TRAFFIC IMPACT ANALYSIS

For

Lasater East Manufactured Home Park

Property Located at:

14707 Lasater Road
Block 8838 – Tracts 14, 15, 22, 24 & 26
City of Dallas, Dallas County, Texas

Prepared by:

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(732) 681-0760
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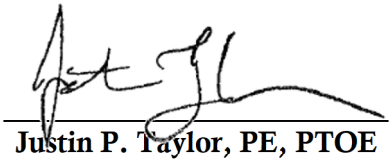
"I, Justin Taylor, hereby certify that the information provided in this report is complete and accurate to the best of my knowledge."



Justin P. Taylor, PE, PTOE
TX PE License #118486

January 10, 2020

2450-99-015T

EXECUTIVE SUMMARY

The following report documents the methodology, analyses, findings, and conclusions of our Traffic Impact Analysis for a proposed manufactured home park located along the westbound side of Lasater Road in the City of Dallas, Dallas County, Texas. It is proposed to construct 265 manufactured homes, with access to the site provided via two full movement driveways along Lasater Road.

Due to the development generating a maximum of 122 peak hour trips and 1,325 daily trips, a Traffic Impact Analysis was performed. As confirmed within the Traffic Study Scope Proposal, analysis of the Existing, 2022 Background, 2022 Project Buildout, and 2027 5-year Horizon Buildout conditions were conducted at the following intersections:

- Lasater Road and Lawson Road
- Lasater Road and East Site Driveway
- Lasater Road and West Site Driveway

As designed, both of the site driveways will operate at acceptable levels of service during both peak hours analyzed. With the addition of the site generated traffic, the intersection of Lawson Road and Lasater Road is anticipated to generally maintain the background levels of service. Several movements operate at levels of service "F" under the existing conditions and will continue to do so with the construction of The Project. As requested by the City of Dallas, the 2019 Existing traffic volumes were compared to the traffic signal warrants set forth within the Manual on Uniform Traffic Control Devices. It was determined that several of the warrants are met and as such it is recommended that the City investigate the possibility of future signalization for the intersection to address existing traffic conditions.

Based upon our Traffic Impact Analysis as detailed in the body of this report, it is the professional opinion of Dynamic Traffic, LLC that the adjacent street system of the City of Dallas will not experience any significant degradation in operating conditions with the development of The Project. The site driveways are located to provide safe and efficient access to the adjacent roadway system.

INTRODUCTION

It is proposed to construct a manufactured home park on a parcel of land that is currently undeveloped, located along the westbound side of Lasater Road in the City of Dallas, Dallas County, Texas, see Figure 1 in Appendix B. The site is located within the MH – Manufactured Home Park district and encompasses 47.39 acres of land. It is proposed to construct 265 manufactured home units (The Project). It is proposed to construct two full movement driveways along Lasater Road for access to The Project.

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 Traffic Study Scope Proposal was submitted to The City of Dallas on December 2, 2019. A copy of it is contained in Appendix A.

- A detailed field inspection was conducted to obtain an inventory of existing roadway geometry, traffic control, and location and geometry of the existing intersection.

- Existing traffic data was collected via manual turning movement (MTM) counts during the weekday AM and weekday PM peak periods at the intersection of Lawson Road and Lasater Road.

- Automatic traffic recorder (ATR) counts were conducted for a 24-hour period on Wednesday, November 20, 2019 along Lasater Road east of Stacey 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, 2022 Background, 2022 Buildout, and 2027 Buildout 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.

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 as well as extensive analyses.

Existing Roadway Conditions

The following is a description of the roadways in the study area:

Lawson Road is classified on the City of Dallas Thoroughfare Plan as a Principal Arterial (M-6-D(A)) roadway with 100' of right-of-way and a general north/south orientation. The roadway provides two lanes of travel in each direction to the north of its intersection with Lasater Road and one lane of travel in each direction to the south. The posted speed limit is 35 MPH to the north of its intersection with Lasater Road and 30 MPH to the south.

Lasater Road is classified on the City of Dallas Thoroughfare Plan as a Principal Arterial (M-6-D(A)) roadway with 100' of right-of-way and a general east/west orientation. The roadway provides one lane of travel in each direction. In the vicinity of the site the posted speed limit is 30 MPH.

Existing Traffic Volumes

Manual turning movement (MTM) counts were conducted on Tuesday, November 19, 2019 and Wednesday, November 20, 2019 from 7:00 to 9:00 AM and from 2:00 to 6:00 PM at the intersection of Lasater Road and Lawson Road. Additionally, automatic traffic recorder (ATR) counts were conducted for a 24-hour period on Wednesday, November 20, 2019 along Lasater Road east of Stacey Street.

Review of the collected data reveals that the total volumes experienced at the intersection were higher on Wednesday, November 20, 2019. Therefore, the volumes collected on Wednesday, November 20, 2019 were utilized for analysis. Additionally, the weekday morning peak street hour (PSH) occurs between 7:15 – 8:15 AM and the weekday evening PSH occurs between 3:45 – 4:45 PM. Figure 2, located in Appendix C, shows the existing peak hour traffic volumes at the study intersection. All traffic counts are contained in Appendix C.

FUTURE CONDITIONS

Traffic volumes and operational analyses were developed for both the 2022 Background and Buildout conditions, as well as the 2027 Buildout condition. The Background conditions provide a baseline for assessing the impact of the site development traffic on the roadway system. The process of developing the Background and Buildout 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. As provided on the North Central Texas Council of Governments (NCTCOG) website, a background growth rate of 2.69% was calculated. Conservatively, a background growth rate of 3% was utilized.

Future 2022 and 2027 Background traffic volumes were developed by applying the background growth rate of 3.0% for two (2) and five (5) years, respectively, to the study area roadways existing traffic volumes. Figure 3, in Appendix B, shows the 2022 Background Traffic Volumes, while Figure 6 shows the 2027 Background Traffic Volumes.

Traffic Generation

Trip generation projections for the proposed manufactured home park were prepared utilizing trip generation research data as published under Land Use Code (LUC) 240 – Mobile Home Park in the Institute of Transportation Engineers' (ITE) publication, *Trip Generation, 10th Edition*. This publication sets forth trip generation rates based on traffic counts conducted at research sites throughout the country.

Table I
Trip Generation

Land Use	AM PSH			PM PSH			Daily
	In	Out	Total	In	Out	Total	
265 Unit Mobile Home Park	21	48	69	76	46	122	1,325

Once the magnitude of the site generated traffic is known, it is necessary to assign the 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. Table II summarizes the anticipated trip distribution for The Project.

Table II
Trip Distribution

To/From	Percentage
Lasater Road – East	35%
Lasater Road – West	30%
Lawson Road - North	25%
Lawson Road – South	10%
Total	**100%**

Located in Appendix B, Figure 4 illustrates the site generated volumes. The site generated volumes were added to both the 2022 and 2027 Background traffic volumes to generate the 2022 and 2027 Buildout traffic volumes, which are shown in Figures 5 and 7, respectively.

Intersection 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 III describes the level of service ranges for unsignalized (stop controlled) intersections.

Table III
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.

Operational conditions at the study intersections were analyzed under the Existing, 2022 Background, 2022 Buildout, and 2027 Buildout conditions and are summarized in Tables IV-IX. It should be noted that the existing percentage of trucks and peak hour factors were used in the existing analysis. Copies of the capacity analysis worksheets are contained in Appendix D.

Lawson Road and Lasater Road

Lasater Road intersects Lawson Road to form a four-leg intersection operating under four-way stop control. The eastbound approach of Lasater Road provides a shared left turn/through lane and a channelized right turn lane, while the westbound approach provides a shared left turn/through/right turn lane. The northbound approach of Lawson Road provides a dedicated left turn lane and a shared through/channelized right turn lane, while the southbound approach provides dedicated left turn, through, and right turn lanes.

Table IV
Lawson Road and Lasater Road
Morning Peak Hour

Condition		2019 Existing		2022 Background		2022 Project Buildout		2027 5-year Buildout	
Approach/ Movement		LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
EB	LTR	c	15	c	16	c	17	c	19
WB	LTR	f	70	f	97	f	125	f	182
NB	L	c	18	c	20	c	20	c	23
	TR	d	28	d	32	d	33	e	44
SB	L	c	16	c	17	c	17	c	19
	T	b	15	c	16	c	16	c	18
	R	b	11	b	11	b	11	b	12
Overall		**e**	**37**	**e**	**47**	**f**	**59**	**f**	**82**

With the addition of site generated traffic, all movements of the intersection are anticipated to operate at background levels of service under both the buildout and 5-year buildout conditions, with the exception of the northbound through/right movement degrading from level of service "D" in the buildout condition to level of service "E" in the 5-year buildout condition. It should be noted that the westbound approach of Lasater Road operates with level of service "F" under the existing conditions. As requested by the City of Dallas, a traffic signal warrant analysis was conducted for this intersection and is contained in a subsequent section of this report. See Table IV for individual movement levels of service and delay.

Table V
Lawson Road and Lasater Road
Evening Peak Hour

Condition		2019 Existing		2022 Background		2022 Project Buildout		2027 5-year Buildout	
Approach/ Movement		LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
EB	LTR	e	41	f	58	f	87	f	135
WB	LTR	c	24	d	29	e	38	f	50
NB	L	c	15	c	17	c	17	c	19
	TR	d	25	d	32	e	37	e	49
SB	L	c	22	d	26	d	32	e	40
	T	c	19	c	22	c	24	d	29
	R	b	11	b	11	b	12	b	12
Overall		**d**	**27**	**d**	**34**	**e**	**46**	**f**	**65**

With the addition of site generated traffic, all movements of the intersection are anticipated to operate at background levels of service under the Buildout condition, with the exception of the westbound approach movement and northbound through/right turn movement, which operates with levels of service "E". Under the 5-year Buildout condition, all movements will operate with levels of service "E" or better with the exception of the eastbound approach, which operates with a level of service "F" under all conditions, and the westbound approach, which operates with a level of service "F". See Table V for individual movement levels of service and delays.

Lasater Road and East Site Driveway

The east site driveway is proposed to intersect Lasater Road to form a T-intersection with the southbound approach of the site driveway operating under stop control. The eastbound approach of Lasater Road is proposed to provide a shared left turn/through lane, while the westbound approach is proposed to provide a shared through/right turn lane. The southbound approach of the site driveway is proposed to provide a shared left/right turn lane.

Table VI
Laster Road and East Site Driveway
Morning Peak Hour

Condition		2022 Project Buildout		2027 5-year Horizon Buildout	
Approach/ Movement		LOS	Delay (sec)	LOS	Delay (sec)
EB	L	a	8	a	8
SB	LR	b	11	b	12

Table VII
Laster Road and East Site Driveway
Evening Peak Hour

Condition		2022 Project Buildout		2027 5-year Horizon Buildout	
Approach/ Movement		LOS	Delay (sec)	LOS	Delay (sec)
EB	L	a	8	a	8
SB	LR	b	13	b	13

As designed, the intersection of Lasater Road and the east site driveway is anticipated to operate with levels of service "B" or better during both the 2022 and 2027 Buildout condition for the peak hours analyzed. See Tables VI and VII for the individual movement delays and levels of service.

Lasater Road and West Site Driveway

The west site driveway is proposed to intersect Lasater Road to form a T-intersection with the southbound approach of the site driveway operating under stop control. The eastbound approach of Lasater Road is proposed to provide a shared left turn/through lane, while the westbound approach is proposed to provide a shared through/right turn lane. The southbound approach of the site driveway is proposed to provide a shared left/right turn lane.

Table VIII
Laster Road and West Site Driveway
Morning Peak Hour

Condition		2022 Project Buildout		2027 5-year Horizon Buildout	
Approach/ Movement		LOS	Delay (sec)	LOS	Delay (sec)
EB	L	a	8	a	8
SB	LR	b	10	b	11

Table IX
Laster Road and West Site Driveway
Evening Peak Hour

Condition		2022 Project Buildout		2027 5-year Horizon Buildout	
Approach/ Movement		LOS	Delay (sec)	LOS	Delay (sec)
EB	L	a	8	a	8
SB	LR	b	11	b	12

As designed, the intersection of Lasater Road and the west site driveway is anticipated to operate with levels of service "B" or better during both the 2022 and 2027 Buildout condition for the peak hours analyzed. See Tables VIII and IX for the individual movement delays and levels of service.

Link Capacity Analysis

Another measure of a project's impact to the surrounding roadway network is its impact to specific roadway links, or sections of road between intersections. The capacity of a roadway link is primarily a function of its geometric cross section, inclusive of the lane widths, type of divider, number of lanes, etc., however the functional classification of the roadway and its geographic location (urban, suburban, rural, etc.) also play a part. The NCTCOG has developed hourly service capacities per lane within their Dallas-Fort Worth Regional Travel Model, which are summarized in the table below.

Table X
Hourly Service Volume Capacity
per Lane by Area Type and Roadway Function

Area Type	Principal Arterial		Minor Arterial & Frontage Road		Collector & Local Street	
	Divided or One-Way	Undivided Two-Way	Divided or One-Way	Undivided Two-Way	Divided or One-Way	Undivided Two-Way
CBD	725	650	725	650	475	425
Outer Business	775	725	775	725	500	450
Urban Residential	850	775	825	750	525	475
Suburban Residential	900	875	900	825	575	525
Rural	1025	925	975	875	600	550

In order to determine the operational capacity of the roadway link, the volume on the roadway is compared to the link capacity to calculate a ratio of volume to capacity (V/C). Specific levels of service ranges are then assigned to V/C ratios as detailed in Table XI below.

Table XI
Level of Service Criteria for Roadway Links

Demand / Capacity Ratio (D/C)		Level of Service
Greater Than	Less Than/Equal To	
-	0.45	A or B
0.45	0.65	C
0.65	0.80	D
0.80	1.00	E
1.00	-	F

The V/C ratios along Lasater Road were calculated for the 2019 Existing volumes, 2022 Background volumes, 2022 Buildout volumes, and 2027 Buildout volumes. It should be noted that the peak hour capacity numbers were converted to daily capacities using the assumption that the peak hour represents 10% of the daily capacity. The following table summarizes the results of these analyses.

Table XII
Roadway Link Levels of Service

Roadway Link	Capacity	2019 Existing			2022 Background			2022 Buildout			2022 Buildout		
		Vol	V/C	LOS	Vol	V/C	LOS	Vol	V/C	LOS	Vol	V/C	LOS
Lasater Road	15,500	5656	0.36	A or B	6180	0.40	A or B	7041	0.45	C	8025	0.52	C

As shown in Table XII above, Lasater Road currently operates at link levels of service "B" and will operate at a link level of service "C" under both of the 2022 Buildout and 2027 Buildout scenarios.

TRAFFIC SIGNAL WARRANT ANALYSIS

As requested by the City of Dallas, a traffic signal warrant analysis for the intersection of Lawson Road and Lasater Road has been prepared based upon the criteria set forth within the Manual on Uniform Traffic Control Devices. Utilizing the 2019 existing traffic volumes illustrated in Figure 2, the intersection satisfies both Warrant 2 – Four Hour Volumes and Warrant 3 – Peak Hour Volumes. It is recommended that the City investigate the possibility of future signalization for the intersection to address existing traffic conditions. Figures I and II below show the existing traffic volumes for Warrants 2 and 3, respectively. The calculations are contained in Appendix E.

Figure I
Warrant 2 Curve

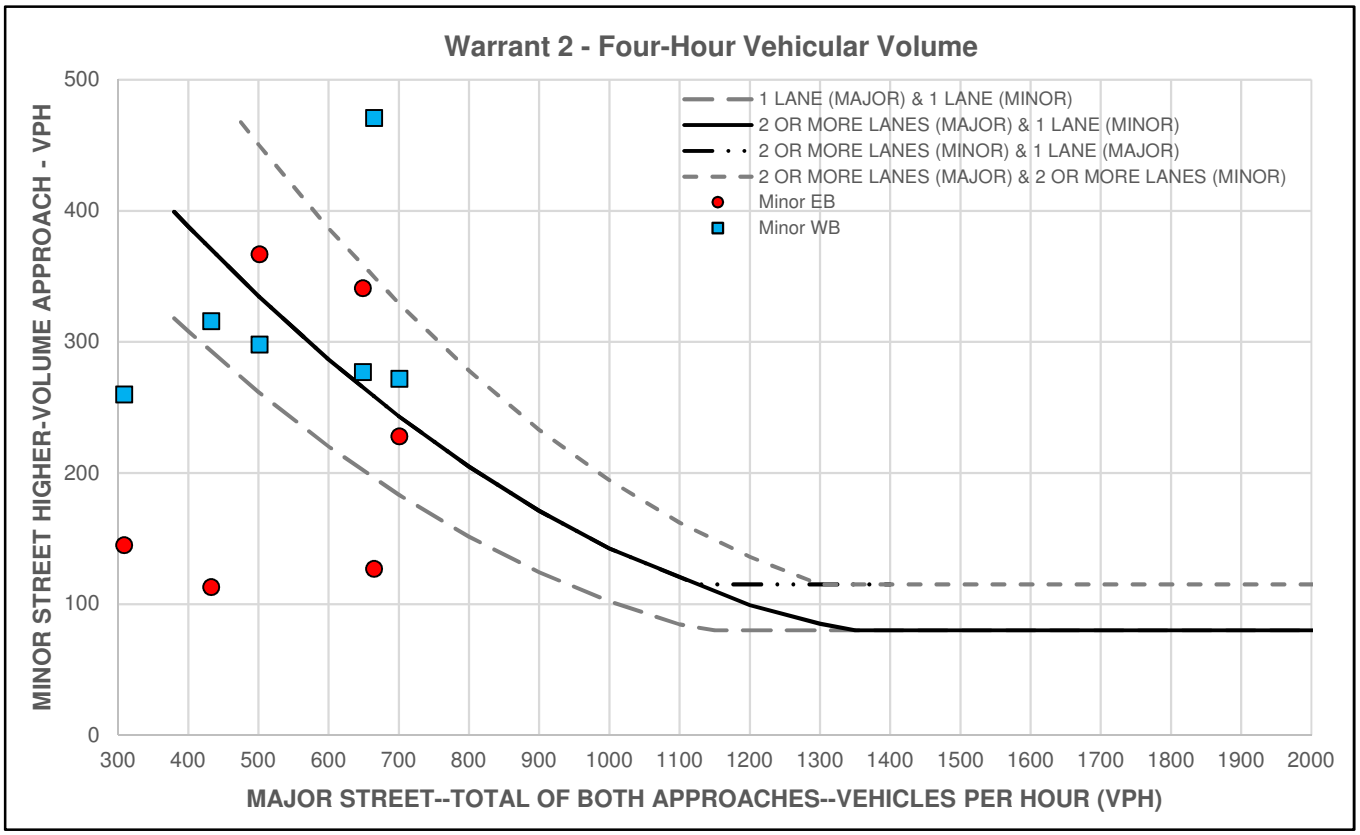
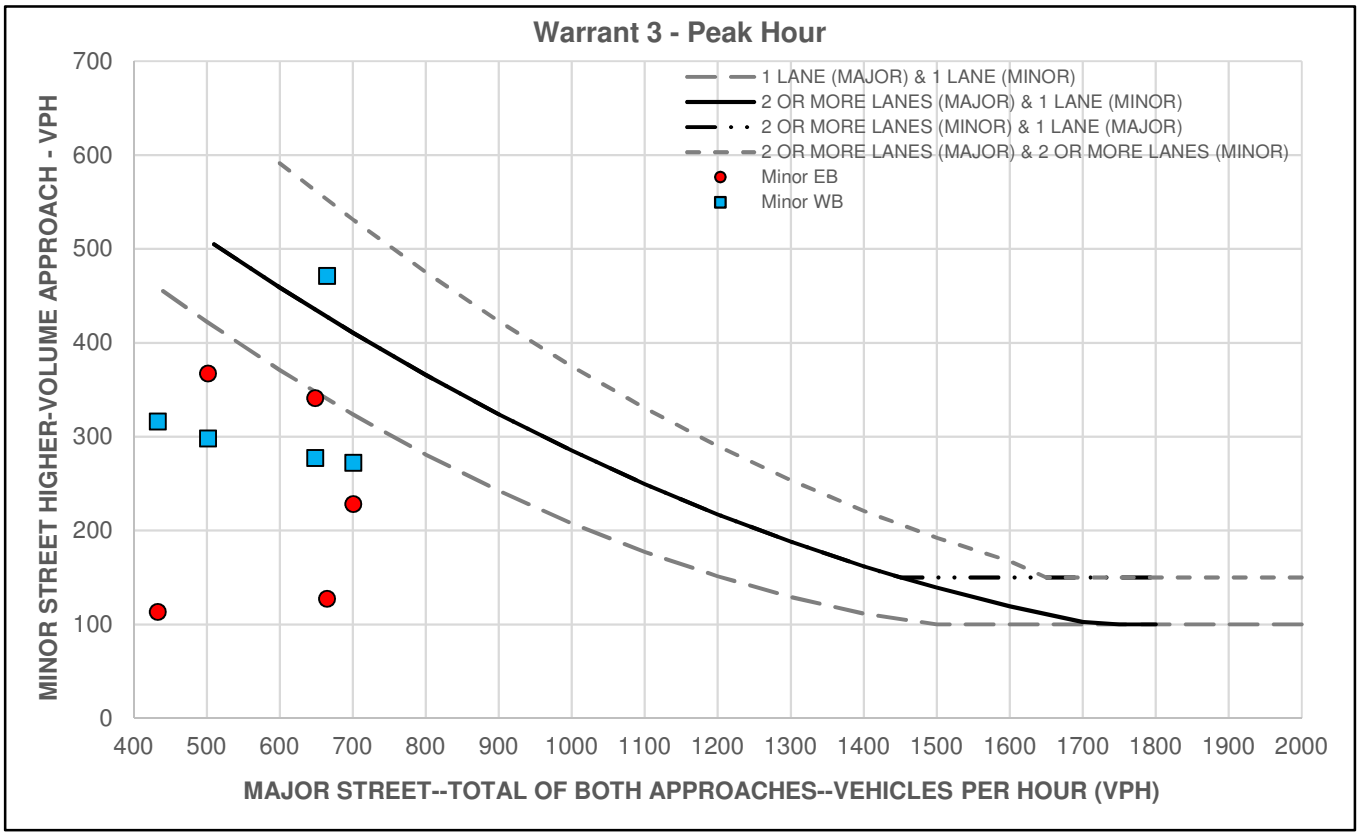


Figure II
Warrant 3 Curve



TURN LANE ASSESSMENT

Turn Lane Analysis

The traffic volumes along Lasater Road, as well as those projected for the site, were compared to national criteria to determine if a left turn lane is warranted at the site driveway. The curve warrants set forth by the American Association of State Transportation and Highway Officials (AASHTO) in their publication *A policy on Geometric Design of Highways and Streets* do not include criteria for roadways with speed limits less than 40 MPH. Conservatively, the 2027 Buildout traffic volumes were compared to criteria for a 40 MPH roadway and it was determined that both driveways do not meet the warrant for a left turn lane during both the weekday morning and evening peak hours. The calculations are contained in Appendix F.

In addition, Chapter 2 of the TxDOT *Access Management Manual* was reviewed to see if a right turn lane would be required. Based upon Table 2-3: Auxiliary Lane Thresholds, the volumes do not warrant the construction of a right turn lane at either of the two proposed driveways to Lasater Road. A copy of this study is contained in Appendix F.

FINDINGS & CONCLUSIONS

Findings

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

- The proposed manufactured home park will generate 21 entering trips and 48 exiting trips during the weekday morning peak hour and 76 entering trips and 46 exiting trips during the weekday evening peak hour that are "new" to the adjacent roadway network.

- Access to the site is proposed to be provided via two full movement driveways along Lasater Road.

- With the addition of site generated traffic, the intersection of Lawson Road and Lasater Road will continue to operate at Background levels of service under the Buildout condition with the exception of the northbound through/right turn movement during the morning peak hour and the westbound approach movement and northbound through/right turn movement, which operate with levels of service "E".

- Under the 5-year Buildout condition, all movements will operate with levels of service "E" or better with the exception of the westbound approach during the morning peak hour and the eastbound and westbound approaches during the evening peak hour, which operate with levels of service "F" under all conditions.

- The 2019 Existing volumes at intersection of Lasater Road and Lawson Road were compared to the traffic signal warrants set forth with the MUTCD. It was determined that Signal Warrants 2 and 3 are satisfied under the existing conditions. It is recommended that the City investigate the possibility of future signalization for the intersection to address existing traffic conditions.

- As designed, the intersection of Lasater Road and the east site driveway is anticipated to operate with levels of service "B" or better under both the 2022 and 2027 Buildout conditions for all peak hours analyzed.

- As designed, the intersection of Lasater Road and the west site driveway is anticipated to operate with levels of service "B" or better under both the 2022 and 2027 Buildout conditions for all peak hours analyzed.

- In accordance with the City of Dallas and TxDOT, left and right turn lanes are not warranted at both of the proposed site driveways.

Conclusions

Based upon our Traffic Impact Analysis as detailed in the body of this report, it is the professional opinion of Dynamic Traffic, LLC that the adjacent street system of the City of Dallas will not experience any significant degradation in operating conditions with the development of The Project. The site driveways are located to provide safe and efficient access to the adjacent roadway system.

Appendix A
Traffic Study Scope

Dynamic Traffic, LLC
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714 S. Greenville Avenue,
Suite 100, Allen, TX 75002
T. 732.681.0760

Traffic Study Scope Proposal

Manufactured Home Development
Block 8838 – Tracts 14, 15, 22, 24 & 26
14707 Lasater Road
City of Dallas, Dallas County, TX
DT # 2450-99-015T

Dynamic Traffic has prepared the following study scoping document for the proposed construction of a 265 unit manufactured home development located along the eastern side of Lasater Road in the City of Dallas, Dallas County, Texas. Based upon the requirements set forth within the Dallas Street Design Manual, dated September 2019, Appendix A-6, Section A, there are eleven (11) modules by which to determine the scope of the traffic study associated with the proposed project. They are as follows:

1. **Project Description:** It is proposed to construct a 265 unit manufactured home development along the eastern side of Lasater Road. The property is designated as Block 8838 – Tracts 14, 15, 22, 24 & 26 and is currently undeveloped. The property is located within the MH (Manufactured Home Park) Zoning District. It is currently anticipated that two full movement access points will be provided to the development from Lasater Road.

2. **Proposed Study Locations:**
   a. Lasater Road & Lawson Road
   b. Lasater Road & Site Roadways

3. **Proposed Roadway Links:**
   a. Lasater Road south of Stacey Street

4. **Proposed Study Hours:**
   a. Weekday AM Peak Hours (7:00-9:00 AM)
   b. Weekday PM Peak Hours (4:00-6:00 AM)

5. **Development Phase:** There is no proposed phasing for the project at this time. It is anticipated that the full buildout of the project will be 2022.

6. **Proposed Study Scenarios:**
   a. Existing
   b. 2022 Background
   c. 2022 Project Buildout
   d. 2027 5-year Horizon

7. **Preliminary Site Traffic Generation:** Trip generation projections for The Project were prepared utilizing trip generation research data as published under Land Use Code 240 – Mobile Home Park in the Institute of Transportation Engineers' (ITE) publication, *Trip Generation, 10th Edition.* The following table summarizes the anticipated trip generation for the project.

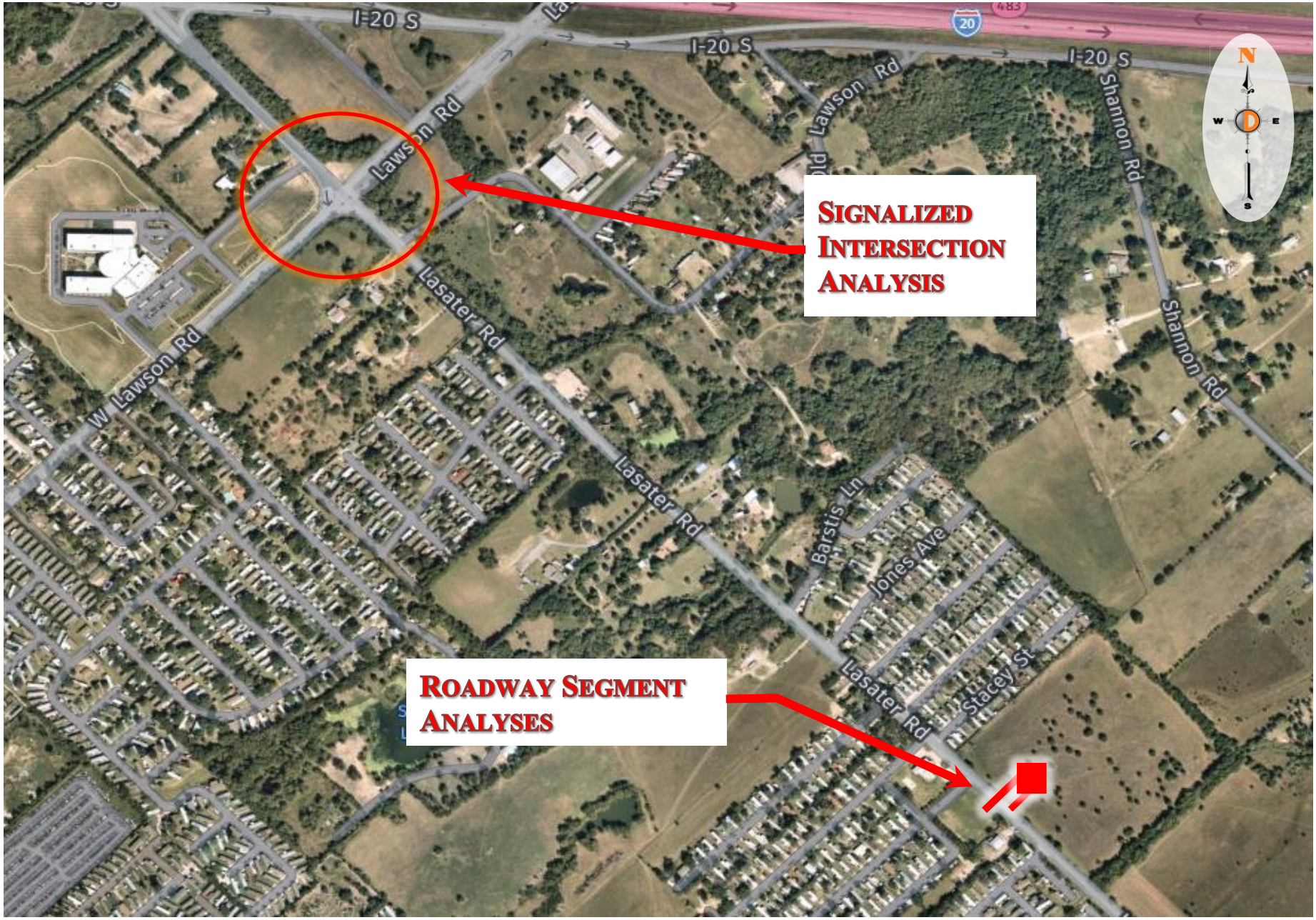
	AM PSH			PM PSH			Daily
	In	Out	Total	In	Out	Total	Traffic
265 Manufactured Homes	21	48	69	76	46	122	1325

8. **Proposed Traffic Growth:** Based upon historical count data as provided on the NTCOG website, we have calculated an average annual growth rate of 2.69%. Consequently, we propose to utilize a background growth rate of 3% per year.

9. **Proposed Trip Distribution:** The trip distribution will be based on the existing turning movement counts and automatic traffic recorder data.

10. **Preliminary Traffic Study Elements:** The following elements are proposed to be included in traffic study:
    a. Intersection level of service analysis utilizing Synchro 10.
    b. Roadway link capacity analyses based upon the NTCOG standards.
    c. Site Access, including driveway location, spacing and sight distances.

11. **Site Location Map:** A Site Location Map is enclosed illustrating all traffic signals and proposed study intersections/roadway segments within a one-mile radius from the subject property. Note that there are no DART stops within one mile of the site.



Location: Lasater Rd & Lawson Rd
Dallas, Dallas Co, NJ

DT #: 2450-99-015T

Justin Taylor

From: Nevarez, David <david.nevarez@dallascityhall.com>
Sent: Monday, December 9, 2019 7:33 PM
To: Justin Taylor
Cc: Avatapalli, Shailaja
Subject: RE: TIA Requirements

Categories: Filed by Newforma

Justin,

The signal warrant analysis is for Lasater at Lawson. Please consider school traffic in your analysis. Please confirm with the school if they have any special events or hours on the date of your observations.

https://www.mesquiteisd.org/school-basics/calendar-test

David Nevarez, P.E., PTOE
City of Dallas | Sustainable Development & Construction | (214) 671.5115

From: Justin Taylor
Sent: Monday, December 9, 2019 3:28 PM
To: Nevarez, David
Cc: Avatapalli, Shailaja
Subject: RE: TIA Requirements

External Email!

David – I am just following up on the email below to confirm the requirements for the Traffic Study. Thanks in advance for your help.

Justin Taylor, PE, PTOE, LEED AP
Principal
Dynamic Traffic

1904 Main Street | Lake Como, New Jersey 07719
PH: (732) 681-0760 Ext. 1131 | Fax: (732) 974-3521 | Cell: (732) 766-2485

From: Justin Taylor
Sent: Wednesday, December 4, 2019 2:14 PM
To: 'Nevarez, David' <david.nevarez@dallascityhall.com>
Cc: Avatapalli, Shailaja <s.avatapalli@dallascityhall.com>
Subject: RE: TIA Requirements

David – thanks for the quick response. To answer your question, we do not currently anticipate any cross connection to Shannon Road, the only access points would be the 2 full movement roadway connections to Lasater Road. We will get moving right away on the traffic study. Just to clarify, we do not need to study Lasater Road and Lawson Road because it is an unsignalized intersection, correct? And you are looking for a traffic signal warrant analysis for the site driveways, including the school peak hour, correct?

Justin Taylor, PE, PTOE, LEED AP
Principal
Dynamic Traffic

1904 Main Street | Lake Como, New Jersey 07719
PH: (732) 681-0760 Ext. 1131 | Fax: (732) 974-3521 | Cell: (732) 766-2485

From: Nevarez, David [mailto:david.nevarez@dallascityhall.com]
Sent: Monday, December 2, 2019 4:44 PM
To: Justin Taylor <jtaylor@dynamictraffic.com>
Cc: Avatapalli, Shailaja <s.avatapalli@dallascityhall.com>
Subject: RE: TIA Requirements

Justin,

During your field observations, you'll see that Lawson at Lasater is not signalized. A signal was not warranted in 2016 when we did our last study. We also received a TIA for this site in recent weeks. I believe the case got denied which explains why the site is now being developed with mobile homes. Let me know if you need me to check.

In any case, your study should include a traffic signal warrant analysis including school traffic peak hours. Also, will the site plan provide access directly to Shannon Road?

David Nevarez, P.E., PTOE
City of Dallas | Sustainable Development & Construction | (214) 671.5115

From: Justin Taylor <jtaylor@dynamictraffic.com>
Sent: Monday, December 2, 2019 10:53 AM
To: Nevarez, David <david.nevarez@dallascityhall.com>
Cc: Avatapalli, Shailaja <s.avatapalli@dallascityhall.com>
Subject: RE: TIA Requirements

External Email!

David – we won the job and are now proceeding with the TIA. Based on our conversation and the information within the Dallas Street Design Manual, I've prepared the attached Scoping proposal for the traffic study. Could you please review and let me know if the scope is acceptable? Also, are you the right person talk to about obtaining the traffic signal timing for the intersection of Lasater Road and Lawson Road?

Justin Taylor, PE, PTOE, LEED AP
Principal
Dynamic Traffic

1904 Main Street | Lake Como, New Jersey 07719
PH: (732) 681-0760 Ext. 1131 | Fax: (732) 974-3521 | Cell: (732) 766-2485

From: Nevarez, David [mailto:david.nevarez@dallascityhall.com]
Sent: Friday, November 8, 2019 4:52 PM
To: Justin Taylor <jtaylor@dynamictraffic.com>
Cc: Avatapalli, Shailaja <s.avatapalli@dallascityhall.com>
Subject: RE: TIA Requirements

Justin,

Do you allow the utilization of ITE Land Use Code 240 – Mobile Home Park for a manufactured home development?

- Yes, we reserve the right to request trip generation based on actual conditions at other existing, similar developments, upon review of the land use statement.

Do you have a specific threshold for determining the locations? Thanks in advance for the help with this!

- There is no specific threshold. Please provide a site location map to help understand the scope of the study. Our determination of scope is based on the amount of site generated traffic and location. We may add any intersection of interest if it's not included in the analysis.

David Nevarez, P.E., PTOE
City of Dallas | Sustainable Development & Construction | (214) 671.5115

From: Justin Taylor
Sent: Friday, November 8, 2019 8:32 AM
To: Nevarez, David
Subject: RE: TIA Requirements

External Email!

David – I'm just following up on the email below. I'm not trying to be pushy, just wanted to make sure I'd written your email address down correctly.

Justin Taylor, PE, PTOE, LEED AP
Principal
Dynamic Traffic

1904 Main Street | Lake Como, New Jersey 07719
PH: (732) 681-0760 Ext. 1131 | Fax: (732) 974-3521 | Cell: (732) 766-2485

From: Justin Taylor
Sent: Thursday, November 7, 2019 12:01 PM
To: 'david.nevarez@dallascityhall.com' <david.nevarez@dallascityhall.com>
Subject: TIA Requirements

David – it was a pleasure speaking with you today. I found the TIA requirements in the Streets Design Manual, thanks for the direction. After reading thru it, I just have 2 follow up questions. First of all, do you allow the utilization of ITE Land Use Code 240 – Mobile Home Park for a manufactured home development? And second, I'm still a little unclear on the study area determination. I would typically follow the ITE guidance for study locations of 100 new peak hour trips, but I noticed reference to all signalized intersections within a ½ mile radius in several locations. Do you have a specific threshold for determining the locations? Thanks in advance for the help with this!

Justin Taylor, PE, PTOE, LEED AP
Principal

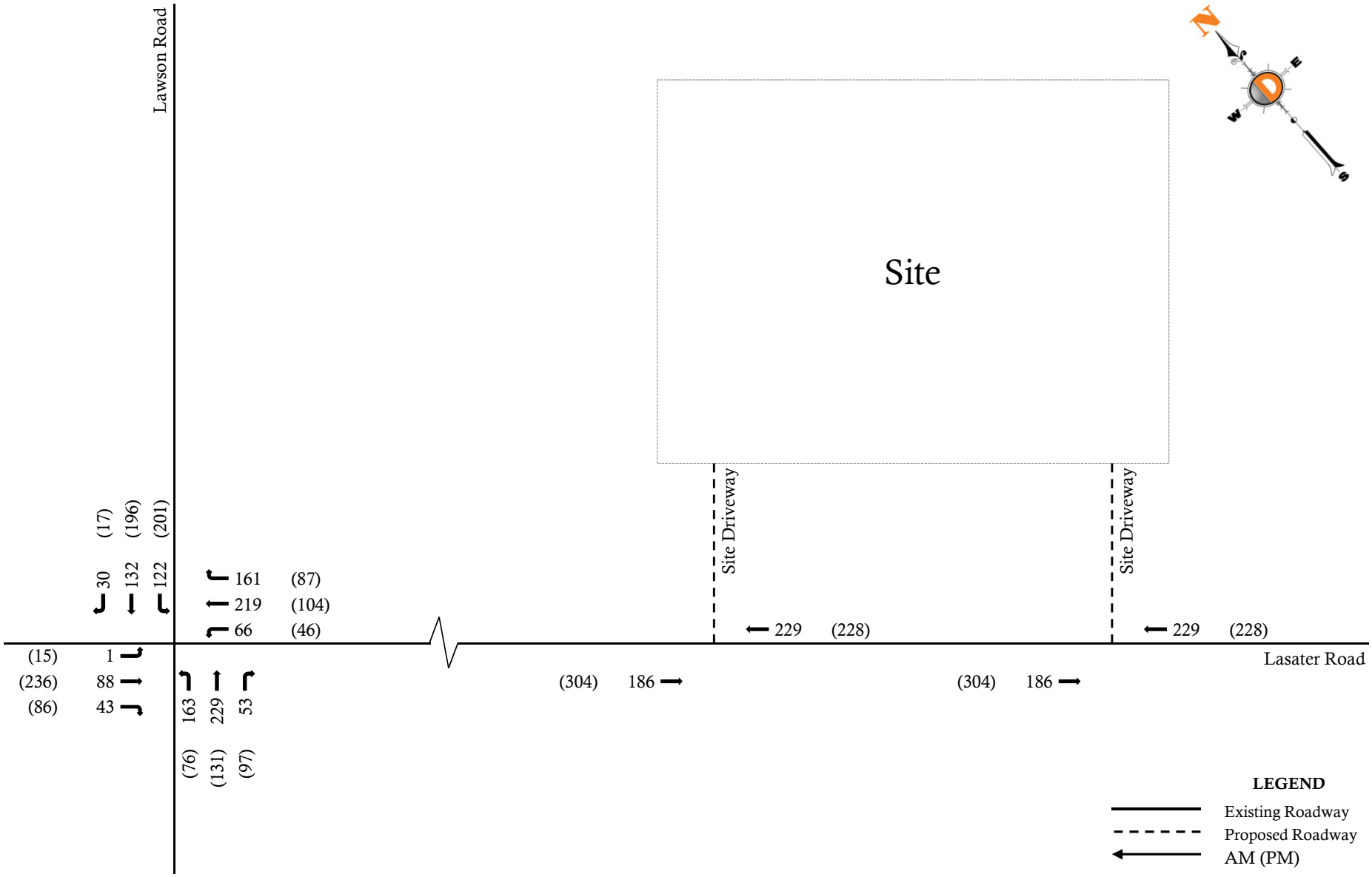
1904 Main Street | Lake Como, New Jersey 07719

Appendix B
Traffic Volume Figures

Proposed Residential Development
Traffic Impact Study
1250-99-015T
1/10/2020

Figure 1

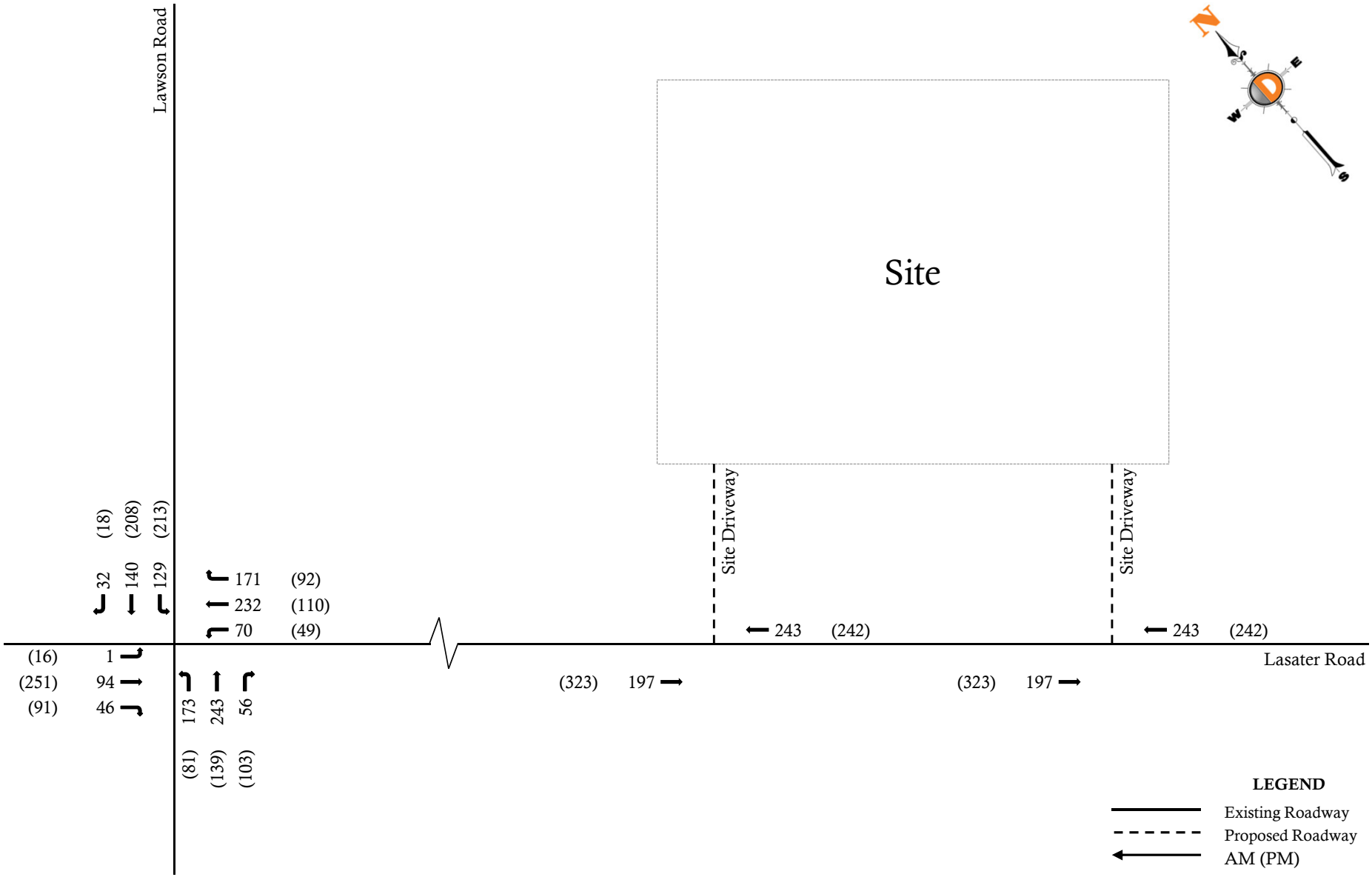
Site Location Map



Proposed Residential Development
Traffic Impact Study
1250-99-015T
1/10/2020

Figure 2

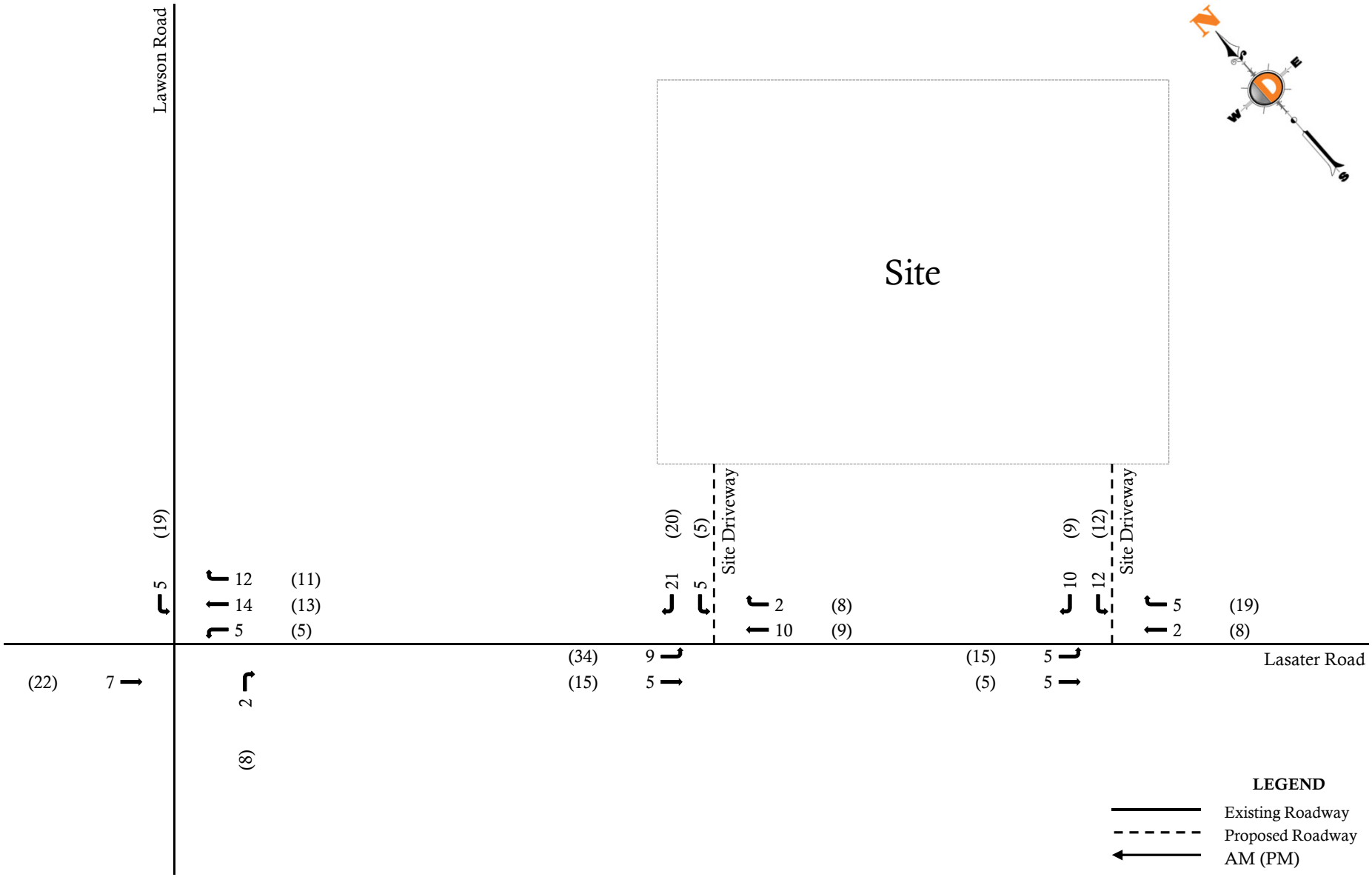
Existing Traffic Volumes



Proposed Residential Development
Traffic Impact Study
1250-99-015T
1/10/2020

Figure 3

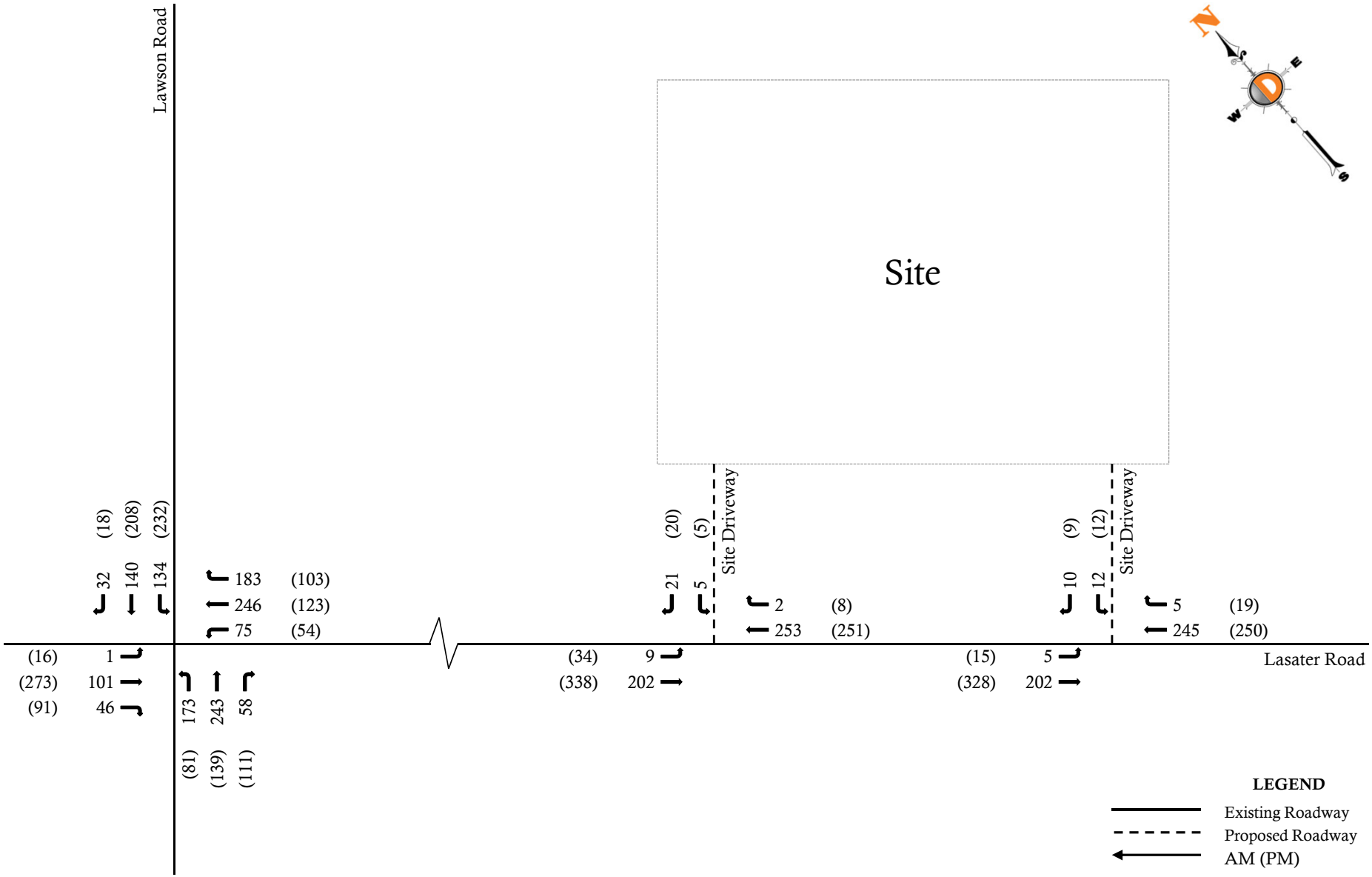
2022 No Build Traffic Volumes



Proposed Residential Development
Traffic Impact Study
1250-99-015T
1/10/2020

Figure 4

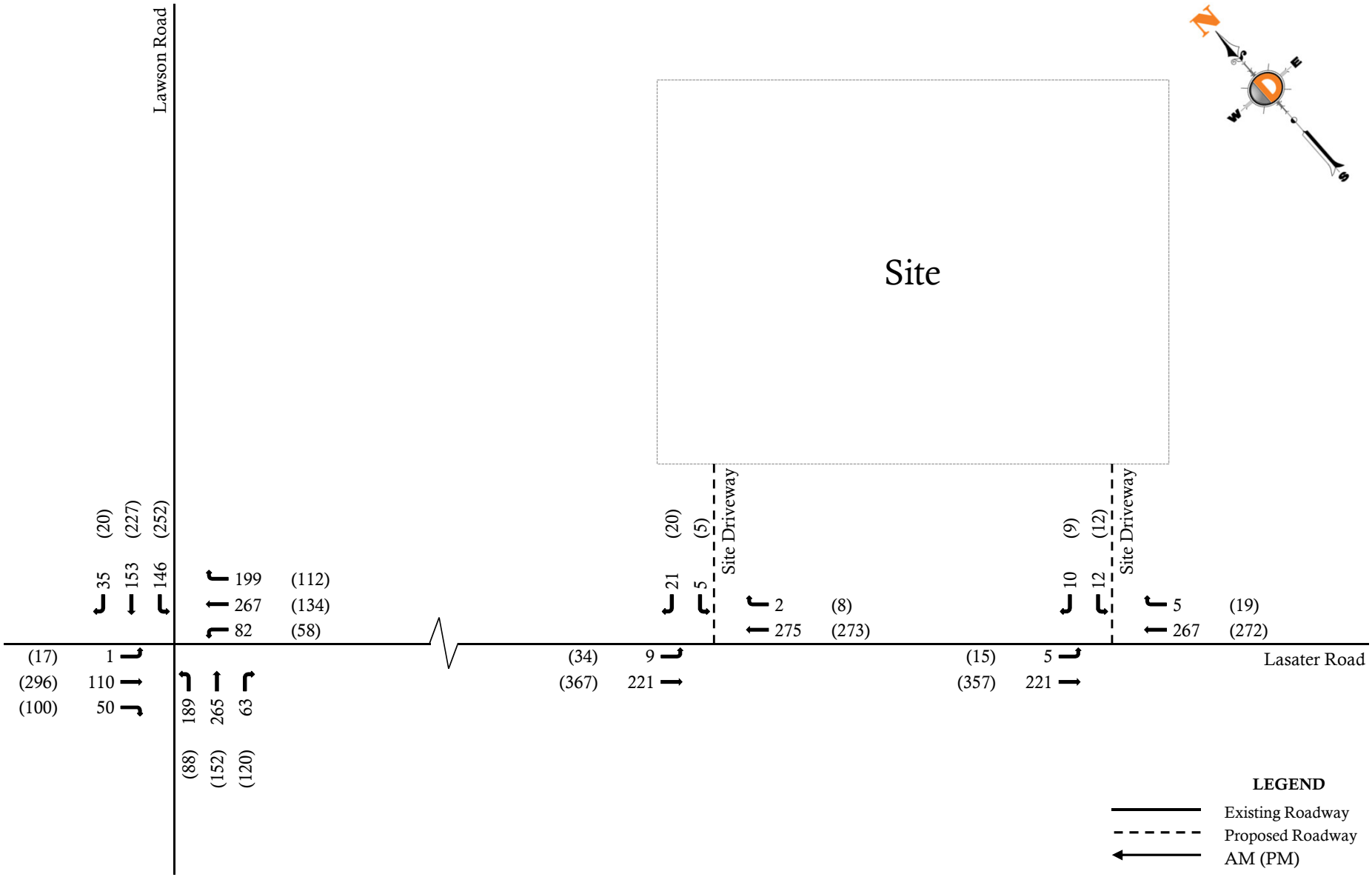
Site Generated Trips



Proposed Residential Development
Traffic Impact Study
1250-99-015T
1/10/2020

Figure 5

2022 Build Traffic Volumes



Proposed Residential Development
Traffic Impact Study
1250-99-015T
1/10/2020

Figure 6

2027 5-year Horizon Build Traffic Volumes

Appendix C
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:Lasater Rd
N/S:Lawson Rd
Town/County: Dallas/Dallas County
Job #: 2450-99-015T

File Name : Lawson Rd @ Lasater Rd-11-19-19
Site Code : 00000000
Start Date : 11/19/2019
Page No : 1

Groups Printed- Cars - Medium - Articulated

	Lasater Road Eastbound					Lasater Road Westbound					Lawson Road Northbound					Lawson Road Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	16	9	0	25	11	63	54	0	128	17	33	4	0	54	17	18	9	0	44	251
07:15 AM	0	18	9	0	27	19	65	28	0	112	66	57	11	0	134	15	33	15	0	63	336
07:30 AM	1	19	18	0	38	22	62	50	0	134	50	65	15	0	130	27	30	9	0	66	368
07:45 AM	0	40	7	0	47	12	57	43	0	112	28	66	23	0	117	28	35	6	1	70	346
Total	1	93	43	0	137	64	247	175	0	486	161	221	53	0	435	87	116	39	1	243	1301
08:00 AM	0	19	12	0	31	9	35	45	0	89	14	66	8	0	88	43	32	0	0	75	283
08:15 AM	0	19	13	0	32	6	41	24	0	71	17	30	6	0	53	34	35	2	0	71	227
08:30 AM	0	21	10	0	31	5	38	39	0	82	11	28	3	0	42	19	29	1	0	49	204
08:45 AM	0	16	8	0	24	9	26	25	0	60	9	20	4	0	33	11	9	0	0	20	137
Total	0	75	43	0	118	29	140	133	0	302	51	144	21	0	216	107	105	3	0	215	851
*** BREAK ***																					
02:00 PM	2	19	7	0	28	8	20	10	0	38	5	23	9	0	37	13	12	0	0	25	128
02:15 PM	0	31	9	0	40	16	37	22	0	75	9	22	9	0	40	18	16	2	0	36	191
02:30 PM	0	25	14	0	39	8	27	20	0	55	5	23	10	0	38	22	23	3	0	48	180
02:45 PM	0	23	18	0	41	17	38	30	0	85	12	26	17	0	55	12	23	2	0	37	218
Total	2	98	48	0	148	49	122	82	0	253	31	94	45	0	170	65	74	7	0	146	717
03:00 PM	1	38	14	0	53	10	42	20	0	72	23	45	23	0	91	25	36	6	0	67	283
03:15 PM	0	45	15	0	60	9	26	30	0	65	27	85	19	0	131	51	36	1	0	88	344
03:30 PM	0	30	10	0	40	17	33	30	0	80	9	37	20	0	66	25	26	1	0	52	238
03:45 PM	8	45	19	0	72	7	24	23	0	54	12	29	21	0	62	53	77	5	0	135	323
Total	9	158	58	0	225	43	125	103	0	271	71	196	83	0	350	154	175	13	0	342	1188
04:00 PM	1	59	21	0	81	20	22	29	0	71	18	29	25	0	72	54	51	8	0	113	337
04:15 PM	3	51	28	0	82	9	24	26	0	59	26	42	24	1	93	49	40	1	0	90	324
04:30 PM	3	56	22	0	81	14	27	10	0	51	11	28	29	0	68	39	24	1	0	64	264
04:45 PM	2	53	24	0	79	17	36	36	0	89	12	30	29	0	71	28	23	0	1	52	291
Total	9	219	95	0	323	60	109	101	0	270	67	129	107	1	304	170	138	10	1	319	1216
05:00 PM	0	59	23	0	82	12	31	24	0	67	12	25	30	0	67	37	30	0	0	67	283
05:15 PM	0	69	20	0	89	14	44	25	0	83	7	28	18	0	53	45	33	1	0	79	304
05:30 PM	0	57	21	0	78	19	28	24	0	71	9	30	22	0	61	32	24	1	0	57	267
05:45 PM	1	82	25	0	108	29	31	19	0	79	13	25	32	0	70	29	21	1	0	51	308
Total	1	267	89	0	357	74	134	92	0	300	41	108	102	0	251	143	108	3	0	254	1162
Grand Total	22	910	376	0	1308	319	877	686	0	1882	422	892	411	1	1726	726	716	75	2	1519	6435
Apprch %	1.7	69.6	28.7	0		17	46.6	36.5	0		24.4	51.7	23.8	0.1		47.8	47.1	4.9	0.1		
Total %	0.3	14.1	5.8	0	20.3	5	13.6	10.7	0	29.2	6.6	13.9	6.4	0	26.8	11.3	11.1	1.2	0	23.6	
Cars	21	878	356	0	1255	318	853	664	0	1835	398	877	396	1	1672	702	703	75	2	1482	6244
% Cars	95.5	96.5	94.7	0	95.9	99.7	97.3	96.8	0	97.5	94.3	98.3	96.4	100	96.9	96.7	98.2	100	100	97.6	97
Medium	1	26	19	0	46	1	21	17	0	39	22	12	15	0	49	18	11	0	0	29	163
% Medium	4.5	2.9	5.1	0	3.5	0.3	2.4	2.5	0	2.1	5.2	1.3	3.6	0	2.8	2.5	1.5	0	0	1.9	2.5
Articulated	0	6	1	0	7	0	3	5	0	8	2	3	0	0	5	6	2	0	0	8	28
% Articulated																					

Dynamic Traffic, LLC

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

E/W:Lasater Rd
N/S:Lawson Rd
Town/County: Dallas/Dallas County
Job #: 2450-99-015T

File Name : Lawson Rd @ Lasater Rd-11-20-19
Site Code : 00000000
Start Date : 11/20/2019
Page No : 1

Groups Printed- Cars - Medium - Articulated

	Lasater Road Eastbound					Lasater Road Westbound					Lawson Road Northbound					Lawson Road Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	16	8	0	24	12	62	50	0	124	19	37	3	0	59	16	17	9	0	42	249
07:15 AM	0	15	6	0	21	21	65	23	0	109	74	49	10	0	133	15	34	14	0	63	326
07:30 AM	1	22	18	0	41	24	61	47	0	132	52	56	14	0	122	29	28	9	0	66	361
07:45 AM	0	35	6	0	41	13	53	40	0	106	25	57	21	0	103	33	37	7	1	78	328
Total	1	88	38	0	127	70	241	160	0	471	170	199	48	0	417	93	116	39	1	249	1264
08:00 AM	0	16	13	0	29	8	40	51	0	99	12	67	8	0	87	45	33	0	0	78	293
08:15 AM	0	17	12	0	29	6	39	23	0	68	15	31	5	0	51	36	32	2	0	70	218
08:30 AM	0	20	12	0	32	5	36	40	0	81	12	32	3	0	47	20	28	1	0	49	209
08:45 AM	0	13	10	0	23	9	29	30	0	68	7	21	4	0	32	10	9	0	0	19	142
Total	0	66	47	0	113	28	144	144	0	316	46	151	20	0	217	111	102	3	0	216	862
*** BREAK ***																					
02:00 PM	2	17	7	0	26	6	19	9	0	34	6	19	9	0	34	13	10	0	0	23	117
02:15 PM	0	26	8	0	34	13	38	25	0	76	7	19	8	0	34	15	13	2	0	30	174
02:30 PM	0	28	16	0	44	9	29	24	0	62	5	26	12	0	43	24	22	3	0	49	198
02:45 PM	0	25	16	0	41	16	38	34	0	88	14	27	14	0	55	13	26	2	0	41	225
Total	2	96	47	0	145	44	124	92	0	260	32	91	43	0	166	65	71	7	0	143	714
03:00 PM	1	37	13	0	51	10	48	17	0	75	28	51	29	0	108	28	34	5	0	67	301
03:15 PM	0	54	16	0	70	9	21	28	0	58	28	80	22	0	130	57	30	1	0	88	346
03:30 PM	0	29	9	0	38	18	31	33	0	82	10	30	21	0	61	25	25	1	0	51	232
03:45 PM	8	41	20	0	69	8	26	23	0	57	12	30	22	0	64	51	76	5	0	132	322
Total	9	161	58	0	228	45	126	101	0	272	78	191	94	0	363	161	165	12	0	338	1201
04:00 PM	1	67	19	0	87	19	22	29	0	70	20	34	25	0	79	59	59	10	0	128	364
04:15 PM	3	61	24	0	88	8	24	25	0	57	32	37	22	1	92	55	35	1	0	91	328
04:30 PM	3	67	23	0	93	11	32	10	0	53	12	30	28	0	70	36	26	1	0	63	279
04:45 PM	2	46	25	0	73	17	42	38	0	97	13	34	31	0	78	30	19	0	1	50	298
Total	9	241	91	0	341	55	120	102	0	277	77	135	106	1	319	180	139	12	1	332	1269
05:00 PM	0	68	19	0	87	14	29	23	0	66	14	28	31	0	73	36	34	0	0	70	296
05:15 PM	0	70	19	0	89	16	43	29	0	88	8	29	17	0	54	38	30	1	0	69	300
05:30 PM	0	66	20	0	86	18	23	27	0	68	10	27	23	0	60	33	24	1	0	58	272
05:45 PM	1	75	29	0	105	28	26	22	0	76	14	25	33	0	72	24	21	1	0	46	299
Total	1	279	87	0	367	76	121	101	0	298	46	109	104	0	259	131	109	3	0	243	1167
Grand Total	22	931	368	0	1321	318	876	700	0	1894	449	876	415	1	1741	741	702	76	2	1521	6477
Apprch %	1.7	70.5	27.9	0		16.8	46.3	37	0		25.8	50.3	23.8	0.1		48.7	46.2	5	0.1		
Total %	0.3	14.4	5.7	0	20.4	4.9	13.5	10.8	0	29.2	6.9	13.5	6.4	0	26.9	11.4	10.8	1.2	0	23.5	
Cars	21	899	350	0	1270	317	851	673	0	1841	423	862	398	1	1684	720	689	76	2	1487	6282
% Cars	95.5	96.6	95.1	0	96.1	99.7	97.1	96.1	0	97.2	94.2	98.4	95.9	100	96.7	97.2	98.1	100	100	97.8	97
Medium	1	25	17	0	43	1	21	23	0	45	23	11	17	0	51	15	11	0	0	26	165
% Medium	4.5	2.7	4.6	0	3.3	0.3	2.4	3.3	0	2.4	5.1	1.3	4.1	0	2.9	2	1.6	0	0	1.7	2.5
Articulated	0	7	1	0	8	0	4	4	0	8	3	3	0	0	6	6	2	0	0	8	30
% Articulated																					

Dynamic Traffic, LLC

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

Location: Lasater Rd
Cross Street: E of Stacey St
Town/County: Dallas/Dallas
Job #: 2450-99-015T

Site Code:
Station ID:

Latitude: 0' 0.0000 Undefined

Start	18-Nov-19		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	*	*	*	*	23	17	*	*	*	*	*	*	*	*	23	17
01:00	*	*	*	*	12	6	*	*	*	*	*	*	*	*	12	6
02:00	*	*	*	*	9	9	*	*	*	*	*	*	*	*	9	9
03:00	*	*	*	*	18	23	*	*	*	*	*	*	*	*	18	23
04:00	*	*	*	*	30	59	*	*	*	*	*	*	*	*	30	59
05:00	*	*	*	*	52	221	*	*	*	*	*	*	*	*	52	221
06:00	*	*	*	*	62	**244**	*	*	*	*	*	*	*	*	62	**244**
07:00	*	*	*	*	**186**	229	*	*	*	*	*	*	*	*	**186**	229
08:00	*	*	*	*	124	144	*	*	*	*	*	*	*	*	124	144
09:00	*	*	*	*	88	112	*	*	*	*	*	*	*	*	88	112
10:00	*	*	*	*	94	125	*	*	*	*	*	*	*	*	94	125
11:00	*	*	*	*	106	104	*	*	*	*	*	*	*	*	106	104
12:00 PM	*	*	*	*	135	116	*	*	*	*	*	*	*	*	135	116
01:00	*	*	*	*	121	103	*	*	*	*	*	*	*	*	121	103
02:00	*	*	*	*	118	130	*	*	*	*	*	*	*	*	118	130
03:00	*	*	*	*	224	140	*	*	*	*	*	*	*	*	224	140
04:00	*	*	*	*	260	180	*	*	*	*	*	*	*	*	260	180
05:00	*	*	*	*	**305**	**225**	*	*	*	*	*	*	*	*	**305**	**225**
06:00	*	*	*	*	272	184	*	*	*	*	*	*	*	*	272	184
07:00	*	*	*	*	244	131	*	*	*	*	*	*	*	*	244	131
08:00	*	*	*	*	148	106	*	*	*	*	*	*	*	*	148	106
09:00	*	*	*	*	143	77	*	*	*	*	*	*	*	*	143	77
10:00	*	*	*	*	73	53	*	*	*	*	*	*	*	*	73	53
11:00	*	*	*	*	44	27	*	*	*	*	*	*	*	*	44	27
Total	0	0	0	0	2891	2765	0	0	0	0	0	0	0	0	2891	2765
Day	0		0		5656		0		0		0		0		5656	
AM Peak	-	-	-	-	07:00	06:00	-	-	-	-	-	-	-	-	07:00	06:00
Vol.	-	-	-	-	186	244	-	-	-	-	-	-	-	-	186	244
PM Peak	-	-	-	-	17:00	17:00	-	-	-	-	-	-	-	-	17:00	17:00
Vol.	-	-	-	-	305	225	-	-	-	-	-	-	-	-	305	225

Comb. Total	0	0	5656	0	0	0	0	5656

ADT ADT 5,656 AADT 5,656

Appendix D
Capacity Analysis

Intersection	
Intersection Delay, s/veh	36.8
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	88	43	66	219	161	163	229	53	122	132	30
Future Vol, veh/h	1	88	43	66	219	161	163	229	53	122	132	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	9	7	2	2	3	5	1	11	4	0	0
Mvmt Flow	1	97	47	73	241	177	179	252	58	134	145	33
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	15.2	69.8	24.2	14.8
HCM LOS	C	F	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	1%	15%	100%	0%	0%
Vol Thru, %	0%	81%	67%	49%	0%	100%	0%
Vol Right, %	0%	19%	33%	36%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	163	282	132	446	122	132	30
LT Vol	163	0	1	66	122	0	0
Through Vol	0	229	88	219	0	132	0
RT Vol	0	53	43	161	0	0	30
Lane Flow Rate	179	310	145	490	134	145	33
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.434	0.691	0.331	1.007	0.323	0.325	0.068
Departure Headway (Hd)	8.994	8.263	8.394	7.399	8.864	8.273	7.464
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	403	440	431	490	408	437	478
Service Time	6.694	5.963	6.094	5.136	6.564	5.973	5.245
HCM Lane V/C Ratio	0.444	0.705	0.336	1	0.328	0.332	0.069
HCM Control Delay	18.4	27.5	15.2	69.8	15.7	14.9	10.8
HCM Lane LOS	C	D	C	F	C	B	B
HCM 95th-tile Q	2.1	5.1	1.4	13.7	1.4	1.4	0.2

Intersection	
Intersection Delay, s/veh	26.9
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	236	86	46	104	87	76	131	97	201	196	17
Future Vol, veh/h	15	236	86	46	104	87	76	131	97	201	196	17
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	0	4	5	0	10	10	7	4	3	4	3	0
Mvmt Flow	17	265	97	52	117	98	85	147	109	226	220	19
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	40.9	23.8	22.9	20.3
HCM LOS	E	C	C	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	4%	19%	100%	0%	0%
Vol Thru, %	0%	57%	70%	44%	0%	100%	0%
Vol Right, %	0%	43%	26%	37%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	76	228	337	237	201	196	17
LT Vol	76	0	15	46	201	0	0
Through Vol	0	131	236	104	0	196	0
RT Vol	0	97	86	87	0	0	17
Lane Flow Rate	85	256	379	266	226	220	19
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.23	0.627	0.842	0.618	0.552	0.506	0.04
Departure Headway (Hd)	9.708	8.816	8.002	8.358	8.802	8.265	7.484
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	369	410	454	431	409	436	477
Service Time	7.483	6.59	5.757	6.121	6.566	6.029	5.248
HCM Lane V/C Ratio	0.23	0.624	0.835	0.617	0.553	0.505	0.04
HCM Control Delay	15.4	25.4	40.9	23.8	22	19.3	10.6
HCM Lane LOS	C	D	E	C	C	C	B
HCM 95th-tile Q	0.9	4.1	8.3	4	3.2	2.8	0.1

Intersection	
Intersection Delay, s/veh	47.4
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	94	46	70	232	171	173	243	56	129	140	32
Future Vol, veh/h	1	94	46	70	232	171	173	243	56	129	140	32
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	9	7	2	2	3	5	1	11	4	0	0
Mvmt Flow	1	103	51	77	255	188	190	267	62	142	154	35
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	16.2	96.6	27.5	15.7
HCM LOS	C	F	D	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	1%	15%	100%	0%	0%
Vol Thru, %	0%	81%	67%	49%	0%	100%	0%
Vol Right, %	0%	19%	33%	36%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	173	299	141	473	129	140	32
LT Vol	173	0	1	70	129	0	0
Through Vol	0	243	94	232	0	140	0
RT Vol	0	56	46	171	0	0	32
Lane Flow Rate	190	329	155	520	142	154	35
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.465	0.74	0.358	1.095	0.344	0.35	0.073
Departure Headway (Hd)	9.308	8.574	8.696	7.583	9.175	8.583	7.852
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	390	424	417	478	394	422	459
Service Time	7.008	6.274	6.396	5.319	6.875	6.283	5.552
HCM Lane V/C Ratio	0.487	0.776	0.372	1.088	0.36	0.365	0.076
HCM Control Delay	19.8	32	16.2	96.6	16.6	15.8	11.2
HCM Lane LOS	C	D	C	F	C	C	B
HCM 95th-tile Q	2.4	5.9	1.6	17	1.5	1.5	0.2

Intersection	
Intersection Delay, s/veh	34.4
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	251	91	49	110	92	81	139	103	213	208	18
Future Vol, veh/h	16	251	91	49	110	92	81	139	103	213	208	18
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	0	4	5	0	10	10	7	4	3	4	3	0
Mvmt Flow	18	282	102	55	124	103	91	156	116	239	234	20
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	57.7	28.9	27.7	23.5
HCM LOS	F	D	D	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	4%	20%	100%	0%	0%
Vol Thru, %	0%	57%	70%	44%	0%	100%	0%
Vol Right, %	0%	43%	25%	37%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	81	242	358	251	213	208	18
LT Vol	81	0	16	49	213	0	0
Through Vol	0	139	251	110	0	208	0
RT Vol	0	103	91	92	0	0	18
Lane Flow Rate	91	272	402	282	239	234	20
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.258	0.703	0.934	0.687	0.614	0.565	0.044
Departure Headway (Hd)	10.2	9.303	8.362	8.773	9.236	8.697	7.913
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	351	386	434	412	390	414	450
Service Time	7.995	7.098	6.136	6.555	7.022	6.482	5.697
HCM Lane V/C Ratio	0.259	0.705	0.926	0.684	0.613	0.565	0.044
HCM Control Delay	16.5	31.5	57.7	28.9	25.8	22.3	11.1
HCM Lane LOS	C	D	F	D	D	C	B
HCM 95th-tile Q	1	5.2	10.6	5	3.9	3.4	0.1

Intersection	
Intersection Delay, s/veh	58.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	101	46	75	246	183	173	243	58	134	140	32
Future Vol, veh/h	1	101	46	75	246	183	173	243	58	134	140	32
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	9	7	2	2	3	5	1	11	4	0	0
Mvmt Flow	1	111	51	82	270	201	190	267	64	147	154	35
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	16.9	125.7	28.3	16.1
HCM LOS	C	F	D	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	1%	15%	100%	0%	0%
Vol Thru, %	0%	81%	68%	49%	0%	100%	0%
Vol Right, %	0%	19%	31%	36%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	173	301	148	504	134	140	32
LT Vol	173	0	1	75	134	0	0
Through Vol	0	243	101	246	0	140	0
RT Vol	0	58	46	183	0	0	32
Lane Flow Rate	190	331	163	554	147	154	35
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.463	0.742	0.379	1.178	0.356	0.347	0.073
Departure Headway (Hd)	9.541	8.801	8.853	7.654	9.4	8.806	8.074
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	380	413	410	476	386	411	446
Service Time	7.241	6.501	6.553	5.362	7.1	6.506	5.774
HCM Lane V/C Ratio	0.5	0.801	0.398	1.164	0.381	0.375	0.078
HCM Control Delay	20.2	32.9	16.9	125.7	17.2	16.1	11.4
HCM Lane LOS	C	D	C	F	C	C	B
HCM 95th-tile Q	2.4	5.9	1.7	20.6	1.6	1.5	0.2

Intersection	
Intersection Delay, s/veh	46
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	273	91	54	123	103	81	139	111	232	208	18
Future Vol, veh/h	16	273	91	54	123	103	81	139	111	232	208	18
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	0	4	5	0	10	10	7	4	3	4	3	0
Mvmt Flow	18	307	102	61	138	116	91	156	125	261	234	20
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	85.8	38.2	32.5	27.5
HCM LOS	F	E	D	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	4%	19%	100%	0%	0%
Vol Thru, %	0%	56%	72%	44%	0%	100%	0%
Vol Right, %	0%	44%	24%	37%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	81	250	380	280	232	208	18
LT Vol	81	0	16	54	232	0	0
Through Vol	0	139	273	123	0	208	0
RT Vol	0	111	91	103	0	0	18
Lane Flow Rate	91	281	427	315	261	234	20
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.263	0.752	1.042	0.784	0.69	0.584	0.046
Departure Headway (Hd)	10.877	9.96	8.785	9.219	9.816	9.273	8.485
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	332	365	418	396	370	393	425
Service Time	8.577	7.66	6.482	6.919	7.516	6.973	6.185
HCM Lane V/C Ratio	0.274	0.77	1.022	0.795	0.705	0.595	0.047
HCM Control Delay	17.4	37.4	85.8	38.2	31.7	24.2	11.6
HCM Lane LOS	C	E	F	E	D	C	B
HCM 95th-tile Q	1	5.9	13.8	6.7	5	3.6	0.1

Intersection	
Intersection Delay, s/veh	81.7
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	110	50	82	267	199	189	265	63	146	153	35
Future Vol, veh/h	1	110	50	82	267	199	189	265	63	146	153	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	9	7	2	2	3	5	1	11	4	0	0
Mvmt Flow	1	121	55	90	293	219	208	291	69	160	168	38
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	18.7	181.9	36.6	17.7
HCM LOS	C	F	E	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	1%	15%	100%	0%	0%
Vol Thru, %	0%	81%	68%	49%	0%	100%	0%
Vol Right, %	0%	19%	31%	36%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	189	328	161	548	146	153	35
LT Vol	189	0	1	82	146	0	0
Through Vol	0	265	110	267	0	153	0
RT Vol	0	63	50	199	0	0	35
Lane Flow Rate	208	360	177	602	160	168	38
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.52	0.832	0.422	1.319	0.397	0.39	0.082
Departure Headway (Hd)	10.059	9.315	9.364	7.888	9.897	9.299	8.563
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	361	393	387	458	366	390	421
Service Time	7.759	7.015	7.064	5.674	7.597	6.999	6.263
HCM Lane V/C Ratio	0.576	0.916	0.457	1.314	0.437	0.431	0.09
HCM Control Delay	23.2	44.3	18.7	181.9	19	17.8	12
HCM Lane LOS	C	E	C	F	C	C	B
HCM 95th-tile Q	2.9	7.6	2	26.4	1.9	1.8	0.3

Intersection	
Intersection Delay, s/veh	64.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	296	100	58	134	112	88	152	120	252	227	20
Future Vol, veh/h	17	296	100	58	134	112	88	152	120	252	227	20
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	0	4	5	0	10	10	7	4	3	4	3	0
Mvmt Flow	19	333	112	65	151	126	99	171	135	283	255	22
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	133.8	50.2	41.6	33.6
HCM LOS	F	F	E	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	4%	19%	100%	0%	0%
Vol Thru, %	0%	56%	72%	44%	0%	100%	0%
Vol Right, %	0%	44%	24%	37%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	272	413	304	252	227	20
LT Vol	88	0	17	58	252	0	0
Through Vol	0	152	296	134	0	227	0
RT Vol	0	120	100	112	0	0	20
Lane Flow Rate	99	306	464	342	283	255	22
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.292	0.831	1.182	0.862	0.76	0.648	0.052
Departure Headway (Hd)	11.553	10.632	9.167	9.729	10.398	9.853	9.061
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	313	342	399	376	351	370	398
Service Time	9.253	8.332	6.867	7.429	8.098	7.553	6.761
HCM Lane V/C Ratio	0.316	0.895	1.163	0.91	0.806	0.689	0.055
HCM Control Delay	18.9	48.9	133.8	50.2	39.5	29	12.3
HCM Lane LOS	C	E	F	F	E	D	B
HCM 95th-tile Q	1.2	7.3	18.4	8.2	6	4.3	0.2

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	202	245	5	12	10
Future Vol, veh/h	5	202	245	5	12	10
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, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	7	2	2	2	2
Mvmt Flow	6	224	272	6	13	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	278	0	-	0	511	275
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1285	-	-	-	523	764
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1285	-	-	-	520	764
Mov Cap-2 Maneuver	-	-	-	-	520	-
Stage 1	-	-	-	-	767	-
Stage 2	-	-	-	-	803	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1285	-	-	-	608
HCM Lane V/C Ratio	0.004	-	-	-	0.04
HCM Control Delay (s)	7.8	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	328	250	19	12	9
Future Vol, veh/h	15	328	250	19	12	9
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, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	4	8	2	2	2
Mvmt Flow	17	377	287	22	14	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	309	0	-	0	709	298
Stage 1	-	-	-	-	298	-
Stage 2	-	-	-	-	411	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1252	-	-	-	401	741
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	669	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1252	-	-	-	394	741
Mov Cap-2 Maneuver	-	-	-	-	394	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	669	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	12.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1252	-	-	-	493
HCM Lane V/C Ratio	0.014	-	-	-	0.049
HCM Control Delay (s)	7.9	0	-	-	12.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	221	267	5	12	10
Future Vol, veh/h	5	221	267	5	12	10
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, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	7	2	2	2	2
Mvmt Flow	6	246	297	6	13	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	303	0	-	0	558	300
Stage 1	-	-	-	-	300	-
Stage 2	-	-	-	-	258	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1258	-	-	-	491	740
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	785	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1258	-	-	-	488	740
Mov Cap-2 Maneuver	-	-	-	-	488	-
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	785	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1258	-	-	-	577
HCM Lane V/C Ratio	0.004	-	-	-	0.042
HCM Control Delay (s)	7.9	0	-	-	11.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	357	272	19	12	9
Future Vol, veh/h	15	357	272	19	12	9
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, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	4	8	2	2	2
Mvmt Flow	17	410	313	22	14	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	335	0	-	0	768	324
Stage 1	-	-	-	-	324	-
Stage 2	-	-	-	-	444	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1224	-	-	-	370	717
Stage 1	-	-	-	-	733	-
Stage 2	-	-	-	-	646	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1224	-	-	-	363	717
Mov Cap-2 Maneuver	-	-	-	-	363	-
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	646	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1224	-	-	-	460
HCM Lane V/C Ratio	0.014	-	-	-	0.052
HCM Control Delay (s)	8	0	-	-	13.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	202	253	2	5	21
Future Vol, veh/h	9	202	253	2	5	21
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, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	7	2	2	2	2
Mvmt Flow	10	224	281	2	6	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	283	0	-	0	526	282
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	244	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1279	-	-	-	512	757
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	797	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1279	-	-	-	507	757
Mov Cap-2 Maneuver	-	-	-	-	507	-
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1279	-	-	-	691
HCM Lane V/C Ratio	0.008	-	-	-	0.042
HCM Control Delay (s)	7.8	0	-	-	10.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	34	338	251	8	5	20
Future Vol, veh/h	34	338	251	8	5	20
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, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	4	8	2	2	2
Mvmt Flow	39	389	289	9	6	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	298	0	-	0	761	294
Stage 1	-	-	-	-	294	-
Stage 2	-	-	-	-	467	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1263	-	-	-	373	745
Stage 1	-	-	-	-	756	-
Stage 2	-	-	-	-	631	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1263	-	-	-	358	745
Mov Cap-2 Maneuver	-	-	-	-	358	-
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	631	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1263	-	-	-	613
HCM Lane V/C Ratio	0.031	-	-	-	0.047
HCM Control Delay (s)	7.9	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	221	275	2	5	21
Future Vol, veh/h	9	221	275	2	5	21
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, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	7	2	2	2	2
Mvmt Flow	10	246	306	2	6	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	308	0	-	0	573	307
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	266	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1253	-	-	-	481	733
Stage 1	-	-	-	-	746	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1253	-	-	-	477	733
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1253	-	-	-	664
HCM Lane V/C Ratio	0.008	-	-	-	0.044
HCM Control Delay (s)	7.9	0	-	-	10.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	34	367	273	8	5	20
Future Vol, veh/h	34	367	273	8	5	20
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, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	4	8	2	2	2
Mvmt Flow	39	422	314	9	6	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	323	0	-	0	819	319
Stage 1	-	-	-	-	319	-
Stage 2	-	-	-	-	500	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1237	-	-	-	345	722
Stage 1	-	-	-	-	737	-
Stage 2	-	-	-	-	609	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1237	-	-	-	331	722
Mov Cap-2 Maneuver	-	-	-	-	331	-
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	609	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1237	-	-	-	584
HCM Lane V/C Ratio	0.032	-	-	-	0.049
HCM Control Delay (s)	8	0	-	-	11.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Appendix E
Signal Warrant Analysis

Traffic Signal Warrant Analysis

Intersection: Lawson Road & Lasater Road
Location: City of Dallas, Dallas County, Texas
Prepared By: N. Dahl
Date: 1/10/2020
Job # : 2450-99-015T

Time	Weekday Volumes			
	Major Road		Minor Road	
	NB	*SB*	*EB*	*WB*
12:00 AM	0	0	0	0
1:00 AM	0	0	0	0
2:00 AM	0	0	0	0
3:00 AM	0	0	0	0
4:00 AM	0	0	0	0
5:00 AM	0	0	0	0
6:00 AM	0	0	0	0
7:00 AM	417	248	127	471
8:00 AM	217	216	113	316
9:00 AM	0	0	0	0
10:00 AM	0	0	0	0
11:00 AM	0	0	0	0
12:00 PM	0	0	0	0
1:00 PM	0	0	0	0
2:00 PM	166	143	145	260
3:00 PM	363	338	228	272
4:00 PM	318	331	341	277
5:00 PM	259	243	367	298
6:00 PM	0	0	0	0
7:00 PM	0	0	0	0
8:00 PM	0	0	0	0
9:00 PM	0	0	0	0
10:00 PM	0	0	0	0
11:00 PM	0	0	0	0
Lanes	2	2	1	1
Speed	30	35	30	30

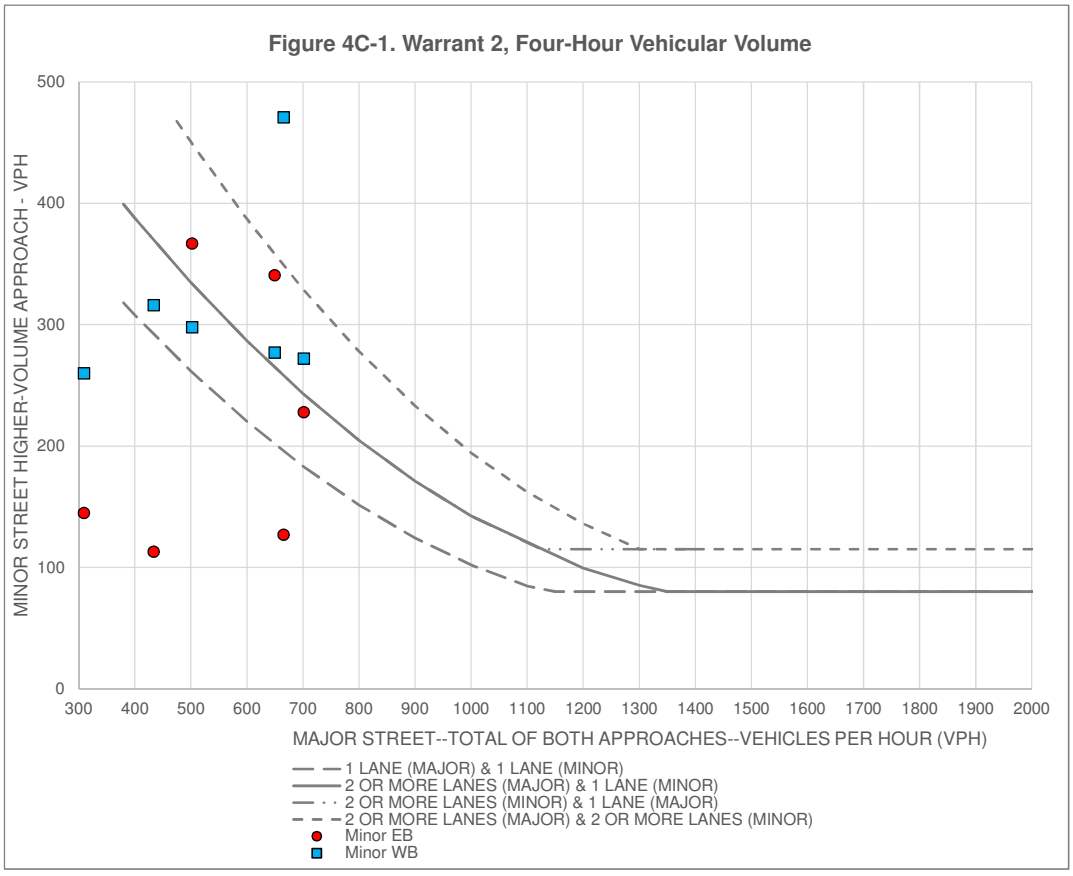
	Warrant Summary				
Warrant	**1A**	**1B**	**1A & 1B**	**2**	**3**
% Criteria	**100**	**100**	**80**	**100**	**100**
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	YES	NO	NO	YES	YES
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	YES	NO	NO	YES	NO
	YES	NO	NO	YES	NO
	NO	NO	NO	YES	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
	NO	NO	NO	NO	NO
Hours Met	3	0	0	4	1
Satisfied?	NO	NO	NO	YES	YES

Based upon the Traffic Signal Warrants described in Chapter 4C of the Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition, published by the Federal Highway Administration (FHWA).

Warrant 2 - Four-Hour Vehicular Volume

(100% Thresholds)

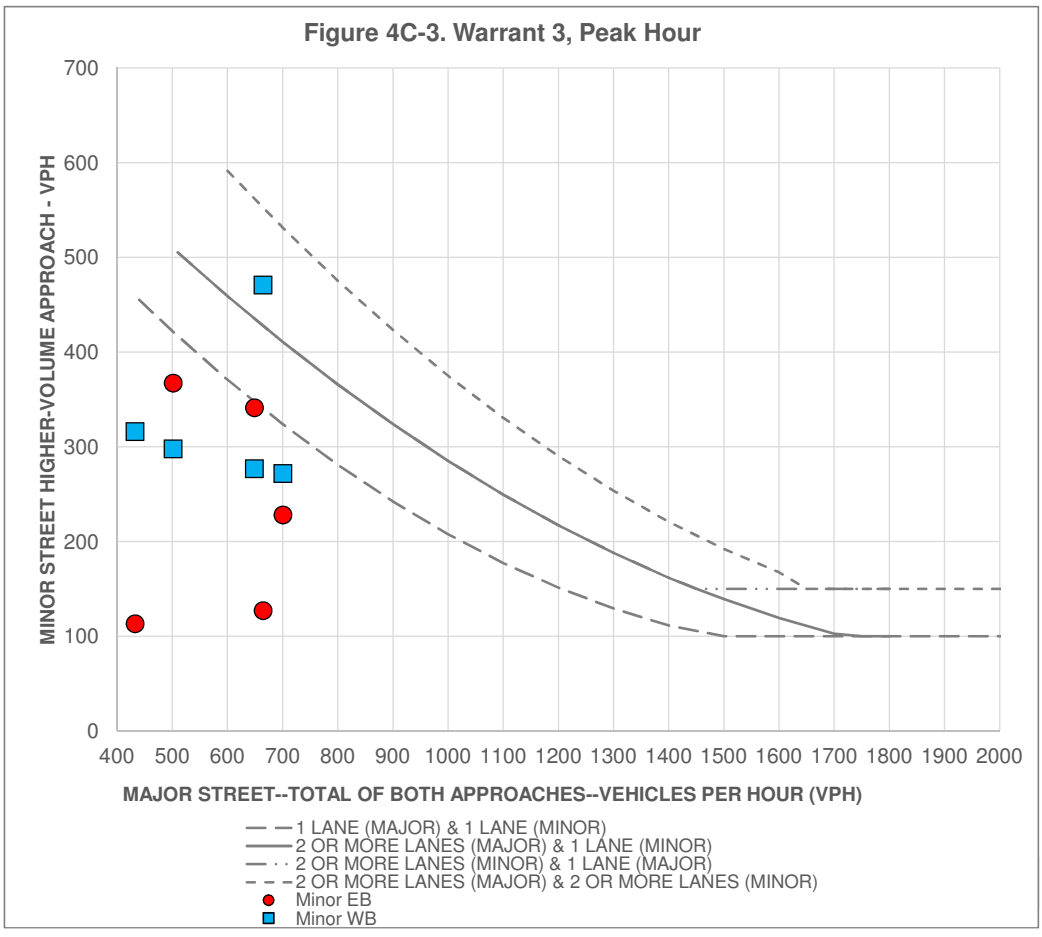
Time	Volumes							WARRANT SATISFIED?
	Major *(Total)*	Minor EB	Threshold	Satisfied?	Minor WB	Threshold	Satisfied?	
12:00 AM	0	0	-	No	0	-	No	NO
1:00 AM	0	0	-	No	0	-	No	NO
2:00 AM	0	0	-	No	0	-	No	NO
3:00 AM	0	0	-	No	0	-	No	NO
4:00 AM	0	0	-	No	0	-	No	NO
5:00 AM	0	0	-	No	0	-	No	NO
6:00 AM	0	0	-	No	0	-	No	NO
7:00 AM	665	127	258	No	471	258	Yes	YES
8:00 AM	433	113	370	No	316	370	No	NO
9:00 AM	0	0	-	No	0	-	No	NO
10:00 AM	0	0	-	No	0	-	No	NO
11:00 AM	0	0	-	No	0	-	No	NO
12:00 PM	0	0	-	No	0	-	No	NO
1:00 PM	0	0	-	No	0	-	No	NO
2:00 PM	309	145	-	No	260	-	No	NO
3:00 PM	701	228	243	No	272	243	Yes	YES
4:00 PM	649	341	265	Yes	277	265	Yes	YES
5:00 PM	502	367	334	Yes	298	334	No	YES
6:00 PM	0	0	-	No	0	-	No	NO
7:00 PM	0	0	-	No	0	-	No	NO
8:00 PM	0	0	-	No	0	-	No	NO
9:00 PM	0	0	-	No	0	-	No	NO
10:00 PM	0	0	-	No	0	-	No	NO
11:00 PM	0	0	-	No	0	-	No	NO
Lanes	**2**	**1**			**1**			**4**
Speed	**35**	**30**			**30**		**Satisfied?**	**Yes**



Warrant 3 - Peak Hour Vehicular Volume

(100% Thresholds)

Time	Volumes							WARRANT SATISFIED ?
	Major *(Total)*	Minor EB	Threshold	Satisfied?	Minor WB	Threshold	Satisfied?	
12:00 AM	0	0	-	No	0	-	No	NO
1:00 AM	0	0	-	No	0	-	No	NO
2:00 AM	0	0	-	No	0	-	No	NO
3:00 AM	0	0	-	No	0	-	No	NO
4:00 AM	0	0	-	No	0	-	No	NO
5:00 AM	0	0	-	No	0	-	No	NO
6:00 AM	0	0	-	No	0	-	No	NO
7:00 AM	665	127	428	No	471	428	Yes	YES
8:00 AM	433	113	-	No	316	-	No	NO
9:00 AM	0	0	-	No	0	-	No	NO
10:00 AM	0	0	-	No	0	-	No	NO
11:00 AM	0	0	-	No	0	-	No	NO
12:00 PM	0	0	-	No	0	-	No	NO
1:00 PM	0	0	-	No	0	-	No	NO
2:00 PM	309	145	-	No	260	-	No	NO
3:00 PM	701	228	410	No	272	410	No	NO
4:00 PM	649	341	435	No	277	435	No	NO
5:00 PM	502	367	-	No	298	-	No	NO
6:00 PM	0	0	-	No	0	-	No	NO
7:00 PM	0	0	-	No	0	-	No	NO
8:00 PM	0	0	-	No	0	-	No	NO
9:00 PM	0	0	-	No	0	-	No	NO
10:00 PM	0	0	-	No	0	-	No	NO
11:00 PM	0	0	-	No	0	-	No	NO
Lanes	**2**	**1**			**1**			**1**
Speed	**35**	**30**			**30**		**Satisfied?**	**Yes**



Appendix F
Turn Lane Analysis

DYNAMIC TRAFFIC

LEFT TURN LANE WARRANT - TWO LANE HIGHWAYS

Project Name: East Lasater Manufactured Home Park
Intersection: Lasater Road and W Site Driveway
Location: City of Dallas, Dallas County, TX
Analysis Period: 2027 Build - AM PSH

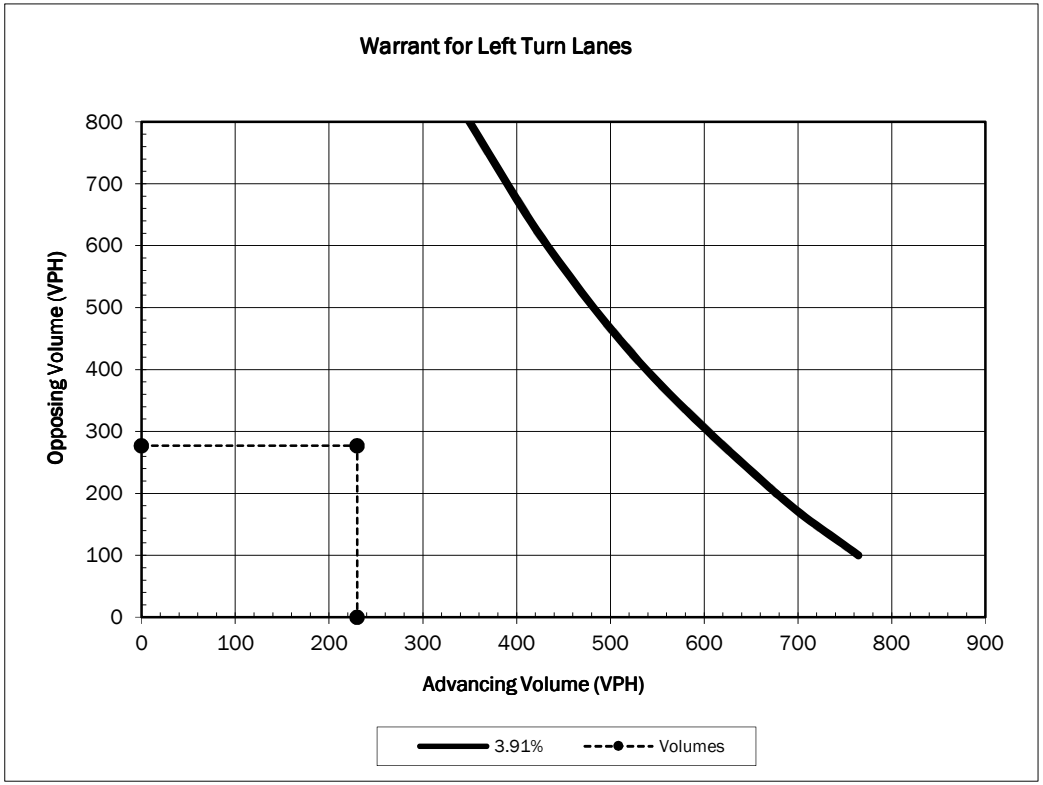
Project #: 2450-99-015T
Prepared By: NED
Date: 1/10/2020

Posted Speed Limit:	40	mph
Advancing Volume:	230	vehicles per hour
Advancing Left Turns:	9	vehicles per hour
Opposing Volume:	277	vehicles per hour
% Left Turns:	3.91%	

Opposing Volume (veh/h)	Advancing Volume (veh/h)				
	5% left turns	10% left turns	20% left turns	30% left turns	40% left turns
40-mph operating speed					
800	330	240	180	160	150
600	410	305	225	200	190
400	510	380	275	245	230
200	640	470	350	305	285
100	720	515	390	340	320

Table based on AASHTO Table 9-23

Opposing Volume	Left Turn % Interpolation		
	0%	**3.91%**	5%
800	NA	**350**	330
600	NA	**433**	410
400	NA	**538**	510
200	NA	**677**	640
100	NA	**765**	720



Warrant Met ? No

DYNAMIC TRAFFIC

LEFT TURN LANE WARRANT - TWO LANE HIGHWAYS

Project Name: East Lasater Manufactured Home Park
Intersection: Lasater Road and W Site Driveway
Location: City of Dallas, Dallas County, TX
Analysis Period: 2027 Build - PM PSH

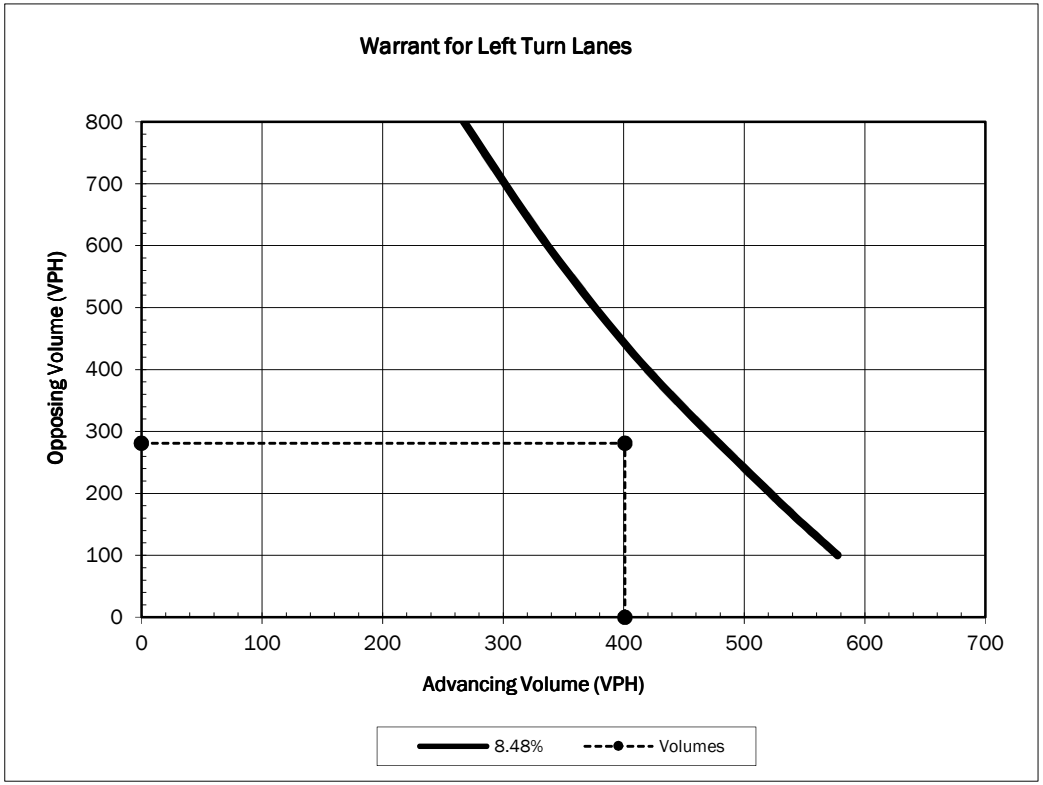
Project #: 2450-99-015T
Prepared By: NED
Date: 1/10/2020

Posted Speed Limit:	40	mph
Advancing Volume:	401	vehicles per hour
Advancing Left Turns:	34	vehicles per hour
Opposing Volume:	281	vehicles per hour
% Left Turns:	8.48%	

Opposing Volume (veh/h)	Advancing Volume (veh/h)				
	5% left turns	10% left turns	20% left turns	30% left turns	40% left turns
40-mph operating speed					
800	330	240	180	160	150
600	410	305	225	200	190
400	510	380	275	245	230
200	640	470	350	305	285
100	720	515	390	340	320

Table based on AASHTO Table 9-23

Opposing Volume	Left Turn % Interpolation		
	5%	**8.48%**	10%
800	330	**267**	240
600	410	**337**	305
400	510	**420**	380
200	640	**522**	470
100	720	**577**	515



Warrant Met ? No

DYNAMIC TRAFFIC

LEFT TURN LANE WARRANT - TWO LANE HIGHWAYS

Project Name: East Lasater Manufactured Home Park
Intersection: Lasater Road and E Site Driveway
Location: City of Dallas, Dallas County, TX
Analysis Period: 2027 Build - AM PSH

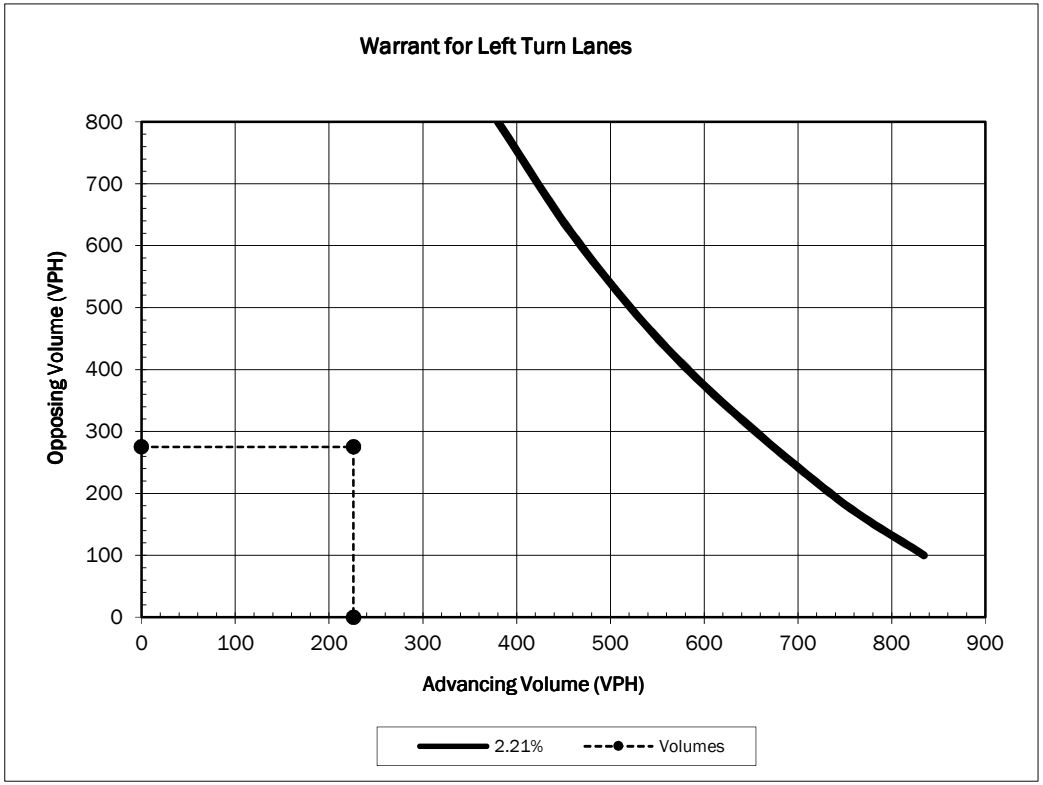
Project #: 2450-99-015T
Prepared By: NED
Date: 1/10/2020

Posted Speed Limit:	40	mph
Advancing Volume:	226	vehicles per hour
Advancing Left Turns:	5	vehicles per hour
Opposing Volume:	275	vehicles per hour
% Left Turns:	2.21%	

Opposing Volume (veh/h)	Advancing Volume (veh/h)				
	5% left turns	10% left turns	20% left turns	30% left turns	40% left turns
40-mph operating speed					
800	330	240	180	160	150
600	410	305	225	200	190
400	510	380	275	245	230
200	640	470	350	305	285
100	720	515	390	340	320

Table based on AASHTO Table 9-23

Opposing Volume	Left Turn % Interpolation		
	0%	**2.21%**	5%
800	NA	**380**	330
600	NA	**469**	410
400	NA	**582**	510
200	NA	**735**	640
100	NA	**834**	720



Warrant Met ? No

DYNAMIC TRAFFIC

LEFT TURN LANE WARRANT - TWO LANE HIGHWAYS

Project Name: East Lasater Manufactured Home Park
Intersection: Lasater Road and E Site Driveway
Location: City of Dallas, Dallas County, TX
Analysis Period: 2027 Build - PM PSH

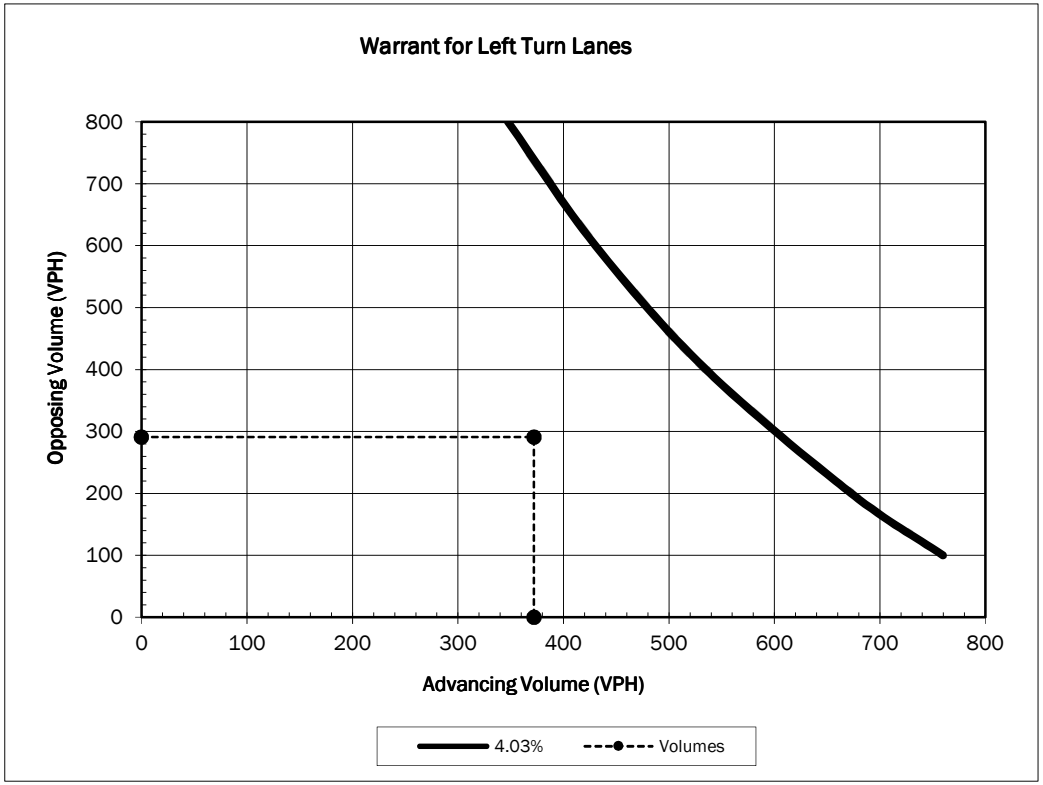
Project #: 2450-99-015T
Prepared By: NED
Date: 1/10/2020

Posted Speed Limit:	40	mph
Advancing Volume:	372	vehicles per hour
Advancing Left Turns:	15	vehicles per hour
Opposing Volume:	291	vehicles per hour
% Left Turns:	4.03%	

Opposing Volume (veh/h)	Advancing Volume (veh/h)				
	5% left turns	10% left turns	20% left turns	30% left turns	40% left turns
40-mph operating speed					
800	330	240	180	160	150
600	410	305	225	200	190
400	510	380	275	245	230
200	640	470	350	305	285
100	720	515	390	340	320

Table based on AASHTO Table 9-23

Opposing Volume	Left Turn % Interpolation		
	0%	**4.03%**	5%
800	NA	**347**	330
600	NA	**430**	410
400	NA	**535**	510
200	NA	**673**	640
100	NA	**760**	720



Warrant Met ? No

where heavy left-turn movements take place, but also occur where left-turn movements enter or leave driveways serving adjacent land development. As with left-turn movements, right-turn movements pose problems at both driveways and street intersections. Right-turn movements increase conflicts, delays, and crashes, particularly where a speed differential of 10 mph or more exists between the speed of through traffic and the vehicles that are turning right.

Table 2-3 presents thresholds for auxiliary lanes. These thresholds represent examples of where left turn and right turn lanes should be considered. Refer to the TxDOT *Roadway Design Manual*, Chapter 3, for proper acceleration and deceleration lengths.

Table 2-3: Auxiliary Lane Thresholds

Median Type	Left Turn to or from Property		Right Turn to or from Property (5)	
	Acceleration	**Deceleration**	**Acceleration**	**Deceleration**
Non-Traversable (Raised Median)	(2)	All	Right turn egress > 200 vph (4)	◆ > 45 mph where right turn volume is > 50 vph (3) ◆ ≤ 45 where right turn volume is > 60 vph (3)
Traversable (Undivided Road)	(2)	(1)	Same as above	Same as Above

(1) Refer to Table 3-11, TxDOT *Roadway Design Manua*l, for alternative left-turn-bay operational considerations.

(2) A left-turn acceleration lane may be required if it would provide a benefit to the safety and operation of the roadway. A left-turn acceleration lane would interfere with the left-turn ingress movements to any other access connection.

(3) Additional right-turn considerations:

- Conditions for providing an exclusive right-turn lane when the right-turn traffic volume projections are less than indicated in Table 2-3:
  - High crash experience
  - Heavier than normal peak flow movements on the main roadway
  - Large volume of truck traffic
  - Highways where sight distance is limited
- Conditions for NOT requiring a right-turn lane where right-turn volumes are more than indicated in Table 2-3:
  - Dense or built-out corridor where space is limited
  - Where queues of stopped vehicles would block the access to the right turn lane
  - Where sufficient length of property width is not available for the appropriate design

(4) The acceleration lane should not interfere with any downstream access connection.

- The distance from the end of the acceleration lane taper to the next unsignalized downstream access connection should be equal to or greater than the distances found in Table 2-2.
- Additionally, if the next access connection is signalized, the distance from the end of the acceleration lane taper to the back of the 90th percentile queue should be greater than or equal to the distances found Table 2-2.

(5) Continuous right-turn lanes can provide mobility benefits both for through movements and for the turning vehicles.[a] Access connections within a continuous right turn lane should meet the spacing requirements found in Table 2-2. However, when combined with crossing left in movements, a continuous right-turn lane can introduce additional operational conflicts.