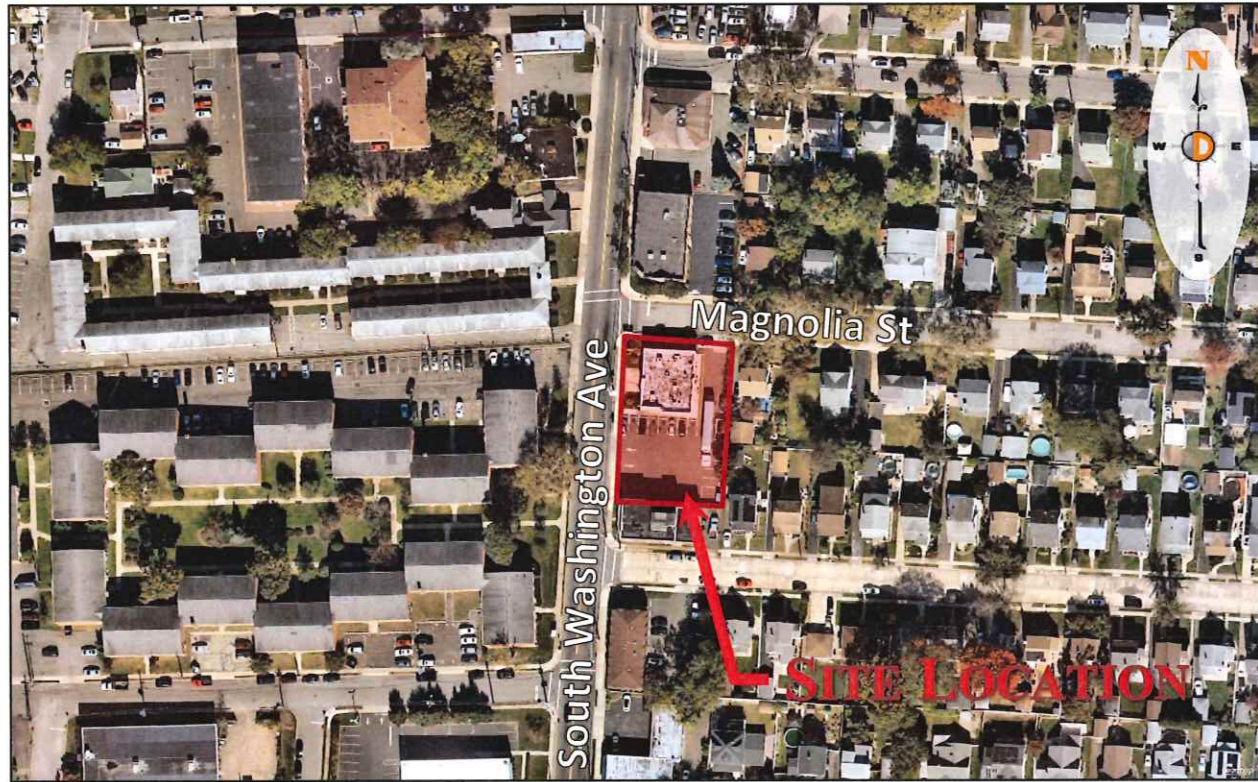
- The proposed 2,517 SF Dunkin' with drive thru is projected to realistically generate 6 entering trips and 6 exiting trips during the weekday morning peak hour and 2 entering trips and 2 exiting trips during the weekday evening peak hour that are "new" to the adjacent roadway network, resulting in what can be characterized as an insignificant increase in traffic.
- Access to the site is proposed to be provided via one (1) full movement driveway and one (1) ingress only driveway along South Washington Avenue as well as one (1) egress only driveway along Magnolia Street.
- With the addition of site generated traffic, based on ultra-conservative projections, the individual intersection movements of South Washington Avenue and Magnolia Street are anticipated to operate at Level of Service "E" or better during the analyzed peak hour.
- With the addition of site generated traffic, based on ultra-conservative projections, the individual intersection movements of South Washington Avenue and the site driveway are anticipated to continue operating at Level of Service "D" or better during the analyzed peak hour.
- With the addition of site generated traffic, the individual intersection movements of Magnolia Street and the site driveway are anticipated to continue operating at Level of Service "A" during the analyzed peak hour.
- As designed, the individual intersection movements of Magnolia Street and the drive-thru entrance are anticipated to operate at Level of Service "B" or better during the studied peak hour.
- As proposed, The Project's site driveways and internal circulation have been designed to provide for safe and efficient movement of automobiles.
- The proposed parking supply and design is sufficient to support the projected demand and satisfies the Ordinance requirements.

### **Conclusions**

Based upon our Traffic Impact Study as detailed in the body of this report, it is the professional opinion of Dynamic Traffic, LLC that the adjacent street system of the Borough of Bergenfield and Bergen County will not experience any significant degradation in operating conditions with the construction of The Project. The site driveways are located to provide safe and efficient access to the adjacent roadway system. The site plan as proposed provides for good circulation throughout the site and provides adequate parking to accommodate The Project's needs.

**Appendix A**  
**Traffic Volume Figures**

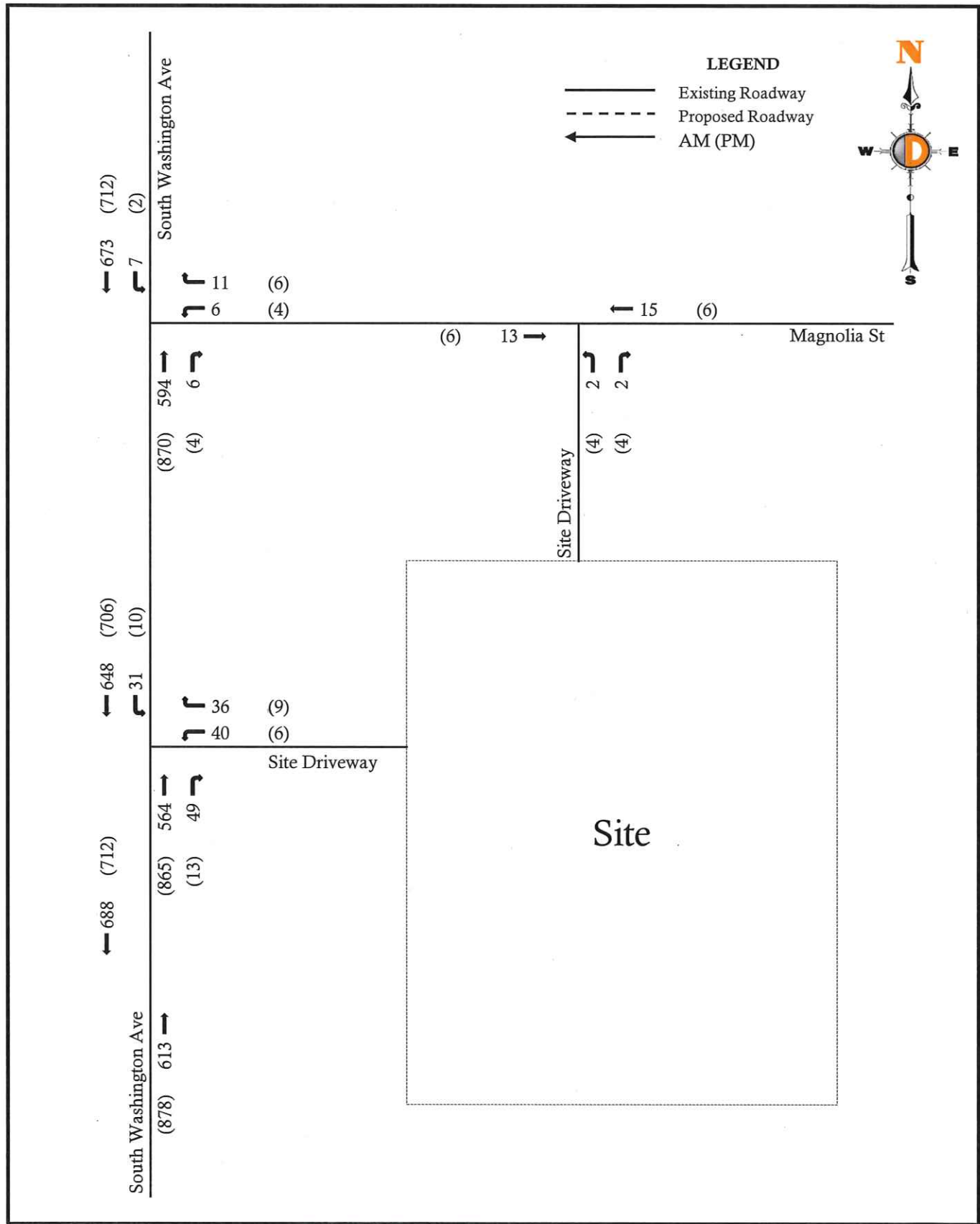


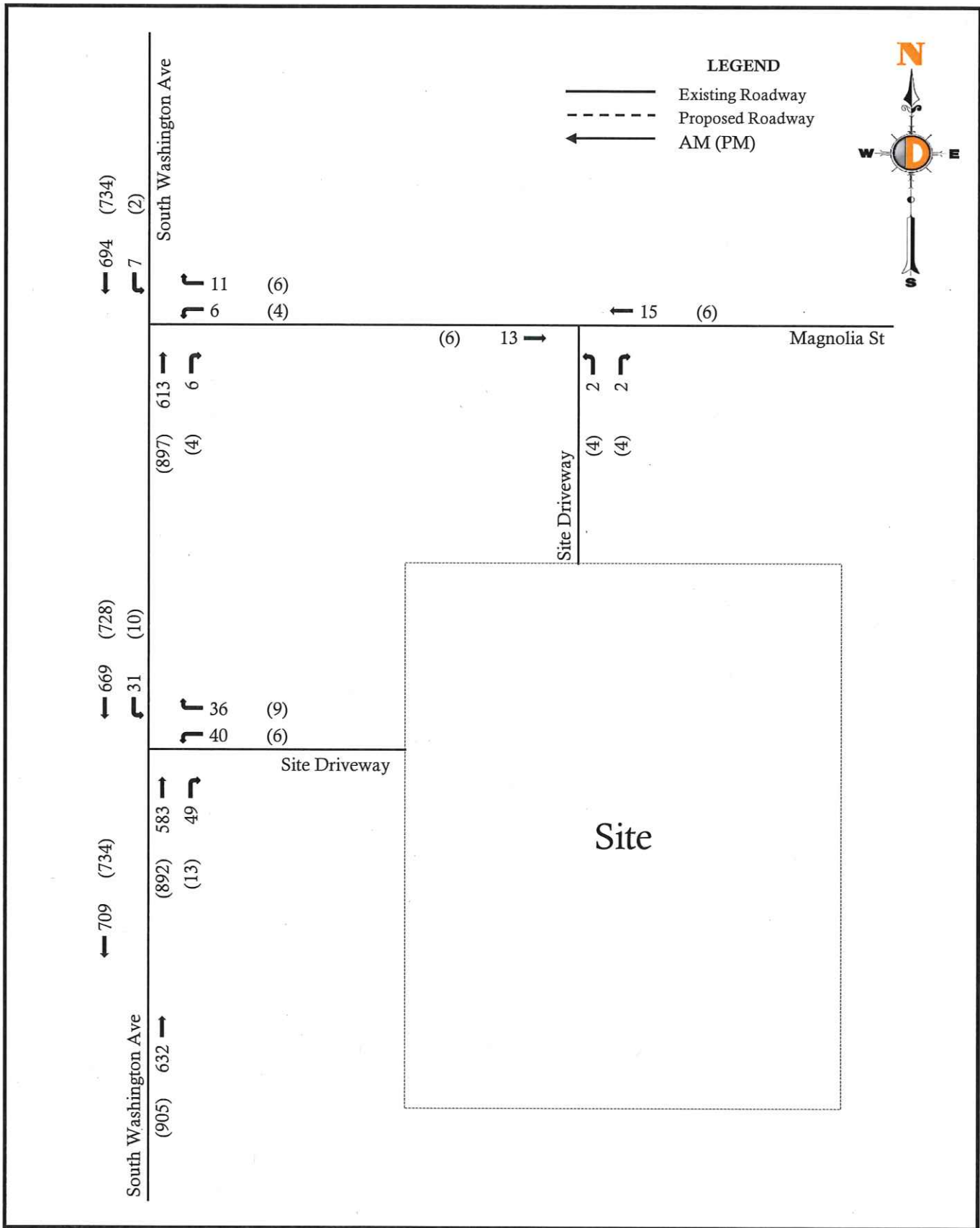


Proposed Dunkin Donuts Drive-Thru  
Traffic Impact Study  
4098-99-001TE

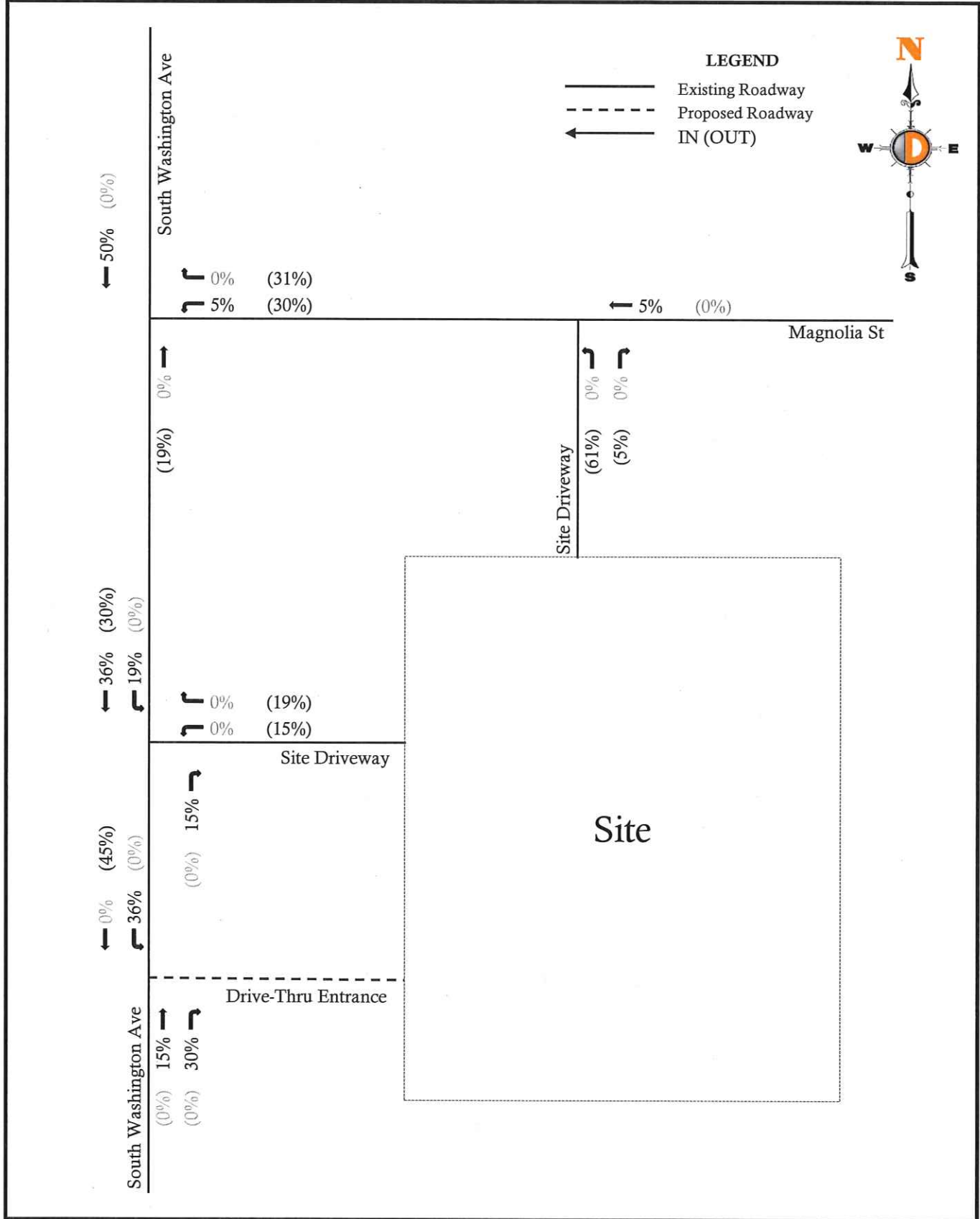
Figure 1

Site Location Map







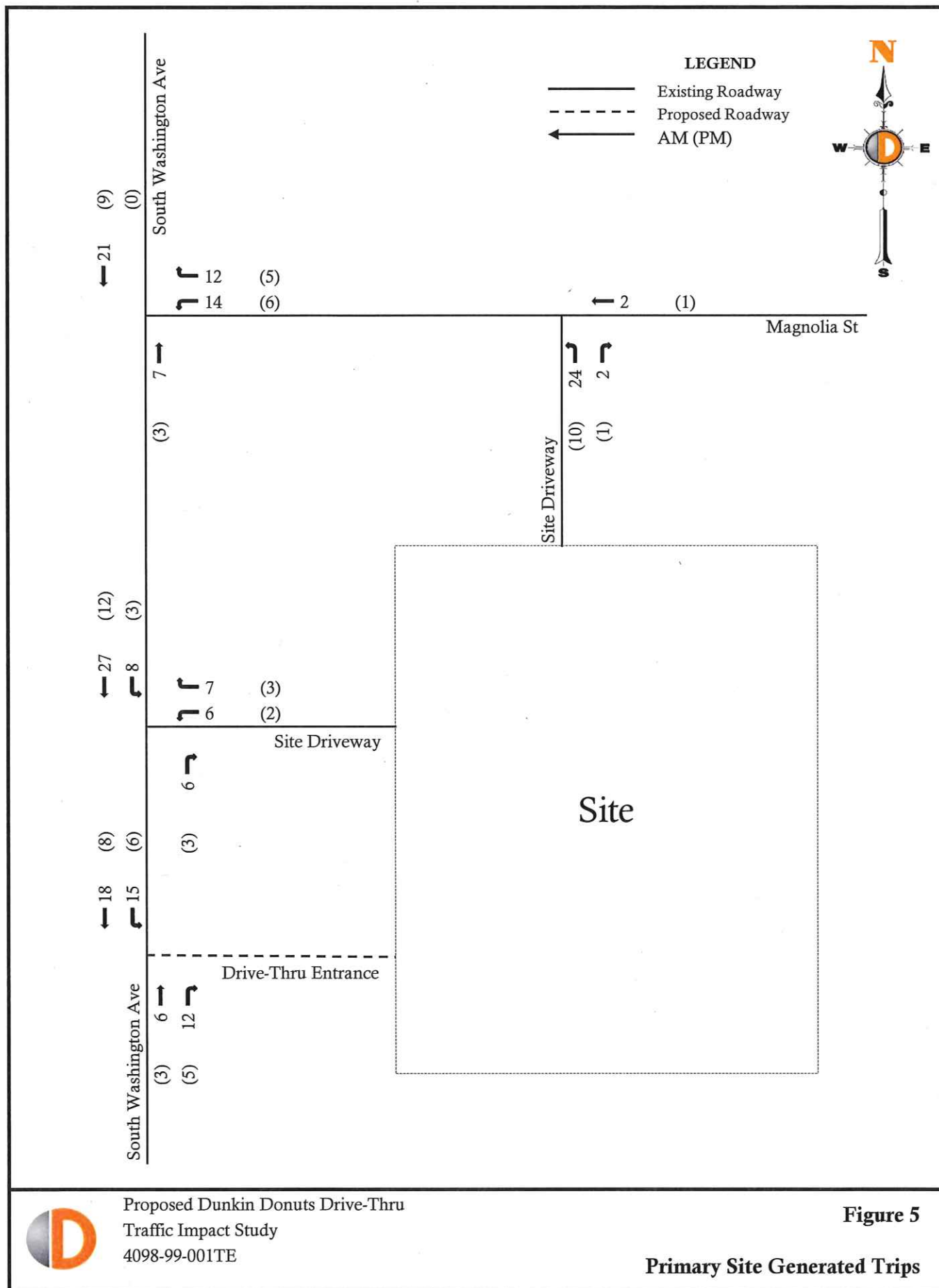




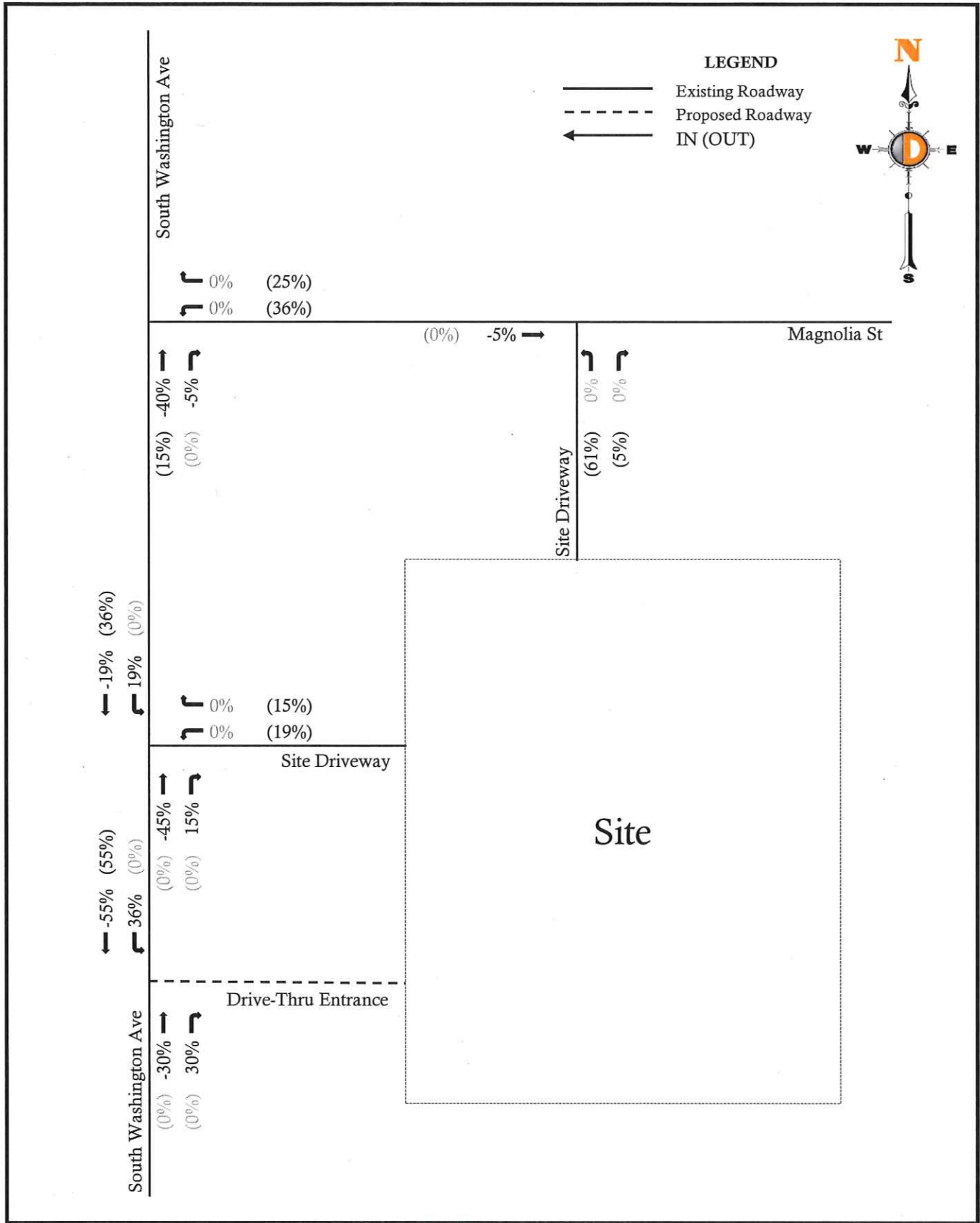
Proposed Dunkin Donuts Drive-Thru  
 Traffic Impact Study  
 4098-99-001TE

**Figure 4**

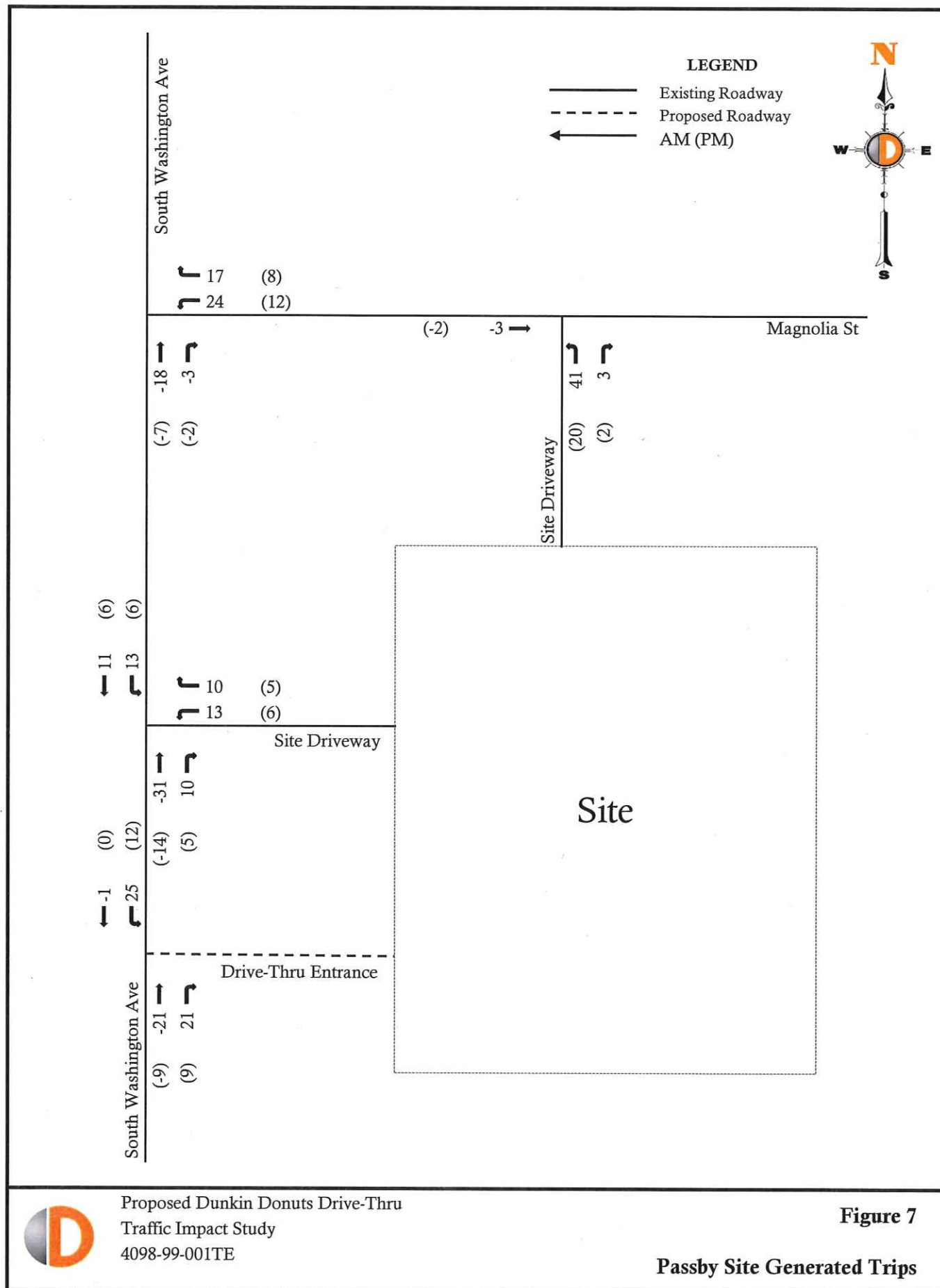
**Percent Distribution**  
**(Primary Trips)**

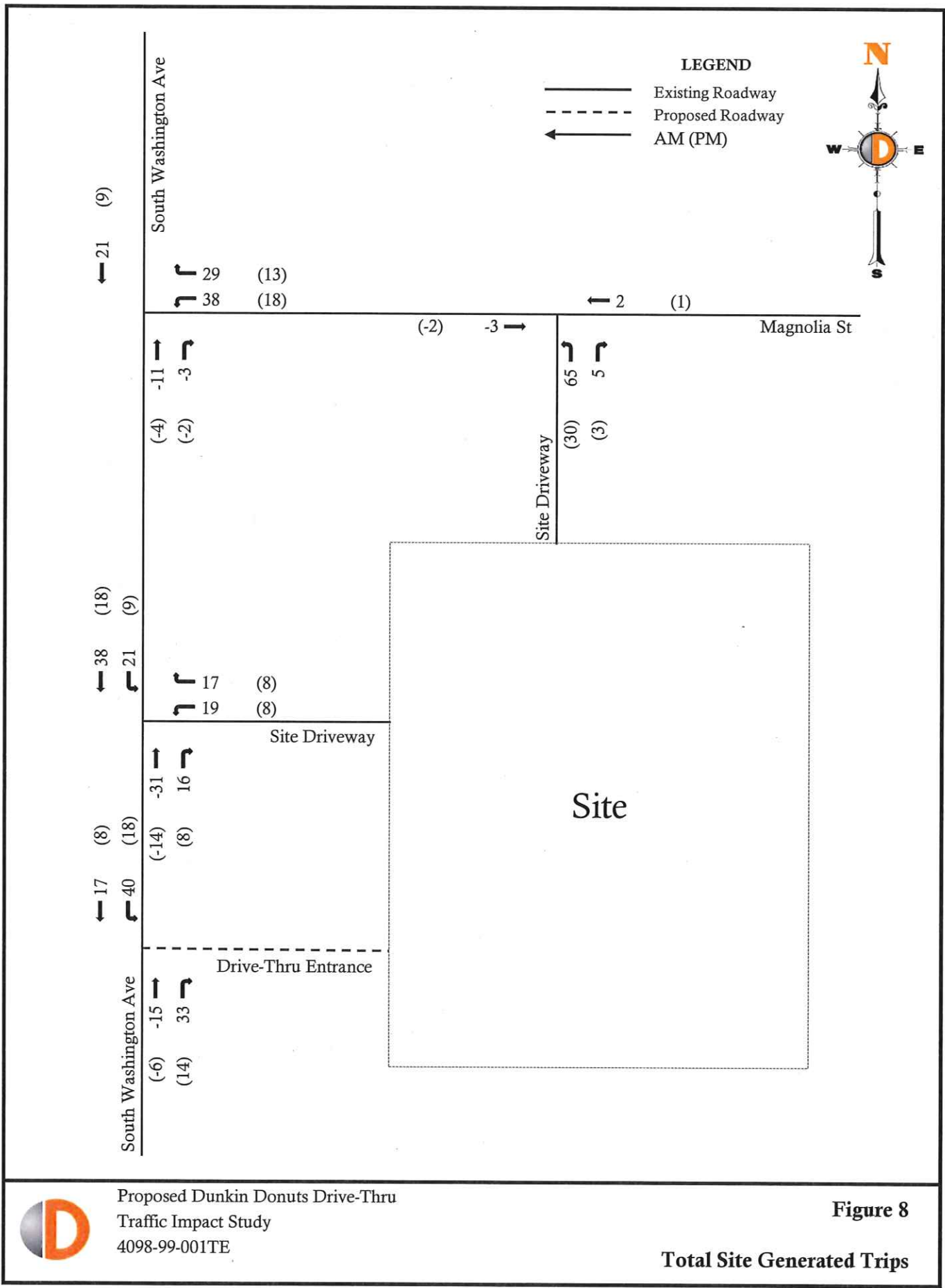


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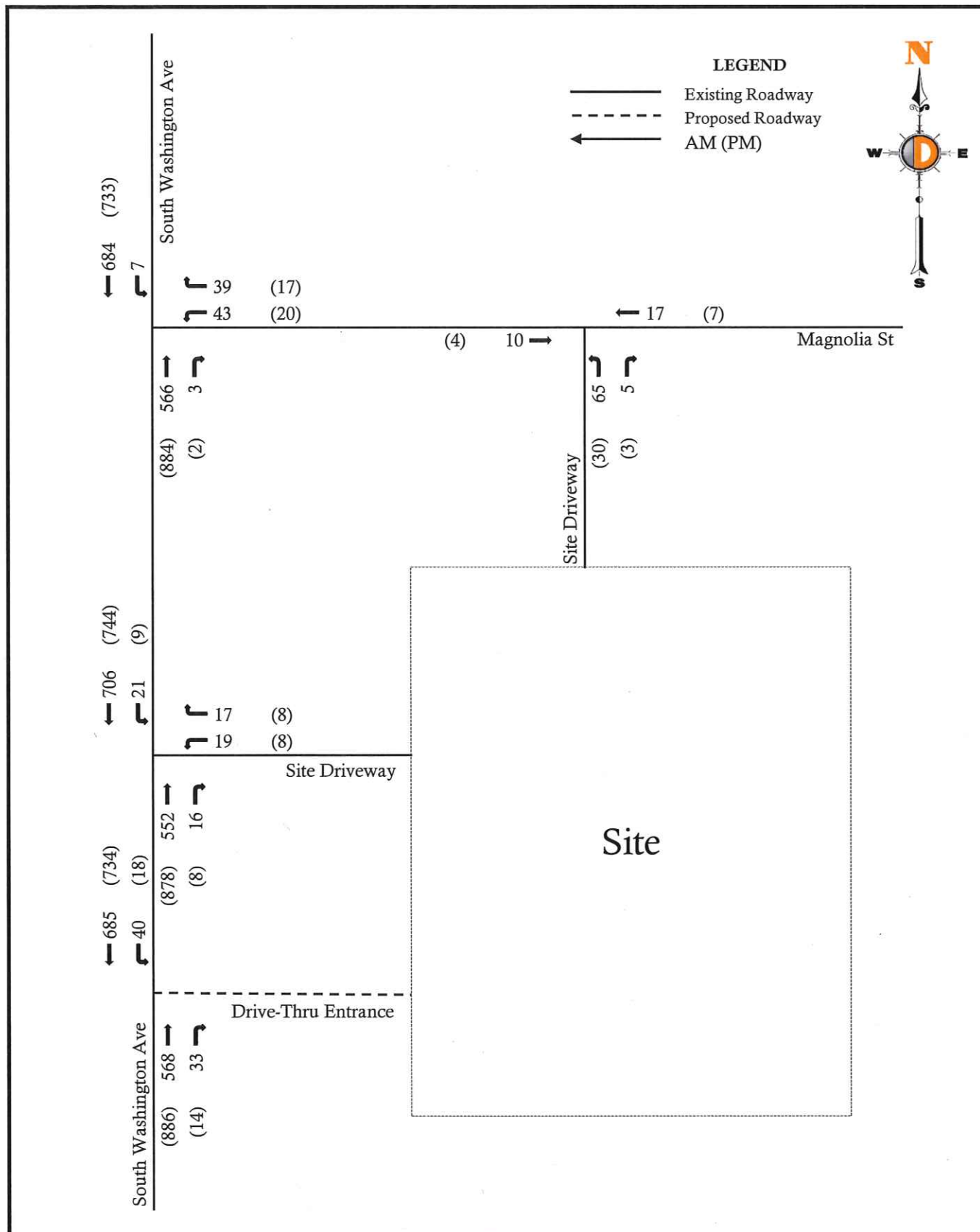








**Figure 8**  
**Total Site Generated Trips**





**Appendix B**  
**Traffic Counts**

# Dynamic Traffic, LLC

1904 Main Street, Lake Como, NJ 07719  
245 Main Street - Suite #110, Chester, NJ 07930  
732-681-0760

E/W: Magnolia Street  
N/S: S. Washington Avenue  
Town/County: Bergenfield/Bergen  
Job #: 4098-99-001TE

File Name : S Washington Ave & Magnolia St - AM  
Site Code : 00000000  
Start Date : 6/16/2022  
Page No : 1

Groups Printed- Cars - Trucks (SU) - Trucks (TT)

Start Time	Magnolia Street Westbound				S Washington Avenue Northbound				S Washington Avenue Southbound				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
07:00 AM	0	2	0	2	98	0	0	98	2	126	0	128	228
07:15 AM	1	3	0	4	108	3	0	111	0	133	0	133	248
07:30 AM	4	7	0	11	122	3	0	125	4	154	0	158	294
07:45 AM	1	5	0	6	153	3	0	156	3	184	0	187	349
Total	6	17	0	23	481	9	0	490	9	597	0	606	1119
08:00 AM	1	3	0	4	138	1	0	139	3	139	0	142	285
08:15 AM	3	1	0	4	143	2	0	145	1	151	0	152	301
08:30 AM	1	2	0	3	130	0	0	130	0	174	0	174	307
08:45 AM	1	4	0	5	130	3	0	133	2	146	0	148	286
Total	6	10	0	16	541	6	0	547	6	610	0	616	1179
Grand Total	12	27	0	39	1022	15	0	1037	15	1207	0	1222	2298
Apprch %	30.8	69.2	0		98.6	1.4	0		1.2	98.8	0		
Total %	0.5	1.2	0	1.7	44.5	0.7	0	45.1	0.7	52.5	0	53.2	
Cars	12	27	0	39	979	15	0	994	14	1156	0	1170	2203
% Cars	100	100	0	100	95.8	100	0	95.9	93.3	95.8	0	95.7	95.9
Trucks (SU)	0	0	0	0	37	0	0	37	1	44	0	45	82
% Trucks (SU)	0	0	0	0	3.6	0	0	3.6	6.7	3.6	0	3.7	3.6
Trucks (TT)	0	0	0	0	6	0	0	6	0	7	0	7	13
% Trucks (TT)	0	0	0	0	0.6	0	0	0.6	0	0.6	0	0.6	0.6

# Dynamic Traffic, LLC

1904 Main Street, Lake Como, NJ 07719  
245 Main Street - Suite #110, Chester, NJ 07930  
732-681-0760

E/W: Magnolia St  
N/S: S Washington Ave  
Town/County: Bergenfield/Bergen  
Job #: 4098-99-001TE

File Name : S Washington Ave & Magnolia St - PM  
Site Code : 00000000  
Start Date : 8/16/2022  
Page No : 1

Groups Printed- Cars - Trucks (SU) - Trucks (TT)

Start Time	Magnolia St Westbound				S Washington Ave Northbound				S Washington Ave Southbound				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
04:45 PM	3	1	0	4	234	1	0	235	1	154	0	155	394
Total	3	1	0	4	234	1	0	235	1	154	0	155	394
05:00 PM	1	0	0	1	182	0	0	182	1	178	0	179	362
05:15 PM	0	3	0	3	210	2	0	212	1	174	0	175	390
05:30 PM	1	2	0	3	234	1	0	235	0	154	0	154	392
05:45 PM	3	1	0	4	221	1	0	222	0	188	0	188	414
Total	5	6	0	11	847	4	0	851	2	694	0	696	1558
06:00 PM	0	0	0	0	205	0	0	205	1	186	0	187	392
06:15 PM	3	1	0	4	203	0	0	203	1	165	0	166	373
Grand Total	11	8	0	19	1489	5	0	1494	5	1199	0	1204	2717
Apprch %	57.9	42.1	0		99.7	0.3	0		0.4	99.6	0		
Total %	0.4	0.3	0	0.7	54.8	0.2	0	55	0.2	44.1	0	44.3	
Cars	11	8	0	19	1456	5	0	1461	5	1165	0	1170	2650
% Cars	100	100	0	100	97.8	100	0	97.8	100	97.2	0	97.2	97.5
Trucks (SU)	0	0	0	0	32	0	0	32	0	32	0	32	64
% Trucks (SU)	0	0	0	0	2.1	0	0	2.1	0	2.7	0	2.7	2.4
Trucks (TT)	0	0	0	0	1	0	0	1	0	2	0	2	3
% Trucks (TT)	0	0	0	0	0.1	0	0	0.1	0	0.2	0	0.2	0.1



# Dynamic Traffic, LLC

1904 Main Street, Lake Como, NJ 07719  
245 Main Street - Suite #110, Chester, NJ 07930  
732-681-0760

E/W: Driveway  
N/S: S. Washington Avenue  
Town/County: Bergenfield/Bergen  
Job #: 4098-99-001TE

File Name : S Washington Ave & Driveway - AM  
Site Code : 00000000  
Start Date : 6/16/2022  
Page No : 1

Groups Printed- Cars - Trucks (SU) - Trucks (TT)

Start Time	Driveway Westbound				S Washington Avenue Northbound				S Washington Avenue Southbound				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
07:00 AM	5	5	0	10	98	8	0	106	13	126	2	141	257
07:15 AM	8	2	0	10	108	7	0	115	8	133	0	141	266
07:30 AM	4	9	0	13	122	9	0	131	11	154	0	165	309
07:45 AM	8	9	0	17	153	9	0	162	12	184	0	196	375
Total	25	25	0	50	481	33	0	514	44	597	2	643	1207
08:00 AM	12	10	0	22	138	15	0	153	7	139	0	146	321
08:15 AM	9	7	0	16	143	10	0	153	4	151	0	155	324
08:30 AM	11	10	0	21	130	15	0	145	8	174	0	182	348
08:45 AM	12	6	0	18	130	7	0	137	9	146	0	155	310
Total	44	33	0	77	541	47	0	588	28	610	0	638	1303
Grand Total	69	58	0	127	1022	80	0	1102	72	1207	2	1281	2510
Apprch %	54.3	45.7	0		92.7	7.3	0		5.6	94.2	0.2		
Total %	2.7	2.3	0	5.1	40.7	3.2	0	43.9	2.9	48.1	0.1	51	
Cars	69	58	0	127	979	80	0	1059	71	1156	0	1227	2413
% Cars	100	100	0	100	95.8	100	0	96.1	98.6	95.8	0	95.8	96.1
Trucks (SU)	0	0	0	0	37	0	0	37	1	44	2	47	84
% Trucks (SU)	0	0	0	0	3.6	0	0	3.4	1.4	3.6	100	3.7	3.3
Trucks (TT)	0	0	0	0	6	0	0	6	0	7	0	7	13
% Trucks (TT)	0	0	0	0	0.6	0	0	0.5	0	0.6	0	0.5	0.5

# Dynamic Traffic, LLC

1904 Main Street, Lake Como, NJ 07719  
 245 Main Street - Suite #110, Chester, NJ 07930  
 732-681-0760




E/W:Dunkin Driveway  
 N/S: S Washington Ave  
 Town/County: Bergenfield/Bergen  
 Job #:4098-99-001TE

File Name : S Washington Ave & Driveway - PM  
 Site Code : 00000000  
 Start Date : 8/16/2022  
 Page No : 1

Groups Printed- Cars - Trucks (SU) - Trucks (TT)														
	Dunkin Driveway Westbound				S Washington Ave Northbound				S Washington Ave Southbound					
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total	
04:45 PM	1	5	0	6	230	4	0	234	4	152	0	156	396	
Total	1	5	0	6	230	4	0	234	4	152	0	156	396	
05:00 PM	4	6	0	10	176	4	0	180	6	169	0	175	365	
05:15 PM	2	4	0	6	208	4	0	212	5	173	0	178	396	
05:30 PM	1	4	0	5	231	2	0	233	1	154	0	155	393	
05:45 PM	1	1	0	2	221	2	0	223	1	190	0	191	416	
Total	8	15	0	23	836	12	0	848	13	686	0	699	1570	
06:00 PM	2	0	0	2	205	5	0	210	3	183	0	186	398	
06:15 PM	3	6	0	9	197	5	0	202	4	163	0	167	378	
Grand Total	14	26	0	40	1468	26	0	1494	24	1184	0	1208	2742	
Apprch %	35	65	0		98.3	1.7	0		2	98	0			
Total %	0.5	0.9	0	1.5	53.5	0.9	0	54.5	0.9	43.2	0	44.1		
Cars	14	26	0	40	1435	26	0	1461	24	1152	0	1176	2677	
% Cars	100	100	0	100	97.8	100	0	97.8	100	97.3	0	97.4	97.6	
Trucks (SU)	0	0	0	0	32	0	0	32	0	30	0	30	62	
% Trucks (SU)	0	0	0	0	2.2	0	0	2.1	0	2.5	0	2.5	2.3	
Trucks (TT)	0	0	0	0	1	0	0	1	0	2	0	2	3	
% Trucks (TT)	0	0	0	0	0.1	0	0	0.1	0	0.2	0	0.2	0.1	

**Appendix C**  
**Capacity Analysis**






Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	11	594	6	7	673
Future Vol, veh/h	6	11	594	6	7	673
Conflicting Peds, #/hr	0	5	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-1	-	-1	-	-	1
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	4	0	14	3
Mvmt Flow	7	12	667	7	8	756
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1455	688	0	0	686	0
Stage 1	683	-	-	-	-	-
Stage 2	772	-	-	-	-	-
Critical Hdwy	6.2	6.1	-	-	4.24	-
Critical Hdwy Stg 1	5.2	-	-	-	-	-
Critical Hdwy Stg 2	5.2	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.326	-
Pot Cap-1 Maneuver	157	458	-	-	854	-
Stage 1	525	-	-	-	-	-
Stage 2	479	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	152	449	-	-	841	-
Mov Cap-2 Maneuver	152	-	-	-	-	-
Stage 1	517	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	19.6	0		0.1		
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	266	841	-	
HCM Lane V/C Ratio	-	-	0.072	0.009	-	
HCM Control Delay (s)	-	-	19.6	9.3	0	
HCM Lane LOS	-	-	C	A	A	
HCM 95th %tile Q(veh)	-	-	0.2	0	-	

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	
Traffic Vol, veh/h	13	0	0	15	2	2
Future Vol, veh/h	13	0	0	15	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-1	-	-	1	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	8	0	0	0	2	2
Mvmt Flow	21	0	0	24	3	3

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	-	-	45	21
Stage 1	-	-	-	21	-
Stage 2	-	-	-	24	-
Critical Hdwy	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	965	1056
Stage 1	-	0	0	1002	-
Stage 2	-	0	0	999	-
Platoon blocked, %	-		-		
Mov Cap-1 Maneuver	-	-	-	965	1056
Mov Cap-2 Maneuver	-	-	-	965	-
Stage 1	-	-	-	1002	-
Stage 2	-	-	-	999	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	1008	-	-
HCM Lane V/C Ratio	0.006	-	-
HCM Control Delay (s)	8.6	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	36	564	49	31	648
Future Vol, veh/h	40	36	564	49	31	648
Conflicting Peds, #/hr	0	0	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	4	2	3	3
Mvmt Flow	44	40	620	54	34	712

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1439	659	0	0	686	0
Stage 1	659	-	-	-	-	-
Stage 2	780	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.13	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.227	-
Pot Cap-1 Maneuver	146	464	-	-	903	-
Stage 1	515	-	-	-	-	-
Stage 2	452	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	135	459	-	-	893	-
Mov Cap-2 Maneuver	135	-	-	-	-	-
Stage 1	509	-	-	-	-	-
Stage 2	424	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.6	0	0.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	203	893
HCM Lane V/C Ratio	-	-	0.411	0.038
HCM Control Delay (s)	-	-	34.6	9.2
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	1.9	0.1



Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	4	6	870	4	2	712
Future Vol, veh/h	4	6	870	4	2	712
Conflicting Peds, #/hr	0	5	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-1	-	-1	-	-	1
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	4	6	906	4	2	742
Major/Minor						
Minor1	Major1		Major2			
Conflicting Flow All	1666	925	0	0	922	0
Stage 1	920	-	-	-	-	-
Stage 2	746	-	-	-	-	-
Critical Hdwy	6.2	6.1	-	-	4.1	-
Critical Hdwy Stg 1	5.2	-	-	-	-	-
Critical Hdwy Stg 2	5.2	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	118	338	-	-	749	-
Stage 1	412	-	-	-	-	-
Stage 2	492	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	116	331	-	-	738	-
Mov Cap-2 Maneuver	116	-	-	-	-	-
Stage 1	406	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Approach						
WB	NB		SB			
HCM Control Delay, s	25	0	0			
HCM LOS	D					
Minor Lane/Major Mvmt						
NBT	NBRWBLn1	SBL	SBT			
Capacity (veh/h)	-	-	190	738	-	
HCM Lane V/C Ratio	-	-	0.055	0.003	-	
HCM Control Delay (s)	-	-	25	9.9	0	
HCM Lane LOS	-	-	D	A	A	
HCM 95th %tile Q(veh)	-	-	0.2	0	-	

Intersection						
Int Delay, s/veh	3.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	Y	
Traffic Vol, veh/h	6	0	0	6	4	4
Future Vol, veh/h	6	0	0	6	4	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-1	-	-	1	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	2	2
Mvmt Flow	9	0	0	9	6	6
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	-	-	-	18	9
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	9	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	-	1000	1073
Stage 1	-	0	0	-	1014	-
Stage 2	-	0	0	-	1014	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	1000	1073
Mov Cap-2 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1014	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		8.5		
HCM LOS				A		
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	1035	-	-			
HCM Lane V/C Ratio	0.012	-	-			
HCM Control Delay (s)	8.5	-	-			
HCM Lane LOS	A	-	-			
HCM 95th %tile Q(veh)	0	-	-			

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	6	9	865	13	10	706
Future Vol, veh/h	6	9	865	13	10	706
Conflicting Peds, #/hr	0	0	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	3
Mvmt Flow	6	9	901	14	10	735

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1675	920	0	0	927
Stage 1	920	-	-	-	-
Stage 2	755	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	105	328	-	-	737
Stage 1	388	-	-	-	-
Stage 2	464	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	101	324	-	-	729
Mov Cap-2 Maneuver	101	-	-	-	-
Stage 1	384	-	-	-	-
Stage 2	453	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	172	729
HCM Lane V/C Ratio	-	-	0.091	0.014
HCM Control Delay (s)	-	-	28	10
HCM Lane LOS	-	-	D	B
HCM 95th %tile Q(veh)	-	-	0.3	0



Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T		L	T
Traffic Vol, veh/h	6	11	613	6	7	694
Future Vol, veh/h	6	11	613	6	7	694
Conflicting Peds, #/hr	0	5	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-1	-	-1	-	-	1
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	4	0	14	3
Mvmt Flow	7	12	689	7	8	780

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1501	710	0	0	708
Stage 1	705	-	-	-	-
Stage 2	796	-	-	-	-
Critical Hdwy	6.2	6.1	-	-	4.24
Critical Hdwy Stg 1	5.2	-	-	-	-
Critical Hdwy Stg 2	5.2	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.326
Pot Cap-1 Maneuver	147	446	-	-	838
Stage 1	513	-	-	-	-
Stage 2	468	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	142	437	-	-	825
Mov Cap-2 Maneuver	142	-	-	-	-
Stage 1	505	-	-	-	-
Stage 2	460	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	252	825
HCM Lane V/C Ratio	-	-	0.076	0.01
HCM Control Delay (s)	-	-	20.5	9.4
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	↑
Traffic Vol, veh/h	13	0	0	15	2	2
Future Vol, veh/h	13	0	0	15	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-1	-	-	1	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	8	0	0	0	2	2
Mvmt Flow	21	0	0	24	3	3
Major/Minor						
Major1	Major2		Minor1			
Conflicting Flow All	0	-	-	-	45	21
Stage 1	-	-	-	-	21	-
Stage 2	-	-	-	-	24	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	-	965	1056
Stage 1	-	0	0	-	1002	-
Stage 2	-	0	0	-	999	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	965	1056
Mov Cap-2 Maneuver	-	-	-	-	965	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	999	-
Approach						
EB	WB		NB			
HCM Control Delay, s	0	0	8.6			
HCM LOS			A			
Minor Lane/Major Mvmt						
NBLn1	EBT	WBT				
Capacity (veh/h)	1008	-	-			
HCM Lane V/C Ratio	0.006	-	-			
HCM Control Delay (s)	8.6	-	-			
HCM Lane LOS	A	-	-			
HCM 95th %tile Q(veh)	0	-	-			

Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Traffic Vol, veh/h	40	36	583	49	31	669
Future Vol, veh/h	40	36	583	49	31	669
Conflicting Peds, #/hr	0	0	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	4	2	3	3
Mvmt Flow	44	40	641	54	34	735

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1483	680	0	0	707
Stage 1	680	-	-	-	-
Stage 2	803	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.13
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.227
Pot Cap-1 Maneuver	138	451	-	-	887
Stage 1	503	-	-	-	-
Stage 2	441	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	128	446	-	-	877
Mov Cap-2 Maneuver	128	-	-	-	-
Stage 1	497	-	-	-	-
Stage 2	412	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37.2	0	0.4
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	193	877
HCM Lane V/C Ratio	-	-	0.433	0.039
HCM Control Delay (s)	-	-	37.2	9.3
HCM Lane LOS	-	-	E	A
HCM 95th %tile Q(veh)	-	-	2	0.1



Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Traffic Vol, veh/h	4	6	897	4	2	734
Future Vol, veh/h	4	6	897	4	2	734
Conflicting Peds, #/hr	0	5	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-1	-	-1	-	-	1
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	4	6	934	4	2	765

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1717	953	0	0	950	0
Stage 1	948	-	-	-	-	-
Stage 2	769	-	-	-	-	-
Critical Hdwy	6.2	6.1	-	-	4.1	-
Critical Hdwy Stg 1	5.2	-	-	-	-	-
Critical Hdwy Stg 2	5.2	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	110	325	-	-	731	-
Stage 1	400	-	-	-	-	-
Stage 2	481	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	108	319	-	-	720	-
Mov Cap-2 Maneuver	108	-	-	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	479	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.4	0	0
HCM LOS	D		




Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	179	720
HCM Lane V/C Ratio	-	-	0.058	0.003
HCM Control Delay (s)	-	-	26.4	10
HCM Lane LOS	-	-	D	B
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Int Delay, s/veh	3.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↓	
Traffic Vol, veh/h	6	0	0	6	4	4
Future Vol, veh/h	6	0	0	6	4	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-1	-	-	1	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	2	2
Mvmt Flow	9	0	0	9	6	6

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	-	-	18	9
Stage 1	-	-	-	9	-
Stage 2	-	-	-	9	-
Critical Hdwy	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	1000	1073
Stage 1	-	0	0	1014	-
Stage 2	-	0	0	1014	-
Platoon blocked, %	-		-		
Mov Cap-1 Maneuver	-	-	-	1000	1073
Mov Cap-2 Maneuver	-	-	-	1000	-
Stage 1	-	-	-	1014	-
Stage 2	-	-	-	1014	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	1035	-	-
HCM Lane V/C Ratio	0.012	-	-
HCM Control Delay (s)	8.5	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	9	892	13	10	728
Future Vol, veh/h	6	9	892	13	10	728
Conflicting Peds, #/hr	0	0	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	3
Mvmt Flow	6	9	929	14	10	758
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1726	948	0	0	955	0
Stage 1	948	-	-	-	-	-
Stage 2	778	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	98	316	-	-	720	-
Stage 1	377	-	-	-	-	-
Stage 2	453	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	95	312	-	-	712	-
Mov Cap-2 Maneuver	95	-	-	-	-	-
Stage 1	373	-	-	-	-	-
Stage 2	442	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	29.4		0		0.1	
HCM LOS	D					
Minor Lane/Major Mvmt	NBT		NBRWBLn1		SBL	SBT
Capacity (veh/h)	-		-		163	712
HCM Lane V/C Ratio	-		-		0.096	0.015
HCM Control Delay (s)	-		-		29.4	10.1
HCM Lane LOS	-		-		D	B
HCM 95th %tile Q(veh)	-		-		0.3	0



Intersection						
Int Delay, s/veh	2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		P			P
Traffic Vol, veh/h	43	39	566	3	7	684
Future Vol, veh/h	43	39	566	3	7	684
Conflicting Peds, #/hr	0	5	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-1	-	-1	-	-	1
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	4	0	14	3
Mvmt Flow	48	44	636	3	8	769

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1435	655	0	0	651
Stage 1	650	-	-	-	-
Stage 2	785	-	-	-	-
Critical Hdwy	6.2	6.1	-	-	4.24
Critical Hdwy Stg 1	5.2	-	-	-	-
Critical Hdwy Stg 2	5.2	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.326
Pot Cap-1 Maneuver	161	478	-	-	881
Stage 1	543	-	-	-	-
Stage 2	473	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	156	468	-	-	868
Mov Cap-2 Maneuver	156	-	-	-	-
Stage 1	535	-	-	-	-
Stage 2	465	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	31.1	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	228	868
HCM Lane V/C Ratio	-	-	0.404	0.009
HCM Control Delay (s)	-	-	31.1	9.2
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	1.8	0

Intersection						
Int Delay, s/veh	6.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	10	0	0	17	65	5
Future Vol, veh/h	10	0	0	17	65	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-1	-	-	1	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	8	0	0	0	2	2
Mvmt Flow	16	0	0	27	103	8

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	-	-	-	43 16
Stage 1	-	-	-	-	16 -
Stage 2	-	-	-	-	27 -
Critical Hdwy	-	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	-	0	0	-	968 1063
Stage 1	-	0	0	-	1007 -
Stage 2	-	0	0	-	996 -
Platoon blocked, %	-			-	
Mov Cap-1 Maneuver	-	-	-	-	968 1063
Mov Cap-2 Maneuver	-	-	-	-	968 -
Stage 1	-	-	-	-	1007 -
Stage 2	-	-	-	-	996 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	974	-	-
HCM Lane V/C Ratio	0.114	-	-
HCM Control Delay (s)	9.2	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-




Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	19	17	552	16	21	706
Future Vol, veh/h	19	17	552	16	21	706
Conflicting Peds, #/hr	0	0	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	4	2	3	3
Mvmt Flow	21	19	607	18	23	776




Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1450	628	0	0	637
Stage 1	628	-	-	-	-
Stage 2	822	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.13
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.227
Pot Cap-1 Maneuver	144	483	-	-	942
Stage 1	532	-	-	-	-
Stage 2	432	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	136	477	-	-	931
Mov Cap-2 Maneuver	136	-	-	-	-
Stage 1	526	-	-	-	-
Stage 2	413	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.7	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	205	931
HCM Lane V/C Ratio	-	-	0.193	0.025
HCM Control Delay (s)	-	-	26.7	9
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1



Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	568	33	40	685
Future Vol, veh/h	0	0	568	33	40	685
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	4	2	2	3
Mvmt Flow	0	0	617	36	43	745
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	635	0	0	653	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	0	482	-	-	934	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	482	-	-	934	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	0	0		0.5		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	-	934	-	
HCM Lane V/C Ratio	-	-	-	0.047	-	
HCM Control Delay (s)	-	-	0	9	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	-	0.1	-	

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	17	884	2	2	733
Future Vol, veh/h	20	17	884	2	2	733
Conflicting Peds, #/hr	0	5	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-1	-	-1	-	-	1
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	21	18	921	2	2	764
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1702	939	0	0	935	0
Stage 1	934	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Critical Hdwy	6.2	6.1	-	-	4.1	-
Critical Hdwy Stg 1	5.2	-	-	-	-	-
Critical Hdwy Stg 2	5.2	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	112	331	-	-	741	-
Stage 1	406	-	-	-	-	-
Stage 2	481	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	110	324	-	-	730	-
Mov Cap-2 Maneuver	110	-	-	-	-	-
Stage 1	400	-	-	-	-	-
Stage 2	479	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	35	0		0		
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	158	730	-	
HCM Lane V/C Ratio	-	-	0.244	0.003	-	
HCM Control Delay (s)	-	-	35	9.9	0	
HCM Lane LOS	-	-	E	A	A	
HCM 95th %tile Q(veh)	-	-	0.9	0	-	

Intersection						
Int Delay, s/veh	6.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	
Traffic Vol, veh/h	4	0	0	7	30	3
Future Vol, veh/h	4	0	0	7	30	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-1	-	-	1	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	2	2
Mvmt Flow	6	0	0	10	45	4
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	-	-	-	16	6
Stage 1	-	-	-	-	6	-
Stage 2	-	-	-	-	10	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	-	1002	1077
Stage 1	-	0	0	-	1017	-
Stage 2	-	0	0	-	1013	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	1002	1077
Mov Cap-2 Maneuver	-	-	-	-	1002	-
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	1013	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		8.8		
HCM LOS				A		
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	1008	-	-			
HCM Lane V/C Ratio	0.049	-	-			
HCM Control Delay (s)	8.8	-	-			
HCM Lane LOS	A	-	-			
HCM 95th %tile Q(veh)	0.2	-	-			






Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Traffic Vol, veh/h	8	8	878	8	9	744
Future Vol, veh/h	8	8	878	8	9	744
Conflicting Peds, #/hr	0	0	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	3
Mvmt Flow	8	8	915	8	9	775

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1724	931	0	0	935
Stage 1	931	-	-	-	-
Stage 2	793	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	98	324	-	-	732
Stage 1	384	-	-	-	-
Stage 2	446	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	95	320	-	-	724
Mov Cap-2 Maneuver	95	-	-	-	-
Stage 1	380	-	-	-	-
Stage 2	436	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	32.6	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	147	724
HCM Lane V/C Ratio	-	-	0.113	0.013
HCM Control Delay (s)	-	-	32.6	10
HCM Lane LOS	-	-	D	B
HCM 95th %tile Q(veh)	-	-	0.4	0

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	886	14	18	734
Future Vol, veh/h	0	0	886	14	18	734
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	1	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	2	2	2	3
Mvmt Flow	0	0	923	15	19	765
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	931	0	0	938	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	0	326	-	-	730	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	326	-	-	730	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	0		0		0.2	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT		NBRWBLn1		SBL	SBT
Capacity (veh/h)	-		-		730	-
HCM Lane V/C Ratio	-		-		0.026	-
HCM Control Delay (s)	-		0		10.1	0
HCM Lane LOS	-		A		B	A
HCM 95th %tile Q(veh)	-		-		0.1	-

## **Appendix D**

### **Queue Analysis**





# QUEUE CALCULATION - AM PEAK HOUR

## Dunkin Donuts - Bergenfield

Job Info	
Project Number:	4098-99-001TE
Project Description:	Edilberto G Jimenez
Analyst:	CGH
Date:	8/18/2022

Traffic Demand	
Hourly Demand, v	73 veh/hr
Peak Hour Factor, PHF	0.92
Available Queue Storage	8 veh

Service Rate	
Service Time	25 sec/veh

Calculations	
Pk Flow Rate, $\lambda = v / PHF$	79 veh/hr
Service Rate per Hour, $\mu$	144.0 veh/hr
Traffic intensity, $\rho = \lambda / \mu$	0.55

\*Model produces unreliable results when  $\rho$  is less than 0.5 or greater than 0.85<sup>1</sup>

Avg. Queue Length, $L_q = (\rho \times \lambda) / (\mu - \lambda)$	0.67 veh.
Avg. System Length, $L_s = \lambda / (\mu - \lambda)$	1.22 veh.

Avg. Queue Waiting Time, $W_q = \rho / (\mu - \lambda)$	0.51 min.
Avg. Time in System, $W_s = 1 / (\mu - \lambda)$	0.92 min.

95th Percentile Queue:	4
Probability of queue exceeding 8 vehicles:	0.45%

Notes
-------

- Queue calculations assume one service lane.
- Queue calculations based on stochastic queueing methods as described by M/M/1 Single-Server Queue Model as presented in "Parking" as published by the ENO foundation(1) and within the Civil Engineering Reference Manual.
- System times and length includes time/presence at service point.

Probability Calculations				
X' Veh. in Queue	P{X} Probability of exactly 'X' Veh. in Queue	Probability of 'X' or less Veh. in Queue	Probability of Queue Greater than 'X' Veh.	95 <sup>th</sup> Percentile Queue
0	45.14%	45.14%	54.86%	4
1	24.76%	69.90%	30.10%	
2	13.59%	83.49%	16.51%	
3	7.45%	90.94%	9.06%	
4	4.09%	95.03%	4.97%	
5	2.24%	97.27%	2.73%	
6	1.23%	98.50%	1.50%	
7	0.68%	99.18%	0.82%	
8	0.37%	99.55%	0.45%	
9	0.20%	99.75%	0.25%	
10	0.11%	99.86%	0.14%	
11	0.06%	99.93%	0.07%	
12	0.03%	99.96%	0.04%	
13	0.02%	99.98%	0.02%	
14	0.01%	99.99%	0.01%	
15	0.01%	99.99%	0.01%	
16	0.00%	100.00%	0.00%	
17	0.00%	100.00%	0.00%	
18	0.00%	100.00%	0.00%	
19	0.00%	100.00%	0.00%	
20	0.00%	100.00%	0.00%	
21	0.00%	100.00%	0.00%	
22	0.00%	100.00%	0.00%	
23	0.00%	100.00%	0.00%	
24	0.00%	100.00%	0.00%	
25	0.00%	100.00%	0.00%	



QUEUE CALCULATION - PM PEAK HOUR

Dunkin Donuts - Bergenfield

Job Info	
Project Number:	4098-99-001TE
Project Description:	Edilberto G Jimenez
Analyst:	CGH
Date:	8/18/2022

Traffic Demand	
Hourly Demand, v	32 veh/hr
Peak Hour Factor, PHF	0.96
Available Queue Storage	8 veh

Service Rate	
Service Time	25 sec/veh

Calculations	
Pk Flow Rate, $\lambda = v / PHF$	33 veh/hr
Service Rate per Hour, $\mu$	144.0 veh/hr
Traffic intensity, $\rho = \lambda / \mu$	0.23

\*Model produces unreliable results when  $\rho$  is less than 0.5 or greater than 0.85<sup>1</sup>

Avg. Queue Length, $L_q = (\rho \times \lambda) / (\mu - \lambda)$	0.07 veh.
Avg. System Length, $L_s = \lambda / (\mu - \lambda)$	0.30 veh.

Avg. Queue Waiting Time, $W_q = \rho / (\mu - \lambda)$	0.12 min.
Avg. Time in System, $W_s = 1 / (\mu - \lambda)$	0.54 min.

95th Percentile Queue:	2
Probability of queue exceeding 8 vehicles:	0.00%

Notes
-------

- Queue calculations assume one service lane.
- Queue calculations based on stochastic queueing methods as described by M/M/1 Single-Server Queue Model as presented in "Parking" as published by the ENO foundation(1) and within the Civil Engineering Reference Manual.
- System times and length includes time/presence at service point.

Probability Calculations				
X' Veh. in Queue	P{X} Probability of exactly 'X' Veh. in Queue	Probability of 'X' or less Veh. in Queue	Probability of Queue Greater than 'X' Veh.	95 <sup>th</sup> Percentile Queue
0	77.08%	77.08%	22.92%	2
1	17.66%	94.75%	5.25%	
2	4.05%	98.80%	1.20%	
3	0.93%	99.72%	0.28%	
4	0.21%	99.94%	0.06%	
5	0.05%	99.99%	0.01%	
6	0.01%	100.00%	0.00%	
7	0.00%	100.00%	0.00%	
8	0.00%	100.00%	0.00%	
9	0.00%	100.00%	0.00%	
10	0.00%	100.00%	0.00%	
11	0.00%	100.00%	0.00%	
12	0.00%	100.00%	0.00%	
13	0.00%	100.00%	0.00%	
14	0.00%	100.00%	0.00%	
15	0.00%	100.00%	0.00%	
16	0.00%	100.00%	0.00%	
17	0.00%	100.00%	0.00%	
18	0.00%	100.00%	0.00%	
19	0.00%	100.00%	0.00%	
20	0.00%	100.00%	0.00%	
21	0.00%	100.00%	0.00%	
22	0.00%	100.00%	0.00%	
23	0.00%	100.00%	0.00%	
24	0.00%	100.00%	0.00%	
25	0.00%	100.00%	0.00%	

## **Appendix E**

### **Gap Analysis**



Dynamic Traffic, LLC  
1904 Main Street, Lake Como, NJ 07719  
245 Main Street - Suite #110, Chester, NJ 07930  
732-681-0760

E/W: Magnolia St  
N/S: S Washington Ave  
Town/County: Bergenfield/Bergen  
Job #: 4098-99-001TE

File Name : S Washington Ave & Magnolia St - GAP AM  
Site Code : 00000000  
Start Date : 8/16/2022  
Page No : 1

Directions Printed: Combined																			
Start Time	Volume	2 - 3	4 - 5	6 - 7	8 - 9	10 - 11	12 - 13	14 - 15	16 - 17	18 - 19	20 - 21	22 - 23	24 - 25	26 - 27	28 - 29	>29	Int. Total	Average	
07:00 AM	222	38	15	15	6	4	1	1	1	0	1	1	0	2	0	1	86	4 - 5	
07:15 AM	246	48	23	12	7	4	3	2	0	0	0	0	0	0	0	0	99	4 - 5	
07:30 AM	294	43	13	6	7	2	5	1	1	0	0	1	0	0	0	0	79	2 - 3	
07:45 AM	302	52	14	7	3	5	1	0	2	0	0	1	0	0	0	0	85	2 - 3	
Total	1064	181	65	40	23	15	10	4	4	0	1	3	0	2	0	1	349	2 - 3	
08:00 AM	311	47	21	7	5	2	2	1	1	0	0	0	0	0	0	0	86	2 - 3	
08:15 AM	283	51	20	10	8	3	2	2	0	0	1	0	0	0	0	0	97	2 - 3	
08:30 AM	326	55	15	7	6	3	1	0	0	0	1	0	0	0	0	0	88	2 - 3	
08:45 AM	304	69	21	11	4	4	2	1	0	0	0	0	0	0	0	0	112	2 - 3	
Total	1224	222	77	35	23	12	7	4	1	0	2	0	0	0	0	0	383	2 - 3	
Grand Total	2288	403	142	75	46	27	17	8	5	0	3	3	0	2	0	1	732	2 - 3	
Total %		55.1	19.4	10.2	6.3	3.7	2.3	1.1	0.7	0.0	0.4	0.4	0.0	0.3	0.0	0.1			

Peak Hour Analysis From 07:45 AM to 08:30 AM - Peak 1 of 1  
Peak Occurred: 07:45 AM  
Volume 1222  
High Int. 08:30 AM  
Volume 326  
PHF 0.937

Dynamic Traffic, LLC  
1904 Main Street, Lake Como, NJ 07719  
245 Main Street - Suite #110, Chester, NJ 07930  
732-681-0760

E/W: Magnolia St  
N/S: S Washington St  
Town/County: Bergefield/Bergen  
Job #: 4098-99-001TE

File Name : S Washington Ave & Magnolia St - GAP PM  
Site Code : 00000000  
Start Date : 8/16/2022  
Page No : 1

Directions Printed: Combined																			
Start Time	Volume	2 - 3	4 - 5	6 - 7	8 - 9	10 - 11	12 - 13	14 - 15	16 - 17	18 - 19	20 - 21	22 - 23	24 - 25	26 - 27	28 - 29	>29	Int. Total	Average	
04:30 PM	364	54	20	9	3	2	0	0	0	0	0	0	0	0	0	0	88	2 - 3	
04:45 PM	354	76	14	2	6	3	0	1	0	0	0	0	0	0	0	0	102	2 - 3	
Total	718	130	34	11	9	5	0	1	0	0	0	0	0	0	0	0	190	2 - 3	
05:00 PM	370	67	20	8	3	1	1	0	0	1	0	0	0	0	0	0	101	2 - 3	
05:15 PM	381	67	13	6	5	2	1	0	0	0	0	0	0	0	0	0	94	2 - 3	
05:30 PM	396	82	13	3	1	3	0	0	0	0	0	0	0	0	0	0	102	2 - 3	
05:45 PM	403	63	9	6	2	3	0	0	0	0	0	0	0	0	0	0	83	2 - 3	
Total	1550	279	55	23	11	9	2	0	0	1	0	0	0	0	0	0	380	2 - 3	
06:00 PM	357	62	18	8	4	1	0	0	0	0	0	0	0	0	0	0	93	2 - 3	
06:15 PM	373	72	28	7	0	1	1	1	0	0	0	0	0	0	0	0	110	2 - 3	
Grand Total	2998	543	135	49	24	16	3	2	0	1	0	0	0	0	0	0	773	2 - 3	
Total %		70.2	17.5	6.3	3.1	2.1	0.4	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0			

Peak Hour Analysis From 05:15 PM to 06:00 PM - Peak 1 of 1  
Peak Occurred: 05:15 PM  
Volume 1537  
High Int. 05:45 PM  
Volume 403  
PHF 0.953

GAP ANALYSIS  
South Washington Avenue & Magnolia Street



Project #: 4098-99-001TE      Analyst: TLV  
Project Description: Dunkin Donut Drive-Thru Addition      Date: 8/18/2022

TIME	AVAILABLE GAPS (Seconds)														
	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	>29
7:00 AM	38	15	15	6	4	1	1	1	0	1	1	0	2	0	1
7:15 AM	48	23	12	7	4	3	2	0	0	0	0	0	0	0	0
7:30 AM	43	13	6	7	2	5	1	1	0	0	1	0	0	0	0
7:45 AM	52	14	7	3	5	1	0	2	0	0	1	0	0	0	0
8:00 AM	47	21	7	5	2	2	1	1	0	0	0	0	0	0	0
8:15 AM	51	20	10	8	3	2	2	0	0	1	0	0	0	0	0
8:30 AM	55	15	7	6	3	1	0	0	0	1	0	0	0	0	0
8:45 AM	69	21	11	4	4	2	1	0	0	0	0	0	0	0	0
4:30 PM	54	20	9	3	2	0	0	0	0	0	0	0	0	0	0
4:45 PM	76	14	2	6	3	0	1	0	0	0	0	0	0	0	0
5:00 PM	67	20	8	3	1	1	0	0	1	0	0	0	0	0	0
5:15 PM	67	13	6	5	2	1	0	0	0	0	0	0	0	0	0
5:30 PM	82	13	3	1	3	0	0	0	0	0	0	0	0	0	0
5:45 PM	63	9	6	2	3	0	0	0	0	0	0	0	0	0	0
6:00 PM	62	18	8	4	1	0	0	0	0	0	0	0	0	0	0
6:15 PM	72	28	7	0	1	1	1	0	0	0	0	0	0	0	0
7:45-8:45 Peak	205	70	31	22	13	6	3	3	0	2	1	0	0	0	0
5:15-6:15 Peak	274	53	23	12	9	1	0	0	0	0	0	0	0	0	0
Veh/Gap	0	0	0	1	1	2	2	2	3	3	4	4	4	5	5
Total Vehicles AM		0	0	22	13	12	6	6	0	6	4	0	0	0	0
Total Vehicles PM		0	0	12	9	2	0	0	0	0	0	0	0	0	0
AM Total															69
PM Total															23

Critical Gaps	
Base Gap	7.1 seconds
Follow Up Gap	3.5 seconds

Gap Required For:	
1 Vehicle	7.1 seconds
2 Vehicles	10.6 seconds
3 Vehicles	17.7 seconds
4 Vehicles	21.2 seconds
5 Vehicles	28.3 seconds



Location (IF ENTERING A NEW SITE - ADD TO "Site Stats" TAB!)	Date	Time	Queue from Order Board at Time of Arrival (Inc. vehicle at Order Board. Exc. vehicles in front of Order Board. Does not include your vehicle)	No. of Vehicles located in front of Order Board (Inc. vehicle at service window. Exc. vehicle at Order Board)	Time to Arrive to Order Board	Avg: 29 Sec.	23 Sec.	Avg:	25 Sec.	20 Sec.	283 Sec.	1.92 Min.	Time Spent from Arriving at Order Board to Leaving Service Window (min.)	Total Time spent in Queue (min.)	Avg. Time per Vehicle in Q at Time of Arrival
						Observed Service Times at Order Board for Vehicle(s) in Front of Observer	Observers Service Time at Order Board	Time to Arrive to Service Window	Observed Service Times at Window for Vehicle(s) in Front of Observer	Observers Service Time at Window	Total Time spent in Queue (sec.)				
Dunkin' Donuts, Shrewsbury Avenue, Tinton Falls, NJ	Friday, May 15, 2015	7:50	10 Veh.	3 Veh.	180 Sec.	Not Collected	24 Sec.	62 Sec.	Not Collected	24 Sec.	290 Sec.	1.84 Min.	4.84 Min.	0.48 Min.	
Dunkin' Donuts, Route 35, Eatontown, NJ	Monday, May 18, 2015	9:00	0 Veh.	0 Veh.	0 Sec.	Not Collected	24 Sec.	9 Sec.	Not Collected	19 Sec.	53 Sec.	0.88 Min.	0.88 Min.	#DIV/0!	
Dunkin' Donuts, Route 9, Freehold	Saturday, May 16, 2015	9:00	9 Veh.	3 Veh.	212 Sec.	Not Collected	34 Sec.	89 Sec.	Not Collected	30 Sec.	365 Sec.	2.55 Min.	6.08 Min.	0.68 Min.	
Dunkin' Donuts, Route 35, Eatontown, NJ	Tuesday, May 19, 2015	8:30	5 Veh.	2 Veh.	174 Sec.	21 Seconds -	22 Sec.	110 Sec.	43 Sec. 20 Sec.	28 Sec.	334 Sec.	1.84 Min.	5.56 Min.	1.11 Min.	
Dunkin' Donuts, Route 35, Eatontown, NJ	Wednesday, May 20, 2015	8:45	4 Veh.	3 Veh.	106 Sec.	26 Sec. 37 Sec.	29 Sec.	82 Sec.	36 Sec. -	16 Sec.	234 Sec.	1.84 Min.	3.89 Min.	0.97 Min.	
Dunkin' Donuts, Shrewsbury Avenue, Tinton Falls, NJ	Friday, May 22, 2015	8:10	8 Veh.	2 Veh.	233 Sec.	26 Sec. 41 Sec. 26 Sec. 24 Sec. 29 Sec.	13 Sec.	69 Sec.	36 Sec. - - - -	17 Sec.	332 Sec.	1.84 Min.	5.54 Min.	0.69 Min.	
Dunkin' Donuts, Route 35, Eatontown, NJ	Friday, June 5, 2015	8:00	1 Veh.	3 Veh.	63 Sec.	27 Sec.	29 Sec.	132 Sec.	37 Sec.	15 Sec.	239 Sec.	2.94 Min.	3.99 Min.	3.99 Min.	
Dunkin' Donuts, Shrewsbury Avenue, Tinton Falls, NJ	Tuesday, June 9, 2015	8:10	7 Veh.	2 Veh.	217 Sec.	20 Sec. 67 Sec. 47 Sec. 23 Sec. -	25 Sec.	66 Sec.	- - - - -	20 Sec.	328 Sec.	1.84 Min.	5.47 Min.	0.78 Min.	
Dunkin' Donuts, Shrewsbury Avenue, Tinton Falls, NJ	Wednesday, June 10, 2015	7:55	10 Veh.	3 Veh.	216 Sec.	37 Sec. 15 Sec. 23 Sec. 18 Sec. 13 Sec.	14 Sec.	61 Sec.	12 Sec. 14 Sec. - - -	17 Sec.	307 Sec.	1.84 Min.	5.12 Min.	0.51 Min.	
Dunkin' Donuts, Shrewsbury Avenue, Tinton Falls, NJ	Thursday, June 11, 2015	8:00	11 Veh.	3 Veh.	264 Sec.	33 Sec. 28 Sec. 19 Sec. 26 Sec. 35 Sec. 18 Sec.	13 Sec.	64 Sec.	21 Sec. 12 Sec. 17 Sec. - - -	11 Sec.	352 Sec.	1.84 Min.	5.86 Min.	0.53 Min.	

Site	Photo	Approx SF (Google Earth)	No. Drive-Thru Lanes	Bypass Lane	Available Vehicle Storage behind Order Board Prior to Blocking Parking (Inc. vehicle at Order Board)	Available Vehicle Storage behind Order Board Prior to On Street (Inc. vehicle at Order Board)	Available Vehicle Storage in front of Order Board (Exc. Vehicle at Order Board, Inc. vehicle at Service Window)
Dunkin' Donuts, Shrewsbury Avenue, Tinton Falls, NJ		2,600 SF (End Cap)	1	N	4	8.25	5
Dunkin' Donuts, Route 35, Eatontown, NJ		2,775 SF	1	Y	4	6	4