
TRAFFIC IMPACT STUDY

For

**West Essex Highlands
Township of West Orange
Essex County, New Jersey**

Prepared For:

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Prepared By:

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LANGAN

**19 June 2024
101049801**

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EXECUTIVE SUMMARY

West Essex Highlands, Inc., is proposing to develop Block 179, Lot 32, located in the Township of West Orange, Essex County, New Jersey. The site is currently undeveloped. The project, upon completion will consist of the construction of 496 multifamily residential units.

The site is bordered by residential land uses on all sides. Access to the development is proposed to be provided via one direct connection to Warner Road, one direct connection to Kuzik Drive which is proposed to be gated for emergency access, and an emergency access connection to Howell Drive. Note that both Warner Road and Kuzik Drive currently terminate at the site's property limits. The proposed connections will be extensions of the existing roadways and the proposed buildings will be accessed via driveways along the internal roadway. With the emergency access drives, three points of access will be provided with two controlled for emergency use. The new roadways will be 22 feet wide with no parking and sidewalks provided. Parking lots are designed with 24 feet wide parking aisles and 9 feet by 18 feet parking spaces. Tandem parking spaces are provided which will be assigned for use by unit tenants.

The site was previously evaluated for the construction of up to 683 multifamily residential units. Associated with the prior development program evaluation, Lublanecki Engineering, Inc., prepared a Traffic Impact Study (TIS), revised dated November 1, 2018. The November 2018 TIS is included Appendix F. The applicant has reduced the maximum number of proposed residential units by 187 units for a proposed total of 496 multifamily residential units. Based on our review of the November 2018 TIS, the new development program will generate less traffic than the previously evaluated development program. Accordingly, the conclusions made in the November 2018 TIS generally remain valid. This Traffic study has been prepared to update the traffic projections and analyses for the key intersections along Eagle Rock Avenue for the current development program and current traffic conditions.

Langan has estimated the number of trips the proposed development would generate based on data compiled for Land Use Code 221 (Multifamily Housing (Mid-Rise) by the Institute of Transportation Engineers (ITE) as contained in the publication Trip Generation, 11th edition. Accordingly, Langan estimated that the proposed residential development will generate approximately 207 new trips (48 enter, 159 exit) during the weekday morning peak hour and 194 trips (118 enter, 76 exit) during the weekday evening peak hour.

We determined the directional distribution of the site-generated trips for the development based on an examination of existing and expected travel patterns in the study area and a review of the Traffic Impact Study, revised dated November 1, 2018, prepared by Lublanecki Engineering, Inc. We conducted updated capacity analyses and evaluated the following intersections:

- Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634)
- Eagle Rock Avenue (County Route (CR) 611) and Oval Road
- Eagle Rock Avenue (CR 611) and Crestmont Country Club Driveway
- Laurel Avenue (CR 634) and Crestmont Country Club Driveway

In addition, the November 2018 TIS by Lublanecki Engineering, Inc., provided additional capacity analyses at the following intersections:

- Oval Road and Rappleye Court
- Oval Road and Bongart Drive
- Warner Road and Davey Drive
- Warner Road and Reger Lane
- Warner Road and Kuzik Drive/Sullivan Drive
- Kuzik Drive and Lapis Circle/Luft Lane
- Sullivan Drive and Davey Drive
- Davey Drive and Bongart Drive

The capacity analysis previously conducted determined that the above intersections would operate at acceptable levels of service between the no-build and build conditions. During our review of the November 2018 TIS we determined that the 2024 traffic data is generally similar than the prior 2018 existing data and 2023 projected data. Accordingly, the prior analyses remain relevant for the above mentioned intersections.

Based upon the analysis contained herein, we identified the following improvements to support the continued growth in the development area and traffic associated with the proposed development.

The following is the proposed mitigation associated with the proposed development:

- Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634)
 - Extend the westbound Eagle Rock Avenue (CR 634) left-turn lane to provide additional storage.
- Timing mitigation
 - Coordinate the signal timings with the proposed signal at the intersection of Eagle Rock Avenue (CR 611) and Oval Road / Crestmont Country Club Driveway
 - Increase the maximum cycle length to 90 seconds during both the AM and PM peak hours.
- Eagle Rock Avenue (CR 611) and Oval Road / Crestmont Country Club Driveway
 - Proposed signalization of the intersection
 - Peak Hour, 4-Hour, and 8-Hour Warrants Met
 - Widen the eastbound Eagle Rock Avenue (CR 611) approach to provide a left turn lane, a through lane and a through/ right turn lane.

- Modify the westbound Eagle Rock Avenue (CR 611) approach to provide a left turn lane, a through lane and an through/right turn lane.
- Relocate the existing Crestmont Country Club exit Driveway along Eagle Rock Avenue (CR 611) to intersect Eagle Rock Avenue (CR 611) directly across from Oval Road.
- Restripe the southbound Oval Road approach to provide a left turn lane and a trough/right turn lane.

Langan finds that the proposed residential development will not significantly alter traffic operations in the study area during peak hours with the recommended intersection improvements. In addition, the capacity analysis conducted in the November 2018 TIS determined that the following intersections would operate at acceptable levels of service between the no-build and build conditions:

- Oval Road and Rappleye Court
- Oval Road and Bongart Drive
- Warner Road and Davey Drive
- Warner Road and Reger Lane
- Warner Road and Kuzik Drive/Sullivan Drive
- Kuzik Drive and Lapis Circle/Luft Lane
- Sullivan Drive and Davey Drive
- Davey Drive and Bongart Drive

INTRODUCTION

West Essex Highlands, Inc., is proposing to develop Block 179, Lot 32, located in the Township of West Orange, Essex County, New Jersey. The project, upon completion will consist of the construction of 496 multifamily residential units.

Project Description

The site is currently undeveloped. The project, upon completion will consist of the construction of 496 multifamily residential units. The development is located on Block 179, Lot 32, according to the Township of West Orange tax maps. The site location is shown in Figure 1.

The site is bordered by residential land uses on all sides. Access to the development is proposed to be provided via one direct connection to Warner Road, one direct connection to Kuzik Drive which is proposed to be gated for emergency access, and an emergency access connection to Howell Drive. Note that both Warner Road and Kuzik Drive currently terminate at the site's property limits. The proposed connections will be extensions of the existing roadways and the proposed buildings will be accessed via driveways along the internal roadway.

Study Area

We conducted capacity analyses and/ or evaluated the following intersections:

- Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634)
- Eagle Rock Avenue (County Route (CR) 611) and Oval Road
- Eagle Rock Avenue (CR 611) and Crestmont Country Club Driveway
- Laurel Avenue (CR 634) and Crestmont Country Club Driveway

An inventory of the physical road conditions is presented in the section "Description of Existing Conditions."

Scope of Study

Langan undertook the following steps to prepare this study in accordance with standard traffic engineering methodologies:

1. Conducted a field examination of the site and surrounding road network to inventory physical and regulatory conditions including the number of lanes, lane assignments, channelization, traffic-control devices, lateral clearances and other factors that limit traffic capacity.
2. Conducted a series of turning movement traffic counts at intersections in the study area. We obtained counts on a typical weekday from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. We then identified the existing weekday morning and evening peak hour traffic volumes based on the traffic count data.
3. Established 2027 Existing traffic volumes using the turning movement traffic counts.
4. Established 2027 No-Build traffic volumes by applying the New Jersey Department of Transportation (NJDOT) Essex County growth factor of 1.75 percent per year to the existing traffic volumes.
5. Prepared trip estimates for the development for the proposed residential based data published by the Institute of Transportation Engineers. .
6. Developed trip distribution for the project based on existing and expected travel patterns, demographic data, and a review of the November 18 TIS by Lublanecki Engineering, Inc.
7. Assigned site-generated trips to the development access roads and surrounding road network based on the likely travel routes motorists will use to travel to and from the development.
8. Established future 2027 Build traffic volumes by adding the total site-generated trips to the 2027 No-Build traffic volumes.
9. Performed intersection capacity analyses for the weekday morning and evening peak hours using Synchro software.
10. Reviewed the site plan for parking and on-site circulation.

DESCRIPTION OF EXISTING CONDITIONS

This section describes the roads, intersections and traffic volumes in the area of the development located in the Township of West Orange, Essex County, New Jersey.

Roads

Eagle Rock Avenue (County Route (CR) 611)

Eagle Rock Avenue (CR 611) is classified as an urban minor arterial and is under Essex County jurisdiction. The roadway has a general east-west orientation and generally provides two travel lanes each direction. The posted speed limit is 40mph.

Laurel Avenue (CR 634)

Laurel Avenue (CR 634) is classified as an urban minor arterial and is under Essex County jurisdiction. The roadway has a general north-south orientation and generally provides one travel lane each direction. The posted speed limit is 35mph.

Oval Road

Oval Road is classified a local road and is under municipal jurisdiction. The roadway has a general north-south orientation and provides one travel lane in each direction. There is no posted speed limit in the immediate study area.

Intersections

Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634)

Laurel Avenue (CR 634) intersects Eagle Rock Avenue (CR 611) to form a T-shaped intersection under signal control. The eastbound Eagle Rock Avenue (CR 611) approach provides one exclusive through lane and one shared through/channelized right-turn lane. The westbound Eagle Rock Avenue (CR 611) approach provides one left-turn lane and two through lanes. The northbound Laurel Avenue (CR 634) approach provides one left-turn lane and one right-turn lane.

Eagle Rock Avenue (CR 611) and Oval Road

Oval Road intersects Eagle Rock Avenue (CR 611) to form a T-shaped intersection under stop-control. The eastbound Eagle Rock Avenue (CR 611) approach provides one shared left-turn/through lane and one exclusive through lane. The westbound Eagle Rock Avenue (CR 611) approach provides one exclusive through lane and one shared through/right-turn lane. The southbound Oval Road approach provides one shared left-turn/right-turn lane and is stop-controlled.

Eagle Rock Avenue (CR 611) and Crestmont Country Club Driveway

The Crestmont Country Club driveway intersects Eagle Rock Avenue (CR 611) to form a T-shaped stop-controlled intersection. The eastbound and westbound Eagle Rock Avenue (CR 611) approaches provide two through lanes. The northbound Crestmont Country Club driveway approach provides on shared left-turn/right-turn lane and is stop-controlled.

Laurel Avenue (CR 634) and Crestmont Country Club Driveway

The Crestmont Country Club driveway intersects Laurel Avenue (CR 634) to form a T-shaped stop-controlled intersection. The westbound Crestmont Country Club driveway approach provides one shared left-turn/right-turn lane and is stop-controlled. The northbound Laurel Avenue (CR 634) approach provides one shared through/right-turn lane. The southbound Laurel Avenue (CR 634) approach provides one shared left-turn/through lane.

Traffic Volumes

We arranged for turning movement traffic counts to be conducted during the morning and evening peak periods on a typical weekday at the study intersections to examine traffic conditions near the development. Specifically, turning movement counts were conducted on Tuesday, 14 May 2024, from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. Note that the intersection of the of Eagle Rock Road (CR 611) and Oval Road was counted on the same day from 7:00 AM to 7:00 PM.

The traffic counts identify distinct times during the weekday morning and evening when traffic experienced its highest levels. We determined that the weekday morning peak hour occurred from 8:00 AM to 9:00 AM and the weekday evening peak hour occurred from 5:00 PM to 6:00 PM.

Figure 2 illustrates the existing weekday morning and evening peak hour traffic volumes. Summaries of the traffic counts are contained in Appendix B.

ESTIMATE OF FUTURE CONDITIONS

This section of the report covers background traffic growth, site-generated trips, trip comparison, trip distribution, and future traffic volumes. We project a design year of 2027. Accordingly, we projected traffic volumes to include the existing traffic and new traffic created by background growth to derive the 2027 No-Build traffic volumes. We then added the site-generated trips to the 2027 No-Build traffic volumes to derive the 2027 Build traffic volumes. All traffic volume worksheets are contained in Appendix A.

Background Traffic Growth

We increased the existing peak hour traffic volumes by a compounded annual growth rate of 1.75 percent, established by the New Jersey Department of Transportation (NJDOT) for Essex County for short-term growth projections, to derive the 2027 No-Build traffic volumes. Figure 3 illustrates the 2027 No-Build traffic volumes.

Site-Generated Trips

We prepared trip generation estimates the proposed development using data compiled for Land Use Code 221 (Multifamily Housing (Mid-Rise)) by the Institute of Transportation Engineers (ITE) as contained in the publication Trip Generation, 11th edition. Table 1 summarizes calculated rates and the future trip generation estimates.

Table 1 – Future Trip Generation Estimates

Use	Weekday AM Peak Hour			Weekday PM Peak Hour		
	In	Out	Total	In	Out	Total
496 Multifamily Residential Units	48	159	207	118	76	194

The site was previously evaluated for the construction of up to 683 multifamily residential units. We have prepared the following table to compare the trip generation estimates utilized in the November 2018 TIS by Lublanecki Engineering, Inc., to the trip generation estimates associated with the currently proposed development program. Table 2 summarizes the comparison.

Table 2 – Trip Generation Comparison

Use	Weekday AM Peak Hour			Weekday PM Peak Hour		
	In	Out	Total	In	Out	Total
Original Development Program						
683 Multifamily Residential Units	64	182	246	184	117	301
Proposed Development Program						
496 Multifamily Residential Units	48	159	207	118	76	194
Comparison						
Difference	- 16	- 23	- 39	- 66	- 41	- 107

Based on Table 2 above, the new development program will generate less traffic than the previously contemplated development program. Accordingly, the conclusions made in the November 2018 TIS remain valid.

Trip Distribution

We determined the directional distribution of the site-generated trips for the development based on an examination of existing and expected travel patterns in the study area and a review of the November 18 TIS by Lublanecki Engineering, Inc. The directional distribution of site traffic is summarized in Table 3.

Table 3 – Trip Distribution

Direction (To/From)	Arrival & Departure Distributions
Eagle Rock Avenue – CR 611 (East)	40%
Eagle Rock Avenue – CR 611 (West)	32%
Laurel Avenue – CR 634 (South)	28%
Total	100%

The arrival and departure distributions for the development are show on Figure 4. The site-generated trips were then applied to the adjacent roadway system as per the above distributions. Figure 5 shows the total site-generated trips assigned to the roadway network.

Build Traffic Volumes

As part of the proposed development, it is proposed to signalized the intersection of the Eagle Rock Avenue (CR 611) and Oval Road. Associated with the signalization it is proposed to relocate the existing exit-only Crestmont Country Club driveway along Eagle Rock Avenue (CR 611). The driveway will be realigned to intersect Eagle Rock Avenue (CR 611) directly across from Oval Road to the form the southern leg of the signalized intersection. The driveway will allow for both ingress and egress movements to/from the Crestmont Country Club under traffic signal control. Figure 6 shows the rerouted traffic volumes associated with the driveway closure and realignment.

We derived the 2027 Build traffic volumes by adding the rerouted traffic volumes and the total site-generated trips to the 2027 No-Build traffic volumes. Figure 7 illustrates the 2027 Build weekday morning and evening peak hour traffic volumes.

ANALYSIS OF TRAFFIC OPERATIONS

This section describes the capacity analysis we conducted to assess traffic operations for the No-Build and Build conditions. Capacity analysis provides an indication of the adequacy of road facilities to serve traffic demand.

Level of Service Criteria

Level of Service (LOS) is the term used to denote different operating conditions that occur on a given road segment under various traffic-volume demands. LOS is a qualitative measure that considers a number of factors including road geometry, speed, travel delay and freedom to maneuver. LOS designations range from A to F and provide an index of operational qualities of a road segment or an intersection. LOS A represents the best operating conditions; LOS F represents the worst.

LOS designations are reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of all traffic entering the intersection. For unsignalized intersections, the analysis considers the operation of all movements that conflict with other movements, such as main-line left turns and traffic exiting a side street. The evaluation criteria used to analyze the study area intersections are based on the Highway Capacity Manual, 6th edition, (HCM), published by the Transportation Research Board and the Synchro and HCS programs.

The HCM defines LOS for signalized intersections as follows:

<u>LOS</u>	<u>Control Delay per Vehicle</u>
A	≤10 sec
B	>10 and ≤20 sec
C	>20 and ≤35 sec
D	>35 and ≤55 sec
E	>55 and ≤80 sec
F	>80 sec

The HCM defines LOS for unsignalized intersections as follows:

<u>LOS</u>	<u>Delay Range (sec/veh)</u>
A	≤10 sec
B	>10 and ≤15 sec
C	>15 and ≤25 sec
D	>25 and ≤35 sec
E	>35 and ≤50 sec
F	>50 sec

Capacity Analysis

We conducted capacity analyses for the intersections in the study area and found that the proposed development will not significantly alter traffic operations in the study area. Table 4 summarizes the 2027 No-Build and 2027 Build levels of service (LOS) at each relevant study intersection during the weekday morning and evening peak hours. The following are discussions pertaining to each of the intersections analyzed for the development. Note that all capacity analyses worksheets are contained in Appendix D.

Table 4 – Intersection Capacity Analysis Summary

Intersection	Lane Use	2027 No-Build AM		2027 No-Build PM		2027 Build AM		2027 Build PM	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Signalized Intersection									
Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634)	Overall	B	17.4	B	19.2	B	17.1	C	23.7
	EB-TR	A	9.1	B	19.6	B	16.9	C	21.7
	WB-L	D	35.9	B	17.8	C	23.6	C	31.1
	WB-T	A	8.0	B	11.1	A	6.0	B	16.9
	NB-L	C	31.7	D	36.4	C	33.7	D	43.1
	NB-R	A	5.8	A	4.5	A	5.5	A	5.2
Eagle Rock Avenue (CR 611) and Oval Road / Crestmont Country Club Drwy	Overall	-	-	-	-	A	9.6	A	7.8
	EB-L	-	-	-	-	A	5.9	A	4.1
	EB-TR	-	-	-	-	A	6.4	A	5.0
	WB-L	-	-	-	-	B	10.5	B	12.0
	WB-TR	-	-	-	-	B	10.6	B	10.6
	NB-L	-	-	-	-	C	25.0	C	26.6
	NB-TR	-	-	-	-	A	0.0	A	0.0
	SB-L	-	-	-	-	C	32.9	C	30.5
SB-TR	-	-	-	-	A	1.1	A	0.6	
Unsignalized Intersection									
Eagle Rock Avenue (CR 611) and Oval Road	EB-L	A	9.6	A	9.0	-	-	-	-
	SB-LR	C	23.6	C	22.3	-	-	-	-
Eagle Rock Avenue (CR 611) and Crestmont Country Club Drwy	NB-LR	B	14.5	C	20.1	-	-	-	-
Laurel Avenue (CR 634) and Crestmont Country Club Drwy	WB-LR	B	12.1	C	15.5	B	12.3	C	16.0
	SB-LT	A	8.7	A	9.7	A	8.7	A	9.8

Based on HCS (Highway Capacity Software):

*Level of Service (Average vehicle delay [seconds per vehicle])

Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634)

The signalized intersection is expected to operate at an overall LOS B during both the weekday morning and evening peak hours under the No-Build condition.

Based on the results of the analyses the following off-site improvements are recommended to improve operations at the intersection.

- Geometry and Timing Mitigations
 - Extend the westbound Eagle Rock Avenue (CR 634) left-turn lane to provide additional storage.

- Coordinate the signal timings with the proposed signal at the intersection of Eagle Rock Avenue (CR 611) and Oval Road / Crestmont Country Club Driveway
- Increase the maximum cycle length to 90 seconds during both the AM and PM peak hours.

With the above recommendations implemented, the signalized intersection is expected to operate at an overall LOS B during the weekday morning peak hour and LOS C during the weekday evening peak hour.

Eagle Rock Avenue (CR 611) and Oval Road / Crestmont Country Club Driveway

The movements at this stop-controlled intersection are expected to operate at LOS C or better during both the weekday morning and evening peak hours under the No-Build condition.

As part of the proposed development, the existing Crestmont Country Club Driveway will be realigned to intersect Eagle Rock Avenue (CR 611) directly across from Oval Road. The re-aligned driveway will permit entering and exiting traffic to the Country Club. In addition, it is proposed to signalize the intersection and coordinate it with the adjacent intersection of Eagle Rock Avenue (CR 611) and Laurel Avenue (CR 634).

We performed a traffic signal warrant analysis fusing the 2023 Manual on Uniform Traffic Control Devices (MUTCD) standards. There are nine warrants described in the MUTCD. We only evaluated the traffic volume based warrants. The installation of a traffic signal should only be considered if one or more of the signal warrants are met.

Appendix E contains the warrant summary reports and volume information. The traffic volume based warrant analysis results are as follows:

- Warrant 1 (Eight-Hour Vehicular Volume)
 - Build Condition A or B - Met: 11 hours met (8 required)
 - Build Condition A and B- Met: 12 hours met (8 required)
- Warrant 2 (Four-Hour Vehicular Volume)
 - Build – Met: 11 hours met (4 required)
- Warrant 3 (Peak Hour)
 - Build – Met: 5 hour met (1 required)

In addition, the following geometric changes would be constructed in association with the proposed signalization:

- Widen the eastbound Eagle Rock Avenue (CR 611) approach to provide a left turn lane, a through lane and a through/ right turn lane.

- Modify the westbound Eagle Rock Avenue (CR 611) approach to provide a left turn lane, a through lane and an through/right turn lane.
- Relocate the existing Crestmont Country Club exit Driveway along Eagle Rock Avenue (CR 611) to intersect Eagle Rock Avenue (CR 611) directly across from Oval Road.
- Restripe the southbound Oval Road approach to provide a left turn lane and a trough/right turn lane.

With the above recommendations implemented, the signalized intersection is expected to operate at an overall LOS A during both the the weekday morning and evening peak hours.

Eagle Rock Avenue (CR 611) and Crestmont Country Club Driveway

The movement at this stop-controlled intersection is expected to operate at LOS C or better during both the weekday morning and evening peak hours under the No-Build condition. As part of the proposed development, the existing Crestmont Country Club Driveway will be closed and realigned to intersect Eagle Rock Avenue (CR 611) directly across from Oval Road.

Laurel Avenue (CR 634) and Crestmont Country Club Driveway

The movements at this stop-controlled intersection are expected to operate at LOS C or better during both the weekday morning and evening peak hours under the No-Build condition. Under the Build condition, the movements at this stop-controlled intersection are expected to continue to operate at LOS C or better during both the weekday morning and evening peak hours.

CONCLUSIONS

Langan finds that the proposed residential development will not significantly alter traffic operations in the study area during peak hours with the recommended intersection improvements.

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APPENDIX A

FIGURES



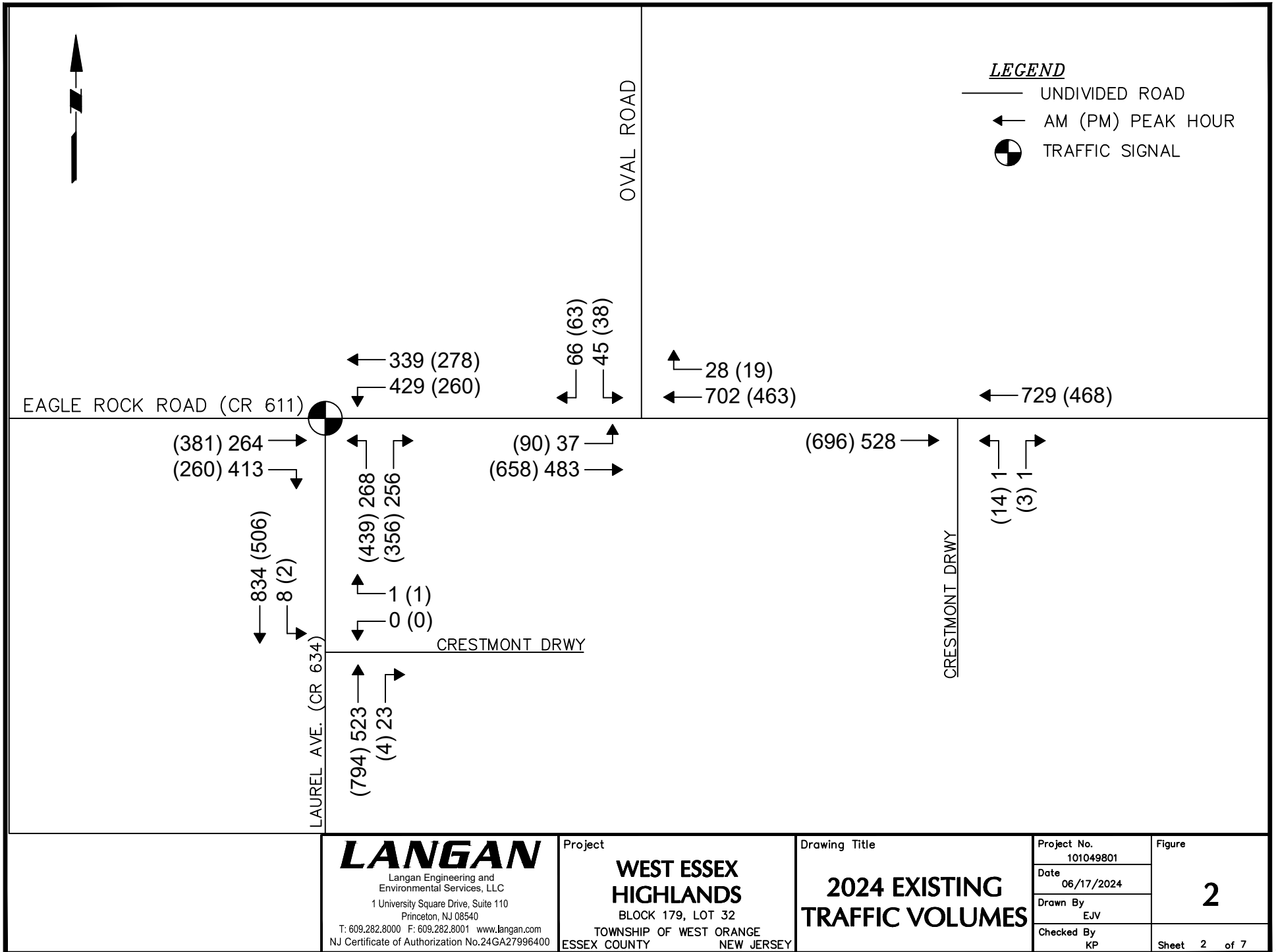
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Project
**WEST ESSEX
HIGHLANDS**
BLOCK 179, LOT 32
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY NEW JERSEY

Drawing Title
**SITE LOCATION
MAP**

Project No.
101049801
Date
06/17/2024
Drawn By
EJV
Checked By
KP

Figure
1
Sheet 1 of 7



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Project

WEST ESSEX HIGHLANDS

BLOCK 179, LOT 32

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY NEW JERSEY

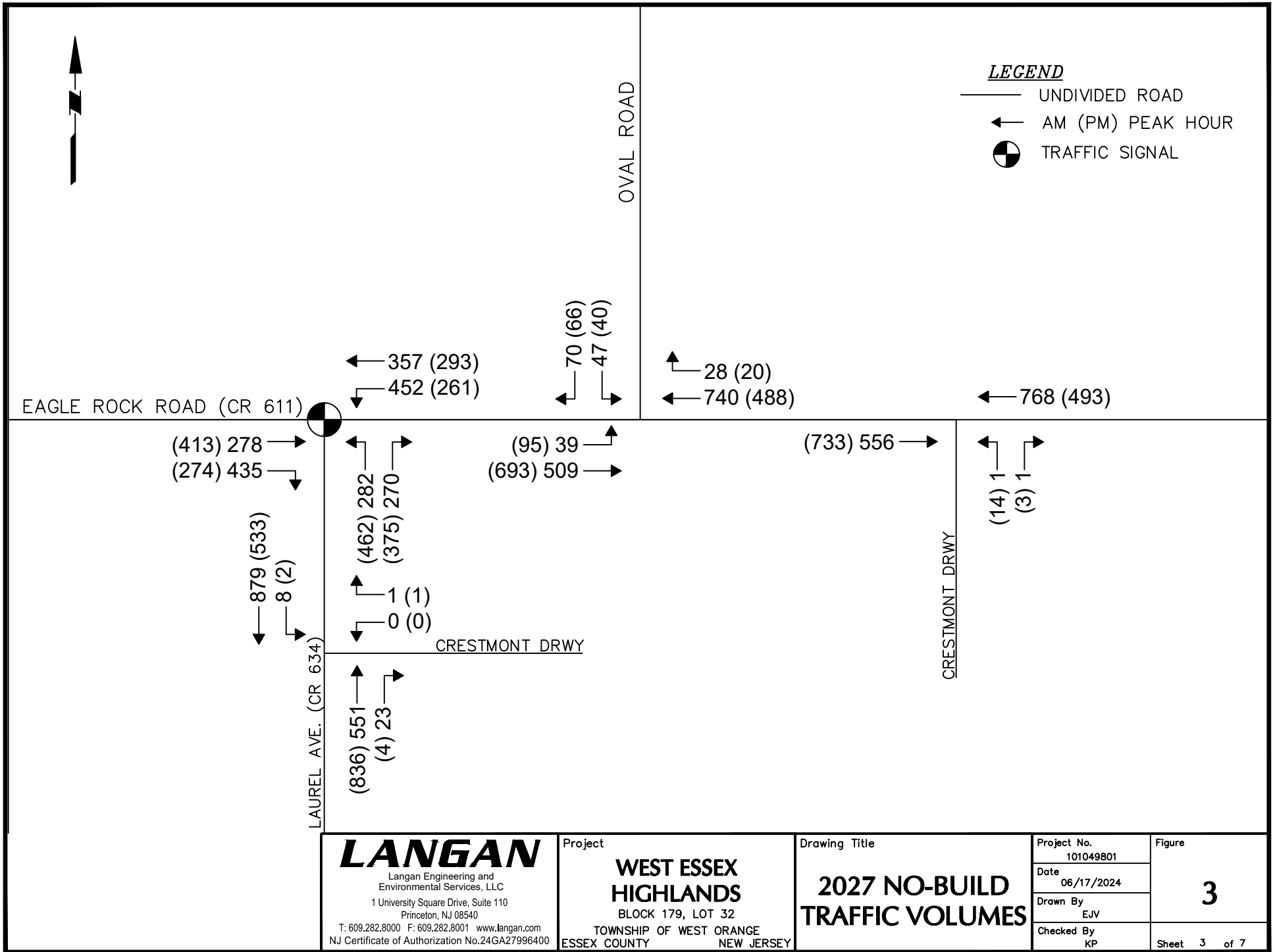
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2024 EXISTING TRAFFIC VOLUMES

Project No.	101049801	Figure
Date	06/17/2024	
Drawn By	EJV	
Checked By	KP	

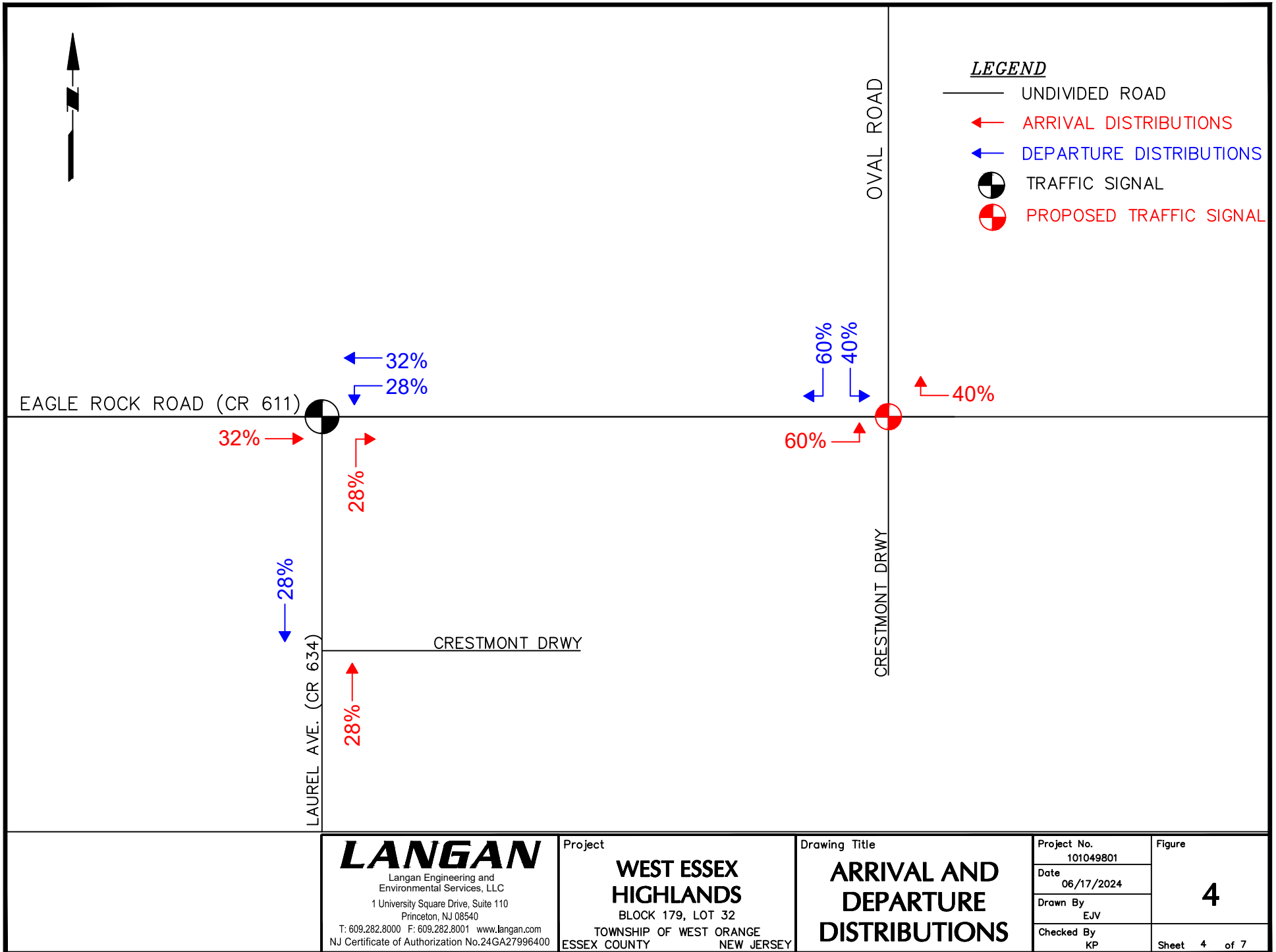
Sheet 2 of 7

2



Langan Engineering and Environmental Services, LLC 1 University Square Drive, Suite 110 Princeton, NJ 08540 T: 609.282.8000 F: 609.282.8001 www.langan.com NJ Certificate of Authorization No.24GA27996400	Project	WEST ESSEX HIGHLANDS BLOCK 179, LOT 32 TOWNSHIP OF WEST ORANGE ESSEX COUNTY NEW JERSEY
	Drawing Title	2027 NO-BUILD TRAFFIC VOLUMES

Project No. 101049801	Figure 3
Date 06/17/2024	
Drawn By EJV	
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Sheet 3 of 7	



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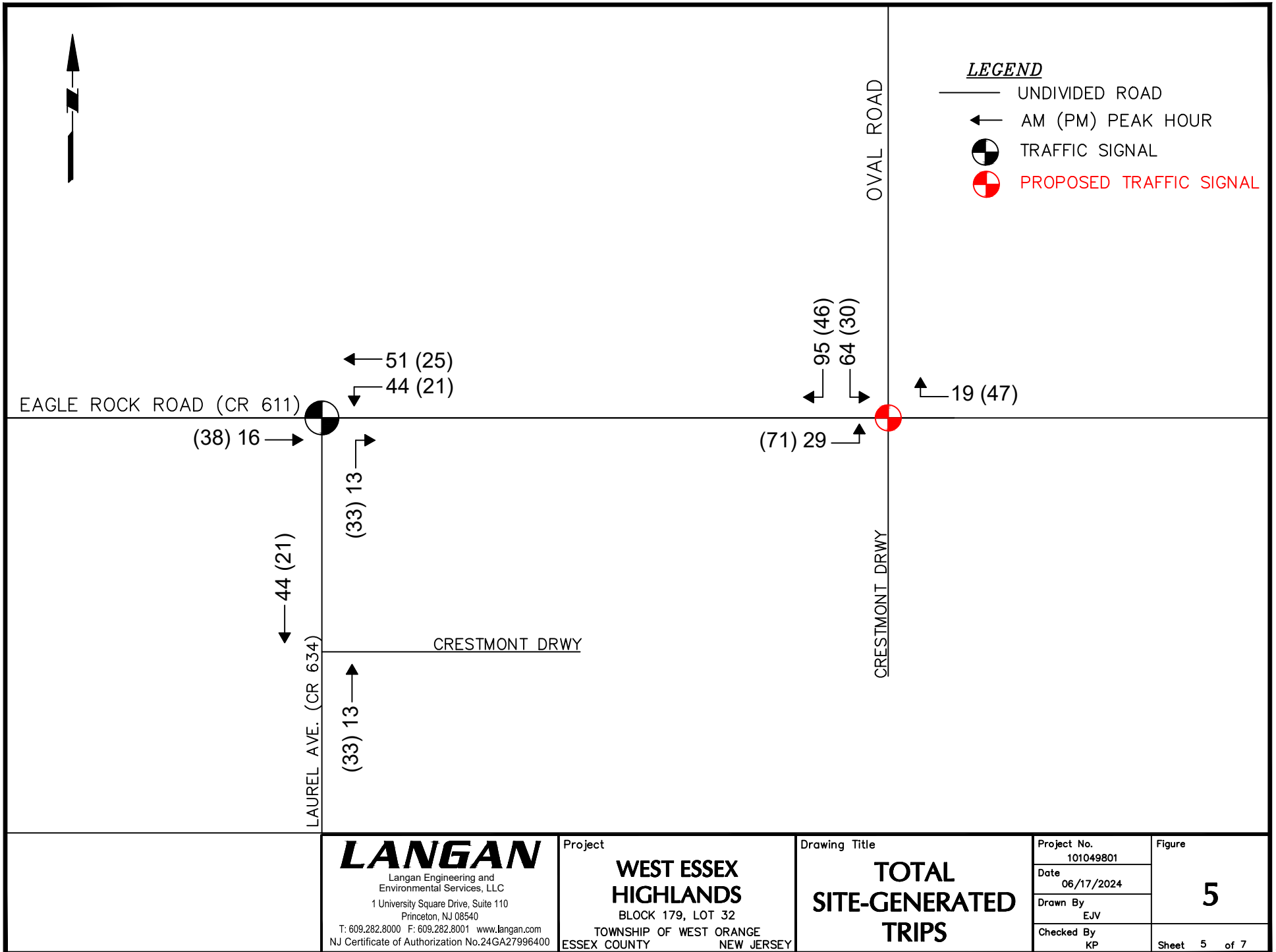
Project

WEST ESSEX HIGHLANDS
BLOCK 179, LOT 32
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY NEW JERSEY

Drawing Title

ARRIVAL AND DEPARTURE DISTRIBUTIONS

Project No. 101049801	Figure 4
Date 06/17/2024	
Drawn By EJV	
Checked By KP	
Sheet 4 of 7	



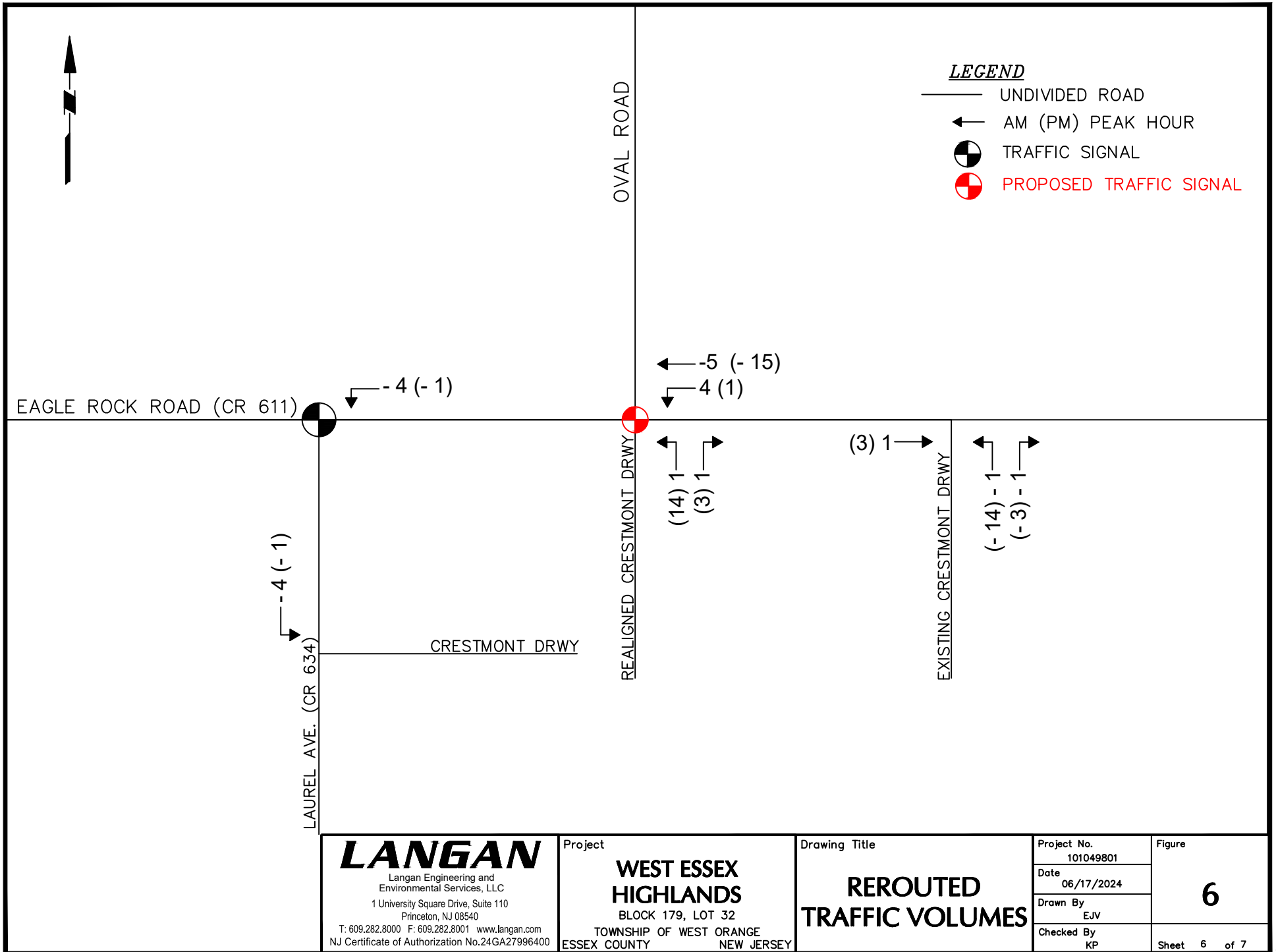
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Project
**WEST ESSEX
 HIGHLANDS**
 BLOCK 179, LOT 32
 TOWNSHIP OF WEST ORANGE
 ESSEX COUNTY NEW JERSEY

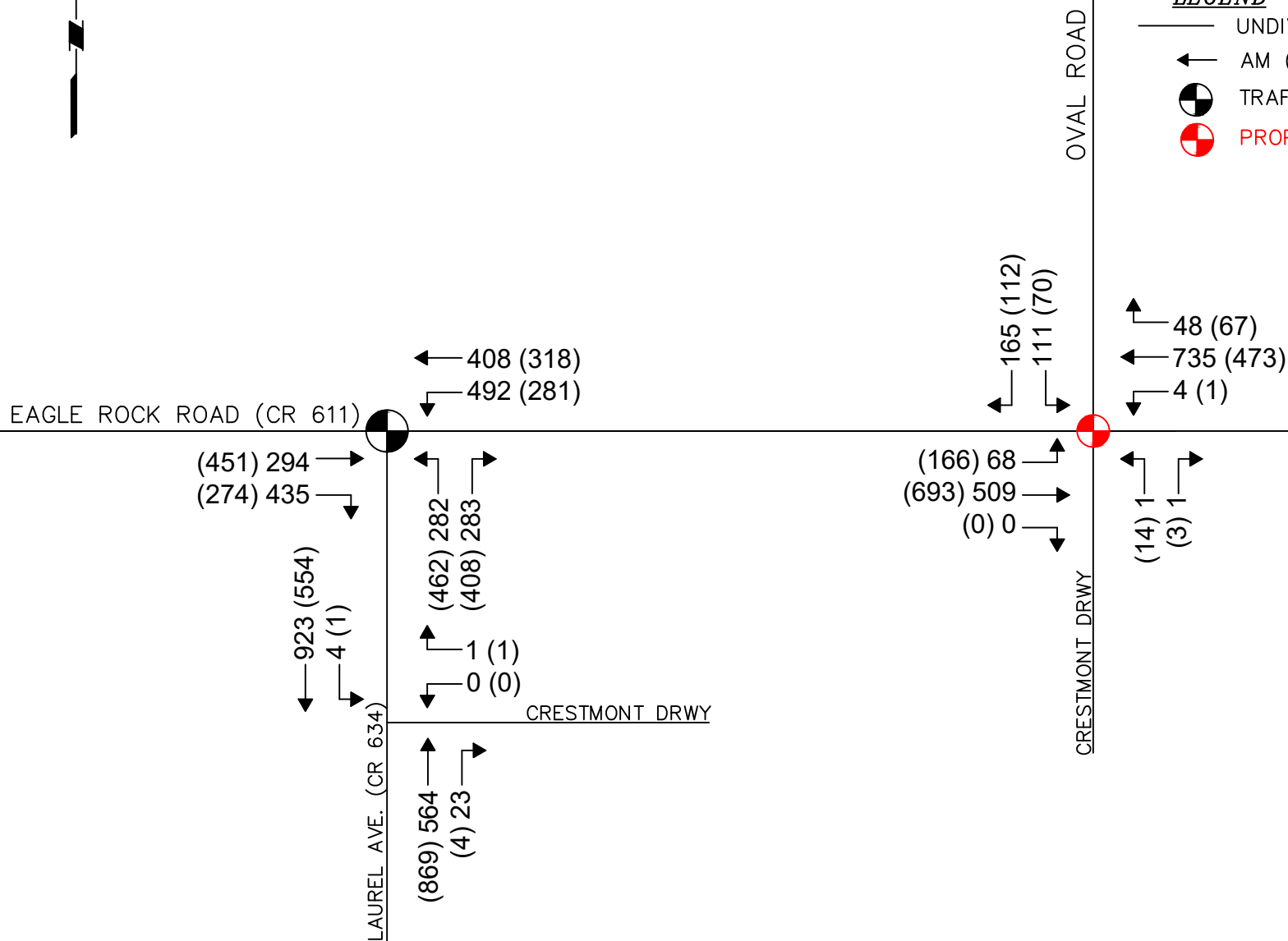
Drawing Title
**TOTAL
 SITE-GENERATED
 TRIPS**

Project No.
 101049801
 Date
 06/17/2024
 Drawn By
 EJV
 Checked By
 KP

Figure
5
 Sheet 5 of 7



LANGAN Langan Engineering and Environmental Services, LLC 1 University Square Drive, Suite 110 Princeton, NJ 08540 T: 609.282.8000 F: 609.282.8001 www.langan.com NJ Certificate of Authorization No.24GA27996400	Project WEST ESSEX HIGHLANDS BLOCK 179, LOT 32 TOWNSHIP OF WEST ORANGE ESSEX COUNTY NEW JERSEY	Drawing Title REROUTED TRAFFIC VOLUMES	Project No. 101049801	Figure 6
			Date 06/17/2024	
			Drawn By EJV	
			Checked By KP	
			Sheet 6 of 7	



LANGAN Langan Engineering and Environmental Services, LLC 1 University Square Drive, Suite 110 Princeton, NJ 08540 T: 609.282.8000 F: 609.282.8001 www.langan.com NJ Certificate of Authorization No.24GA27996400	Project WEST ESSEX HIGHLANDS BLOCK 179, LOT 32 TOWNSHIP OF WEST ORANGE ESSEX COUNTY NEW JERSEY	Drawing Title 2027 BUILD TRAFFIC VOLUMES	Project No. 101049801	7 Sheet 7 of 7
			Date 06/17/2024	
			Drawn By EJV	
			Checked By KP	

APPENDIX B

TRAFFIC COUNTS

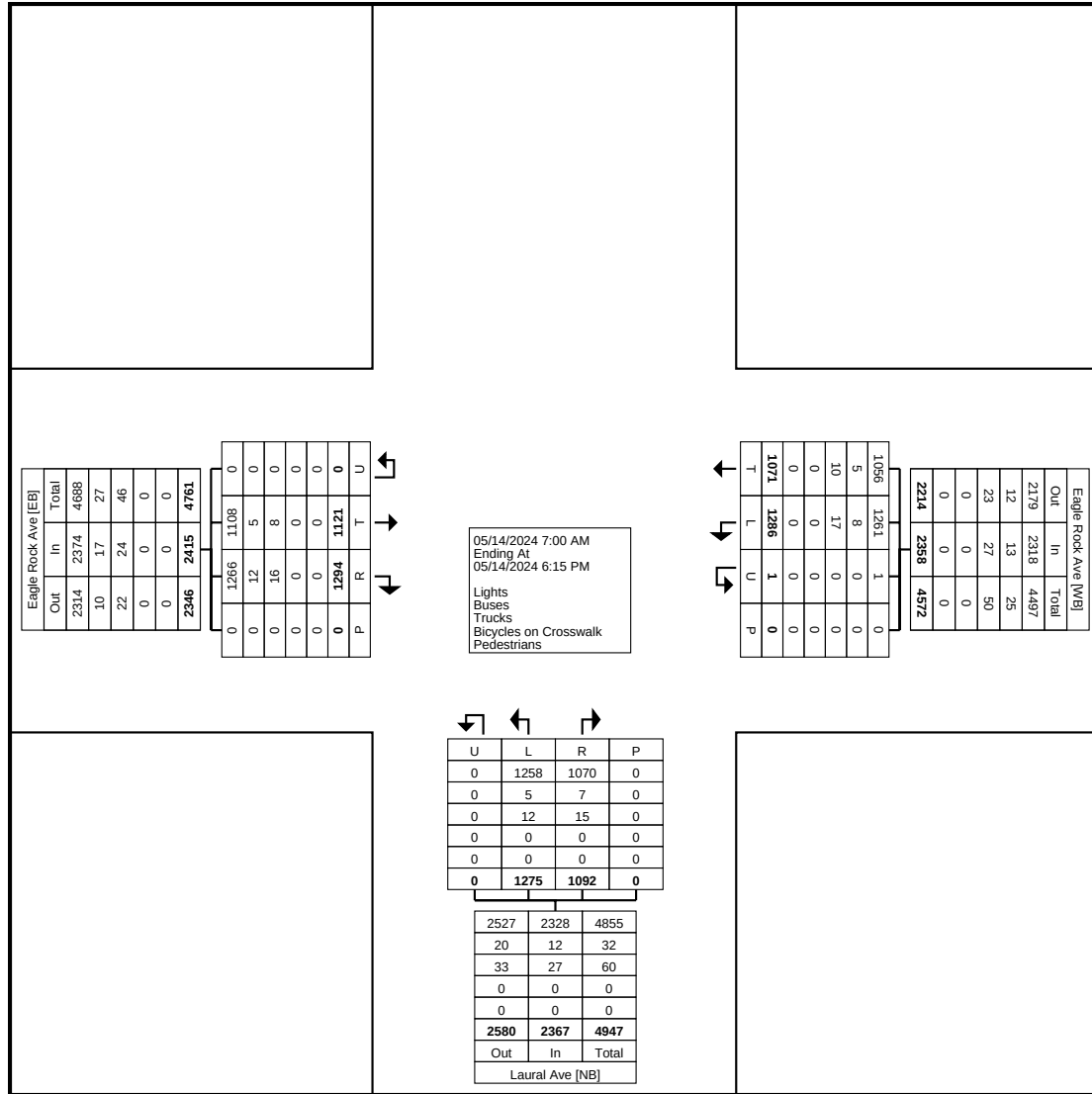
West Orange, NJ
Eagle Rock Ave & Laurel Ave
Tuesday, May 14, 2024
Location: 40.812278, -
74.273118

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Eagle Rock Ave &
Laural Ave
Site Code:
Start Date: 05/14/2024
Page No: 1

Turning Movement Data

Start Time	Eagle Rock Ave Eastbound						Eagle Rock Ave Westbound					Laural Ave Northbound							Int. Total
	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Left	Right	Right on Red	U-Turn	Peds	App. Total		
7:00 AM	27	33	40	0	0	100	70	33	0	0	103	33	13	7	0	0	53	256	
7:15 AM	31	29	50	0	0	110	83	47	0	0	130	55	16	16	0	0	87	327	
7:30 AM	55	59	48	0	0	162	102	78	0	0	180	42	27	14	0	0	83	425	
7:45 AM	58	42	53	0	0	153	103	74	0	0	177	73	40	23	0	0	136	466	
Hourly Total	171	163	191	0	0	525	358	232	0	0	590	203	96	60	0	0	359	1474	
8:00 AM	66	54	57	0	0	177	90	80	0	0	170	49	29	39	0	0	117	464	
8:15 AM	68	63	41	0	0	172	105	81	0	0	186	60	24	31	0	0	115	473	
8:30 AM	71	74	47	0	0	192	100	76	0	0	176	78	43	18	0	0	139	507	
8:45 AM	59	44	33	0	0	136	104	79	0	0	183	81	48	24	0	0	153	472	
Hourly Total	264	235	178	0	0	677	399	316	0	0	715	268	144	112	0	0	524	1916	
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:00 PM	78	32	32	0	0	142	91	74	0	0	165	91	65	11	0	0	167	474	
4:15 PM	60	51	31	0	0	142	65	61	0	0	126	102	76	22	0	0	200	468	
4:30 PM	79	42	31	0	0	152	62	53	0	0	115	86	55	19	0	0	160	427	
4:45 PM	82	48	11	0	0	141	63	57	0	0	120	86	51	25	0	0	162	423	
Hourly Total	299	173	105	0	0	577	281	245	0	0	526	365	247	77	0	0	689	1792	
5:00 PM	108	43	27	0	0	178	74	65	1	0	140	89	62	21	0	0	172	490	
5:15 PM	101	50	21	0	0	172	70	80	0	0	150	99	62	41	0	0	202	524	
5:30 PM	92	37	17	0	0	146	49	73	0	0	122	110	44	37	0	0	191	459	
5:45 PM	86	34	20	0	0	140	55	60	0	0	115	141	53	36	0	0	230	485	
Hourly Total	387	164	85	0	0	636	248	278	1	0	527	439	221	135	0	0	795	1958	
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Grand Total	1121	735	559	0	0	2415	1286	1071	1	0	2358	1275	708	384	0	0	2367	7140	
Approach %	46.4	30.4	23.1	0.0	-	-	54.5	45.4	0.0	-	-	53.9	29.9	16.2	0.0	-	-	-	
Total %	15.7	10.3	7.8	0.0	-	33.8	18.0	15.0	0.0	-	33.0	17.9	9.9	5.4	0.0	-	33.2	-	
Lights	1108	718	548	0	-	2374	1261	1056	1	-	2318	1258	691	379	0	-	2328	7020	
% Lights	98.8	97.7	98.0	-	-	98.3	98.1	98.6	100.0	-	98.3	98.7	97.6	98.7	-	-	98.4	98.3	
Buses	5	7	5	0	-	17	8	5	0	-	13	5	6	1	0	-	12	42	
% Buses	0.4	1.0	0.9	-	-	0.7	0.6	0.5	0.0	-	0.6	0.4	0.8	0.3	-	-	0.5	0.6	
Trucks	8	10	6	0	-	24	17	10	0	-	27	12	11	4	0	-	27	78	
% Trucks	0.7	1.4	1.1	-	-	1.0	1.3	0.9	0.0	-	1.1	0.9	1.6	1.0	-	-	1.1	1.1	
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Turning Movement Data Plot

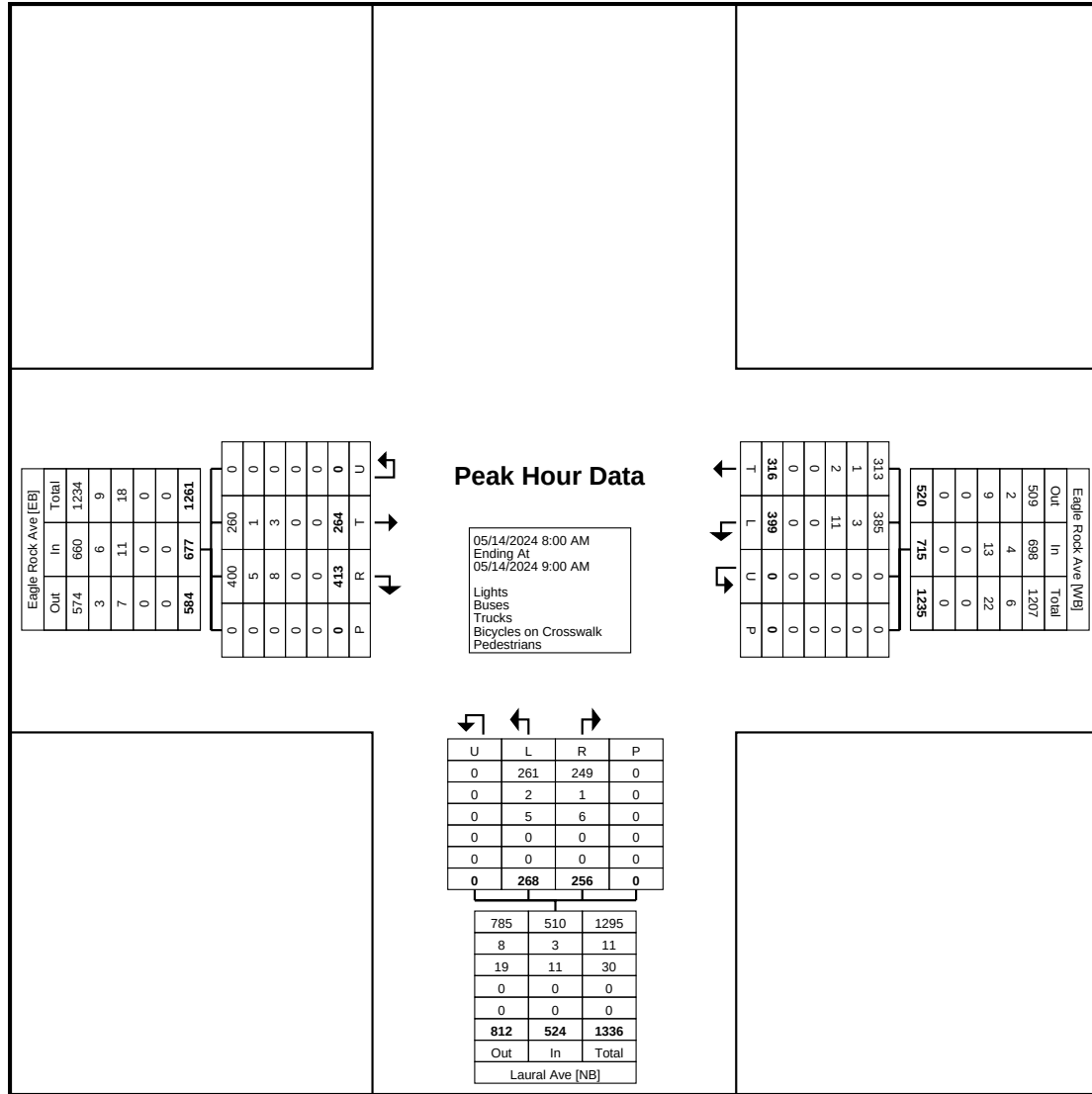
West Orange, NJ
Eagle Rock Ave & Laurel Ave
Tuesday, May 14, 2024
Location: 40.812278, -
74.273118

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Eagle Rock Ave &
Laural Ave
Site Code:
Start Date: 05/14/2024
Page No: 3

Turning Movement Peak Hour Data (8:00 AM)

[illegible]



Turning Movement Peak Hour Data Plot (8:00 AM)

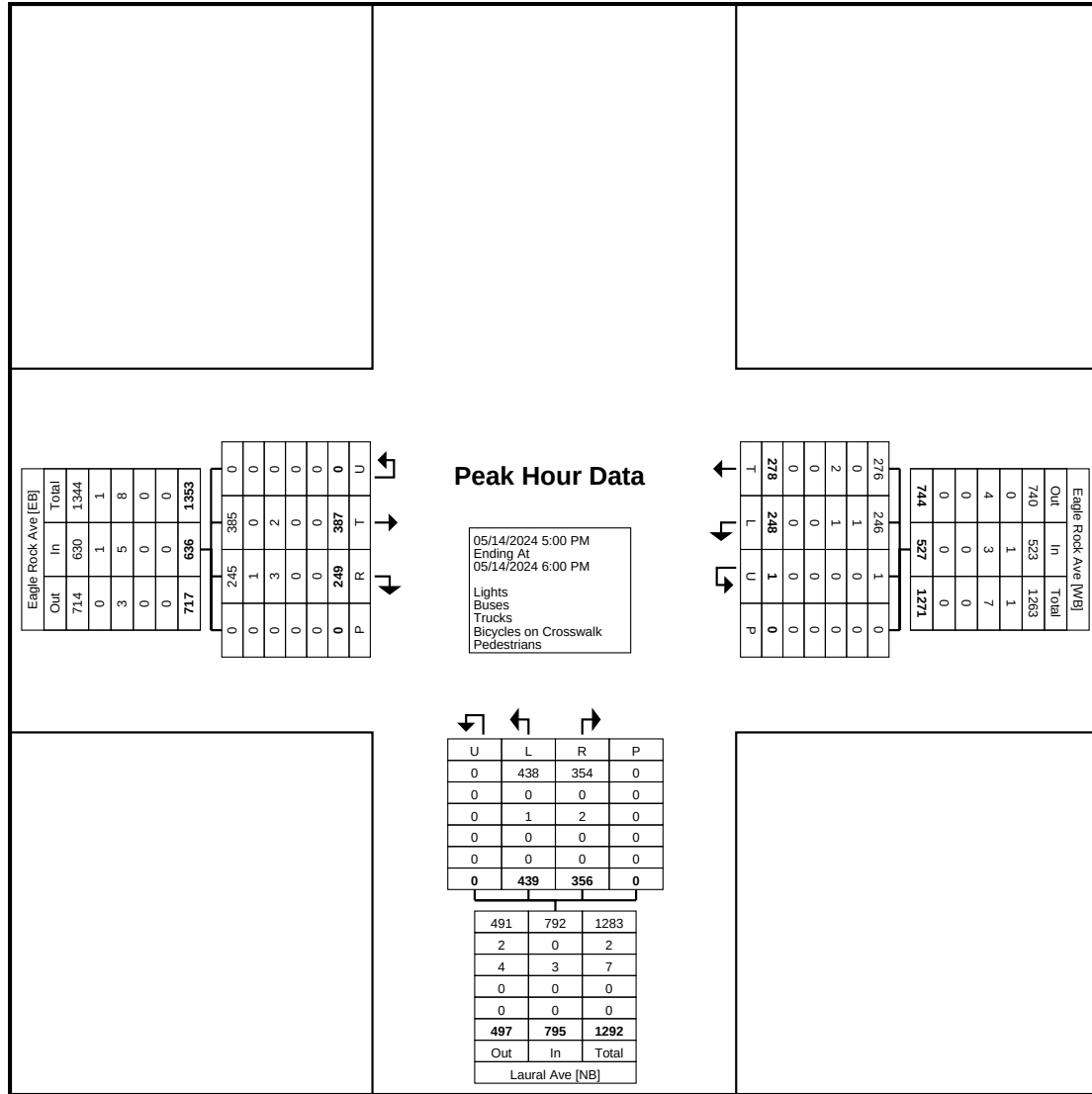
West Orange, NJ
Eagle Rock Ave & Laurel Ave
Tuesday, May 14, 2024
Location: 40.812278, -
74.273118

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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Count Name: Eagle Rock Ave &
Laural Ave
Site Code:
Start Date: 05/14/2024
Page No: 5

Turning Movement Peak Hour Data (5:00 PM)

[illegible]



Turning Movement Peak Hour Data Plot (5:00 PM)



www.TSTData.com

Tri-State Traffic Data, Inc

Coatesville, PA, Pennsylvania, United States 19320

610-466-1469

Serving Transportation Professionals Since 1995

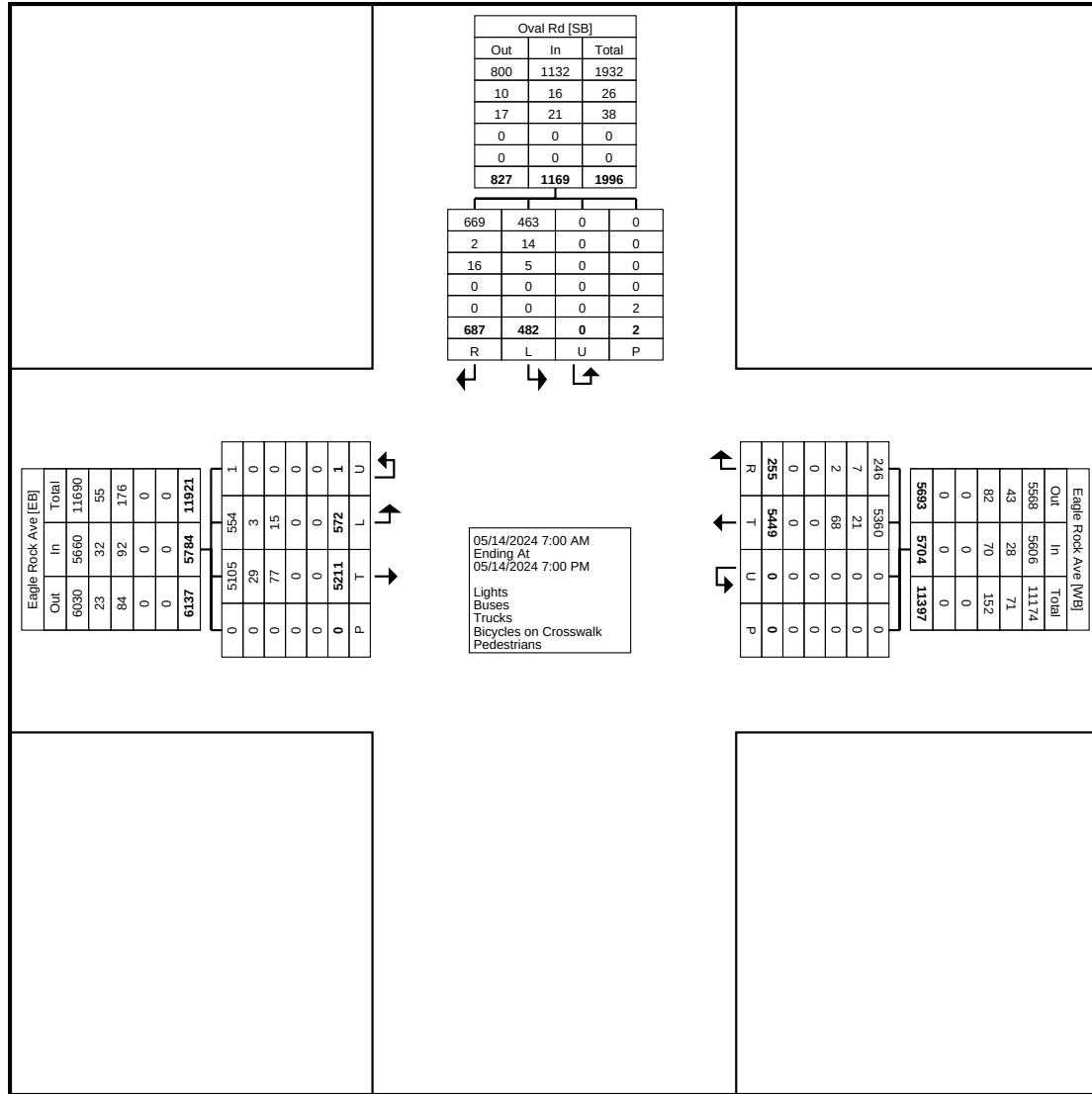
West Orange, NJ
Eagle Rock Ave & Oval Rd
Tuesday, May 14, 2024
Location: 40.812483, -
74.270069

Count Name: Eagle Rock Ave &
Oval Rd
Site Code:
Start Date: 05/14/2024
Page No: 1

Turning Movement Data

Start Time	Eagle Rock Ave Eastbound					Eagle Rock Ave Westbound					Oval Rd Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:00 AM	4	45	0	0	49	78	6	0	0	84	21	23	0	0	44	177
7:15 AM	2	62	0	0	64	118	5	0	0	123	23	18	0	0	41	228
7:30 AM	11	92	0	0	103	160	4	0	0	164	12	16	0	0	28	295
7:45 AM	7	117	0	0	124	143	3	0	0	146	13	32	0	0	45	315
Hourly Total	24	316	0	0	340	499	18	0	0	517	69	89	0	0	158	1015
8:00 AM	7	124	0	0	131	167	2	0	0	169	10	17	0	0	27	327
8:15 AM	7	122	0	0	129	176	6	0	0	182	13	18	0	0	31	342
8:30 AM	12	109	0	0	121	177	11	0	0	188	11	15	0	0	26	335
8:45 AM	11	123	0	0	134	182	9	0	0	191	11	16	0	0	27	352
Hourly Total	37	478	0	0	515	702	28	0	0	730	45	66	0	0	111	1356
9:00 AM	8	94	0	0	102	117	10	0	0	127	13	9	0	0	22	251
9:15 AM	10	76	0	0	86	99	3	0	0	102	6	17	0	0	23	211
9:30 AM	5	75	0	0	80	87	11	0	0	98	14	18	0	0	32	210
9:45 AM	7	74	0	0	81	91	10	0	0	101	5	19	0	0	24	206
Hourly Total	30	319	0	0	349	394	34	0	0	428	38	63	0	0	101	878
10:00 AM	10	59	0	0	69	66	9	0	0	75	4	9	0	0	13	157
10:15 AM	9	79	0	0	88	108	4	0	0	112	12	7	0	0	19	219
10:30 AM	8	81	0	0	89	89	6	0	0	95	11	20	0	0	31	215
10:45 AM	6	75	0	0	81	78	6	0	0	84	7	13	0	0	20	185
Hourly Total	33	294	0	0	327	341	25	0	0	366	34	49	0	0	83	776
11:00 AM	14	65	0	0	79	93	3	0	0	96	10	10	0	0	20	195
11:15 AM	12	67	0	0	79	89	6	0	0	95	9	9	0	0	18	192
11:30 AM	10	83	0	0	93	102	2	0	0	104	8	16	0	0	24	221
11:45 AM	8	104	0	0	112	103	3	0	0	106	6	27	0	0	33	251
Hourly Total	44	319	0	0	363	387	14	0	0	401	33	62	0	0	95	859
12:00 PM	12	78	0	0	90	103	7	0	0	110	5	13	0	0	18	218
12:15 PM	18	104	0	0	122	102	0	0	0	102	6	14	0	0	20	244
12:30 PM	10	106	0	0	116	97	6	0	0	103	5	13	0	0	18	237
12:45 PM	8	90	0	0	98	106	6	0	0	112	10	9	0	0	19	229
Hourly Total	48	378	0	0	426	408	19	0	0	427	26	49	0	0	75	928
1:00 PM	12	112	0	0	124	94	6	0	0	100	8	11	0	0	19	243
1:15 PM	11	92	0	0	103	81	3	0	0	84	5	10	0	1	15	202
1:30 PM	13	79	0	0	92	80	3	0	0	83	9	25	0	0	34	209
1:45 PM	12	96	0	0	108	104	5	0	0	109	9	9	0	0	18	235
Hourly Total	48	379	0	0	427	359	17	0	0	376	31	55	0	1	86	889
2:00 PM	9	96	0	0	105	106	3	0	0	109	9	11	0	0	20	234
2:15 PM	10	98	0	0	108	129	2	0	0	131	18	8	0	0	26	265
2:30 PM	6	88	0	0	94	118	5	0	0	123	8	12	0	0	20	237
2:45 PM	11	123	0	0	134	127	10	0	0	137	9	14	0	0	23	294
Hourly Total	36	405	0	0	441	480	20	0	0	500	44	45	0	0	89	1030
3:00 PM	11	116	0	0	127	114	2	0	0	116	12	12	0	0	24	267
3:15 PM	18	121	0	0	139	129	6	0	0	135	9	23	0	1	32	306
3:30 PM	17	153	0	0	170	139	6	0	0	145	11	11	0	0	22	337
3:45 PM	20	198	0	0	218	131	4	0	0	135	12	18	0	0	30	383
Hourly Total	66	588	0	0	654	513	18	0	0	531	44	64	0	1	108	1293
4:00 PM	11	141	0	0	152	144	7	0	0	151	7	16	0	0	23	326
4:15 PM	16	143	0	0	159	117	1	0	0	118	13	16	0	0	29	306
4:30 PM	15	143	0	0	158	105	3	0	0	108	13	10	0	0	23	289
4:45 PM	15	157	0	0	172	121	4	0	0	125	16	11	0	0	27	324
Hourly Total	57	584	0	0	641	487	15	0	0	502	49	53	0	0	102	1245
5:00 PM	16	180	0	0	196	116	6	0	0	122	9	17	0	0	26	344
5:15 PM	29	172	0	0	201	131	4	0	0	135	9	19	0	0	28	364
5:30 PM	19	162	0	0	181	113	4	0	0	117	10	12	0	0	22	320
5:45 PM	26	144	1	0	171	101	5	0	0	106	10	15	0	0	25	302
Hourly Total	90	658	1	0	749	461	19	0	0	480	38	63	0	0	101	1330
6:00 PM	19	143	0	0	162	124	8	0	0	132	11	8	0	0	19	313
6:15 PM	13	139	0	0	152	122	6	0	0	128	10	7	0	0	17	297
6:30 PM	15	115	0	0	130	92	6	0	0	98	6	9	0	0	15	243
6:45 PM	12	96	0	0	108	80	8	0	0	88	4	5	0	0	9	205

Hourly Total	59	493	0	0	552	418	28	0	0	446	31	29	0	0	60	1058
Grand Total	572	5211	1	0	5784	5449	255	0	0	5704	482	687	0	2	1169	12657
Approach %	9.9	90.1	0.0	-	-	95.5	4.5	0.0	-	-	41.2	58.8	0.0	-	-	-
Total %	4.5	41.2	0.0	-	45.7	43.1	2.0	0.0	-	45.1	3.8	5.4	0.0	-	9.2	-
Lights	554	5105	1	-	5660	5360	246	0	-	5606	463	669	0	-	1132	12398
% Lights	96.9	98.0	100.0	-	97.9	98.4	96.5	-	-	98.3	96.1	97.4	-	-	96.8	98.0
Buses	3	29	0	-	32	21	7	0	-	28	14	2	0	-	16	76
% Buses	0.5	0.6	0.0	-	0.6	0.4	2.7	-	-	0.5	2.9	0.3	-	-	1.4	0.6
Trucks	15	77	0	-	92	68	2	0	-	70	5	16	0	-	21	183
% Trucks	2.6	1.5	0.0	-	1.6	1.2	0.8	-	-	1.2	1.0	2.3	-	-	1.8	1.4
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Turning Movement Data Plot

West Orange, NJ
Eagle Rock Ave & Oval Rd
Tuesday, May 14, 2024
Location: 40.812483, -
74.270069

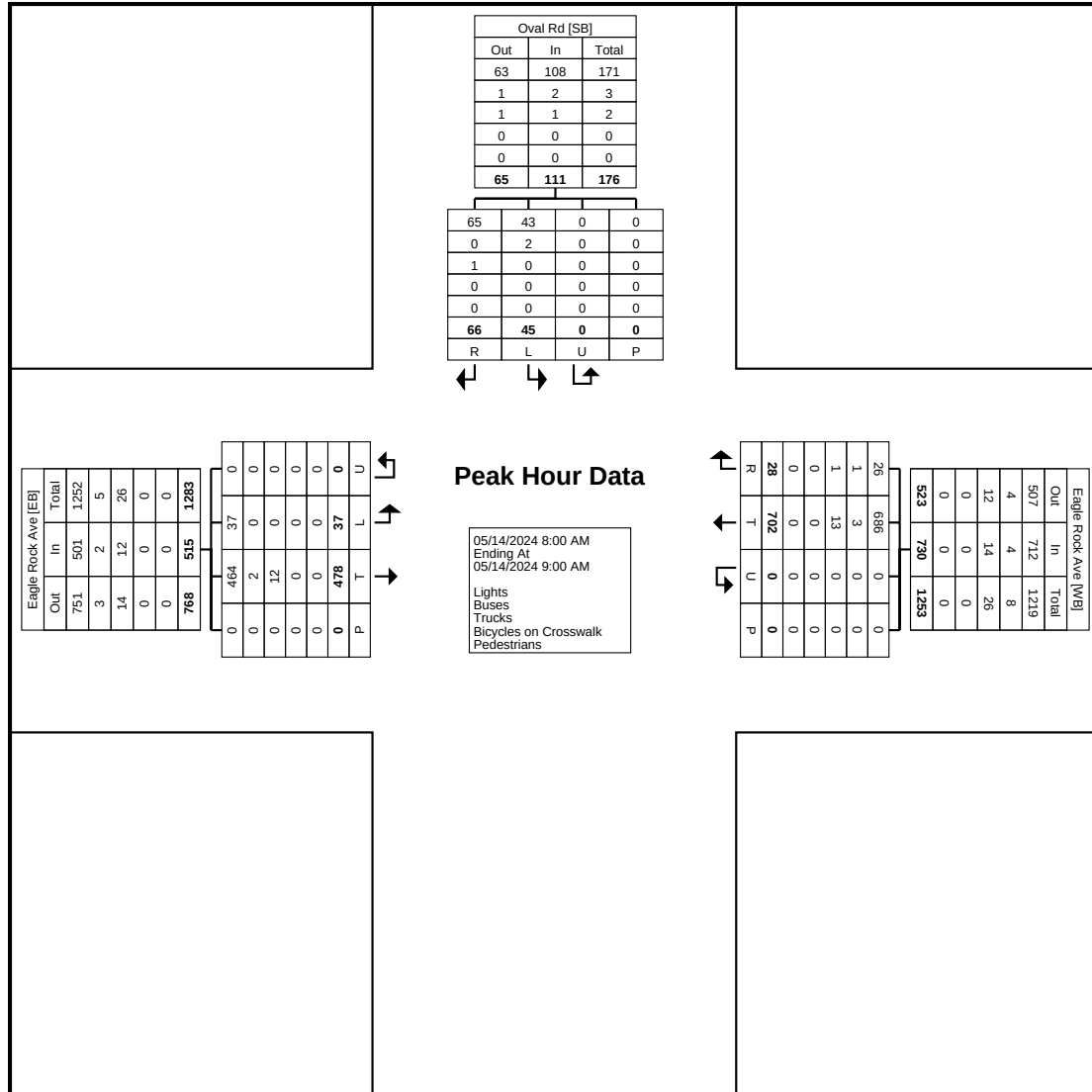
Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Eagle Rock Ave &
Oval Rd
Site Code:
Start Date: 05/14/2024
Page No: 4

Turning Movement Peak Hour Data (8:00 AM)

[illegible]

West Orange, NJ
Eagle Rock Ave & Oval Rd
Tuesday, May 14, 2024
Location: 40.812483, -
74.270069



Turning Movement Peak Hour Data Plot (8:00 AM)

Eagle Rock Ave & Oval Rd - TMC

Tue May 14, 2024

Forced Peak (5 PM - 6 PM)

All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 1187482, Location: 40.812483, -74.270069



Provided by: Tri-State Traffic Data, Inc.

184 Baker Road,
Coatesville, PA, 19320, US

Leg Direction	Eagle Rock Ave Eastbound					Eagle Rock Ave Westbound					Oval Rd Southbound					
Time	L	T	U	App	Ped*	T	R	U	App	Ped*	L	R	U	App	Ped*	Int
2024-05-14 5:00PM	16	180	0	196	0	116	6	0	122	0	9	17	0	26	0	344
5:15PM	29	172	0	201	0	131	4	0	135	0	9	19	0	28	0	364
5:30PM	19	162	0	181	0	113	4	0	117	0	10	12	0	22	0	320
5:45PM	26	144	1	171	0	101	5	0	106	0	10	15	0	25	0	302
Total	90	658	1	749	0	461	19	0	480	0	38	63	0	101	0	1330
% Approach	12.0%	87.9%	0.1%	-	-	96.0%	4.0%	0%	-	-	37.6%	62.4%	0%	-	-	-
% Total	6.8%	49.5%	0.1%	56.3%	-	34.7%	1.4%	0%	36.1%	-	2.9%	4.7%	0%	7.6%	-	-
PHF	0.776	0.914	0.250	0.932	-	0.880	0.792	-	0.889	-	0.950	0.829	-	0.902	-	0.913
Lights	90	654	1	745	-	459	19	0	478	-	37	63	0	100	-	1323
% Lights	100%	99.4%	100%	99.5%	-	99.6%	100%	0%	99.6%	-	97.4%	100%	0%	99.0%	-	99.5%
Articulated Trucks and Single-Unit Trucks	0	4	0	4	-	1	0	0	1	-	1	0	0	1	-	6
% Articulated Trucks and Single-Unit Trucks	0%	0.6%	0%	0.5%	-	0.2%	0%	0%	0.2%	-	2.6%	0%	0%	1.0%	-	0.5%
Buses	0	0	0	0	-	1	0	0	1	-	0	0	0	0	-	1
% Buses	0%	0%	0%	0%	-	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	-	0.1%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Eagle Rock Ave & Oval Rd - TMC

Tue May 14, 2024

Forced Peak (5 PM - 6 PM)

All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Crosswalk)

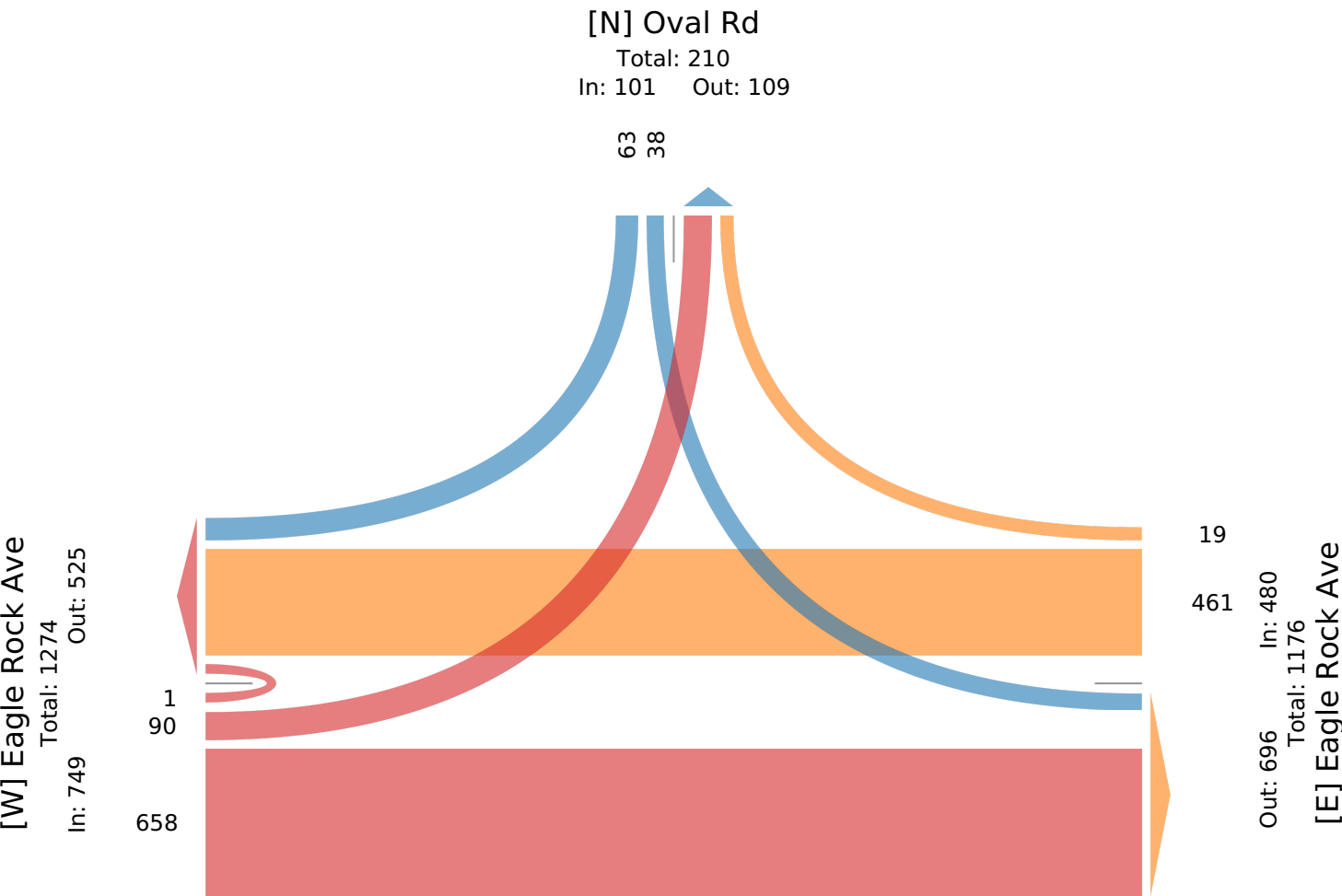
All Movements

ID: 1187482, Location: 40.812483, -74.270069



Provided by: Tri-State Traffic Data, Inc.

184 Baker Road,
Coatesville, PA, 19320, US



West Orange, NJ
Eagle Rock Ave & Crestmont
Country Club
Tuesday, May 14, 2024
Location: 40.812619, -
74.268966

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

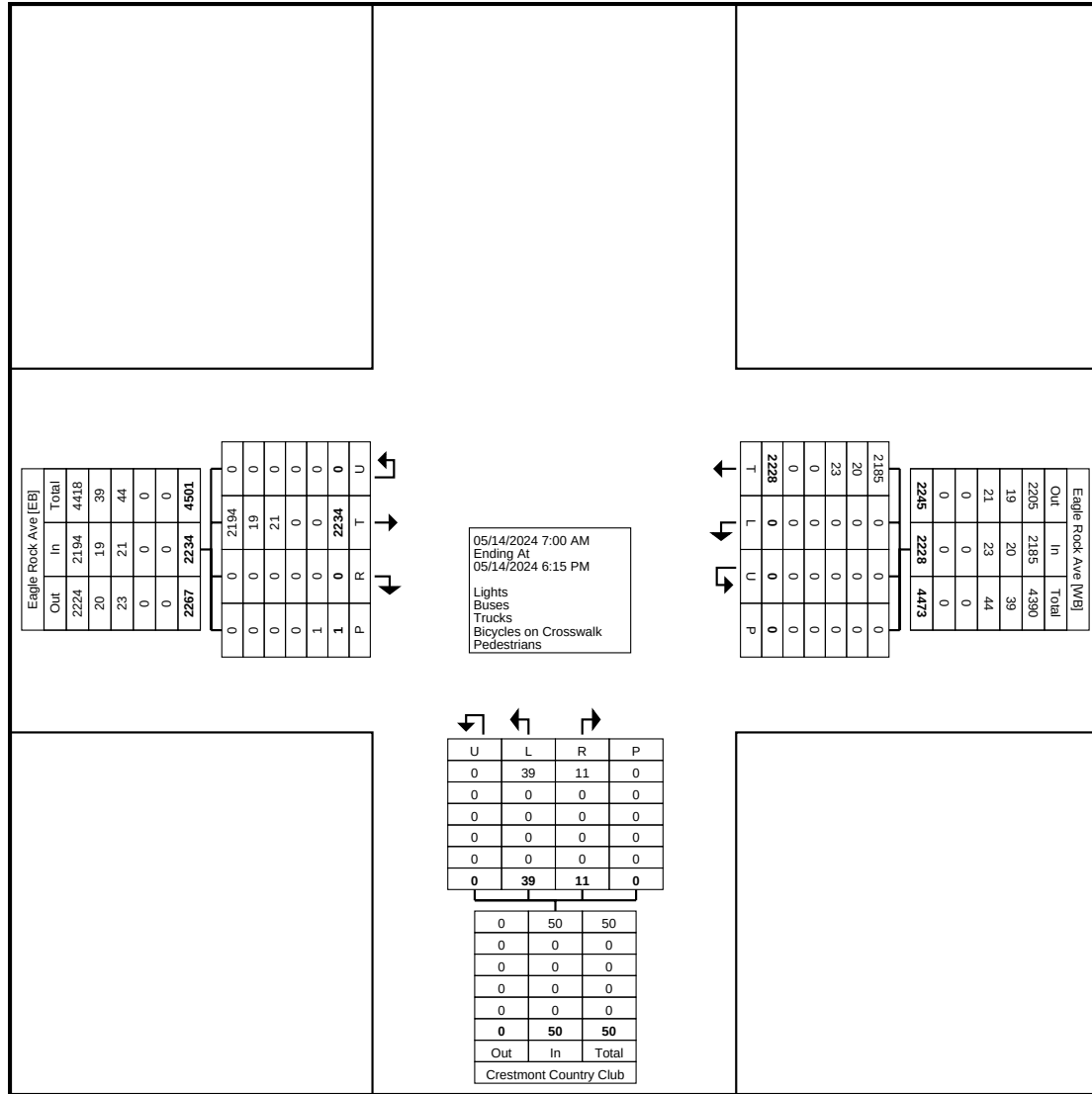
Count Name: Eagle Rock Ave &
Crestmont County Club
Site Code:
Start Date: 05/14/2024
Page No: 1

Turning Movement Data

Start Time	Eagle Rock Ave Eastbound					Eagle Rock Ave Westbound					Crestmont Country Club Northbound					Int. Total
	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:00 AM	67	0	0	0	67	0	87	0	0	87	0	0	0	0	0	154
7:15 AM	84	0	0	0	84	0	119	0	0	119	0	1	0	0	1	204
7:30 AM	98	0	0	0	98	0	165	0	0	165	2	0	0	0	2	265
7:45 AM	126	0	0	0	126	0	147	0	0	147	1	0	0	0	1	274
Hourly Total	375	0	0	0	375	0	518	0	0	518	3	1	0	0	4	897
8:00 AM	139	0	0	0	139	0	171	0	0	171	0	0	0	0	0	310
8:15 AM	134	0	0	0	134	0	185	0	0	185	1	0	0	0	1	320
8:30 AM	123	0	0	0	123	0	181	0	0	181	0	0	0	0	0	304
8:45 AM	126	0	0	0	126	0	194	0	0	194	0	1	0	0	1	321
Hourly Total	522	0	0	0	522	0	731	0	0	731	1	1	0	0	2	1255
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	156	0	0	0	156	0	141	0	0	141	10	0	0	0	10	307
4:15 PM	153	0	0	0	153	0	114	0	0	114	5	2	0	0	7	274
4:30 PM	154	0	0	0	154	0	115	0	0	115	1	1	0	0	2	271
4:45 PM	168	0	0	0	168	0	124	0	0	124	5	3	0	0	8	300
Hourly Total	631	0	0	0	631	0	494	0	0	494	21	6	0	0	27	1152
5:00 PM	194	0	0	1	194	0	121	0	0	121	5	1	0	0	6	321
5:15 PM	184	0	0	0	184	0	134	0	0	134	5	0	0	0	5	323
5:30 PM	166	0	0	0	166	0	122	0	0	122	1	1	0	0	2	290
5:45 PM	162	0	0	0	162	0	108	0	0	108	3	1	0	0	4	274
Hourly Total	706	0	0	1	706	0	485	0	0	485	14	3	0	0	17	1208
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2234	0	0	1	2234	0	2228	0	0	2228	39	11	0	0	50	4512
Approach %	100.0	0.0	0.0	-	-	0.0	100.0	0.0	-	-	78.0	22.0	0.0	-	-	-
Total %	49.5	0.0	0.0	-	49.5	0.0	49.4	0.0	-	49.4	0.9	0.2	0.0	-	1.1	-
Lights	2194	0	0	-	2194	0	2185	0	-	2185	39	11	0	-	50	4429
% Lights	98.2	-	-	-	98.2	-	98.1	-	-	98.1	100.0	100.0	-	-	100.0	98.2
Buses	19	0	0	-	19	0	20	0	-	20	0	0	0	-	0	39
% Buses	0.9	-	-	-	0.9	-	0.9	-	-	0.9	0.0	0.0	-	-	0.0	0.9
Trucks	21	0	0	-	21	0	23	0	-	23	0	0	0	-	0	44
% Trucks	0.9	-	-	-	0.9	-	1.0	-	-	1.0	0.0	0.0	-	-	0.0	1.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

West Orange, NJ
Eagle Rock Ave & Crestmont
Country Club
Tuesday, May 14, 2024
Location: 40.812619, -
74.268966

Count Name: Eagle Rock Ave &
Crestmont Country Club
Site Code:
Start Date: 05/14/2024
Page No: 2



Turning Movement Data Plot

West Orange, NJ
Eagle Rock Ave & Crestmont
Country Club
Tuesday, May 14, 2024
Location: 40.812619, -
74.268966

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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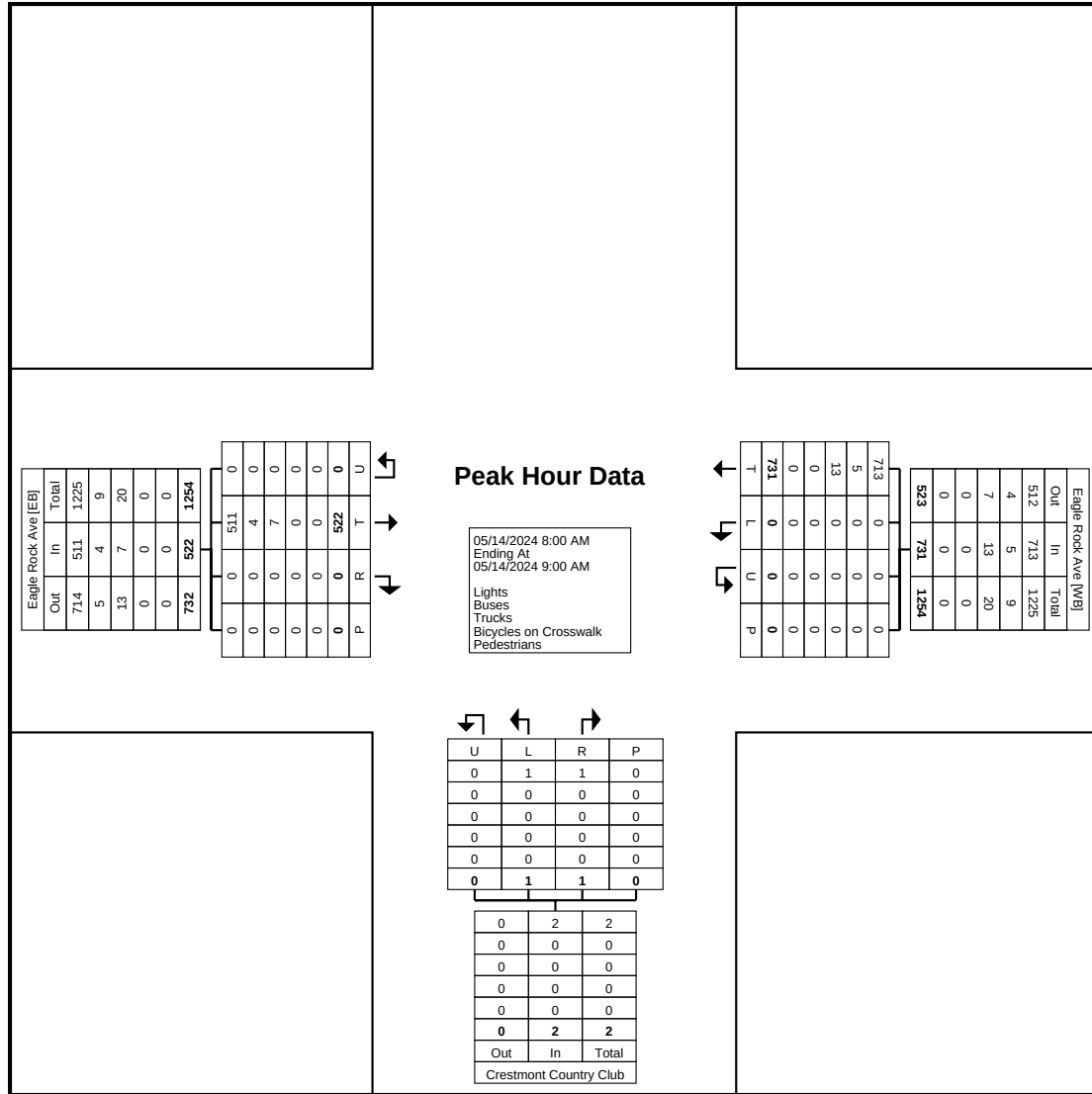
Count Name: Eagle Rock Ave &
Crestmont County Club
Site Code:
Start Date: 05/14/2024
Page No: 3

Turning Movement Peak Hour Data (8:00 AM)

[illegible]

West Orange, NJ
Eagle Rock Ave & Crestmont
Country Club
Tuesday, May 14, 2024
Location: 40.812619, -
74.268966

Count Name: Eagle Rock Ave &
Crestmont Country Club
Site Code:
Start Date: 05/14/2024
Page No: 4



Turning Movement Peak Hour Data Plot (8:00 AM)

Eagle Rock Ave & Crestmont County Club - TMC

Tue May 14, 2024

Forced Peak (5 PM - 6 PM)

All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 1187483, Location: 40.812619, -74.268966



Provided by: Tri-State Traffic Data, Inc.

184 Baker Road,
Coatesville, PA, 19320, US

Leg Direction	Eagle Rock Ave Eastbound					Eagle Rock Ave Westbound					Crestmont Country Club Northbound					
Time	T	R	U	App	Ped*	L	T	U	App	Ped*	L	R	U	App	Ped*	Int
2024-05-14 5:00PM	194	0	0	194	1	0	121	0	121	0	5	1	0	6	0	321
5:15PM	184	0	0	184	0	0	134	0	134	0	5	0	0	5	0	323
5:30PM	166	0	0	166	0	0	122	0	122	0	1	1	0	2	0	290
5:45PM	162	0	0	162	0	0	108	0	108	0	3	1	0	4	0	274
Total	706	0	0	706	1	0	485	0	485	0	14	3	0	17	0	1208
% Approach	100%	0%	0%	-	-	0%	100%	0%	-	-	82.4%	17.6%	0%	-	-	-
% Total	58.4%	0%	0%	58.4%	-	0%	40.1%	0%	40.1%	-	1.2%	0.2%	0%	1.4%	-	-
PHF	0.910	-	-	0.910	-	-	0.905	-	0.905	-	0.700	0.750	-	0.708	-	0.935
Lights	701	0	0	701	-	0	483	0	483	-	14	3	0	17	-	1201
% Lights	99.3%	0%	0%	99.3%	-	0%	99.6%	0%	99.6%	-	100%	100%	0%	100%	-	99.4%
Articulated Trucks and Single-Unit Trucks	5	0	0	5	-	0	0	0	0	-	0	0	0	0	-	5
% Articulated Trucks and Single-Unit Trucks	0.7%	0%	0%	0.7%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0.4%
Buses	0	0	0	0	-	0	2	0	2	-	0	0	0	0	-	2
% Buses	0%	0%	0%	0%	-	0%	0.4%	0%	0.4%	-	0%	0%	0%	0%	-	0.2%
Pedestrians	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Eagle Rock Ave & Crestmont County Club - TMC

Tue May 14, 2024

Forced Peak (5 PM - 6 PM)

All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Crosswalk)

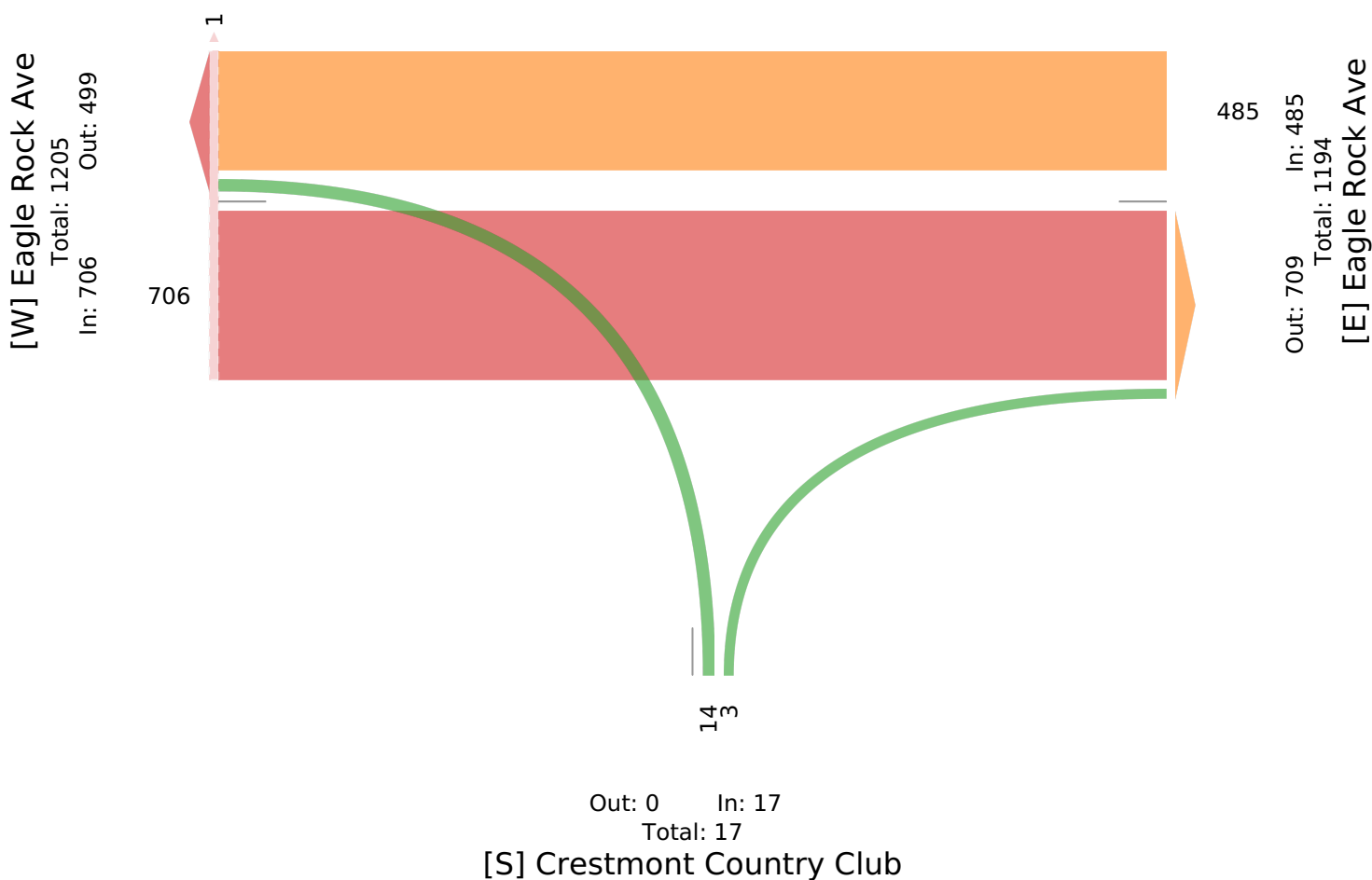
All Movements

ID: 1187483, Location: 40.812619, -74.268966



Provided by: Tri-State Traffic Data, Inc.

184 Baker Road,
Coatesville, PA, 19320, US



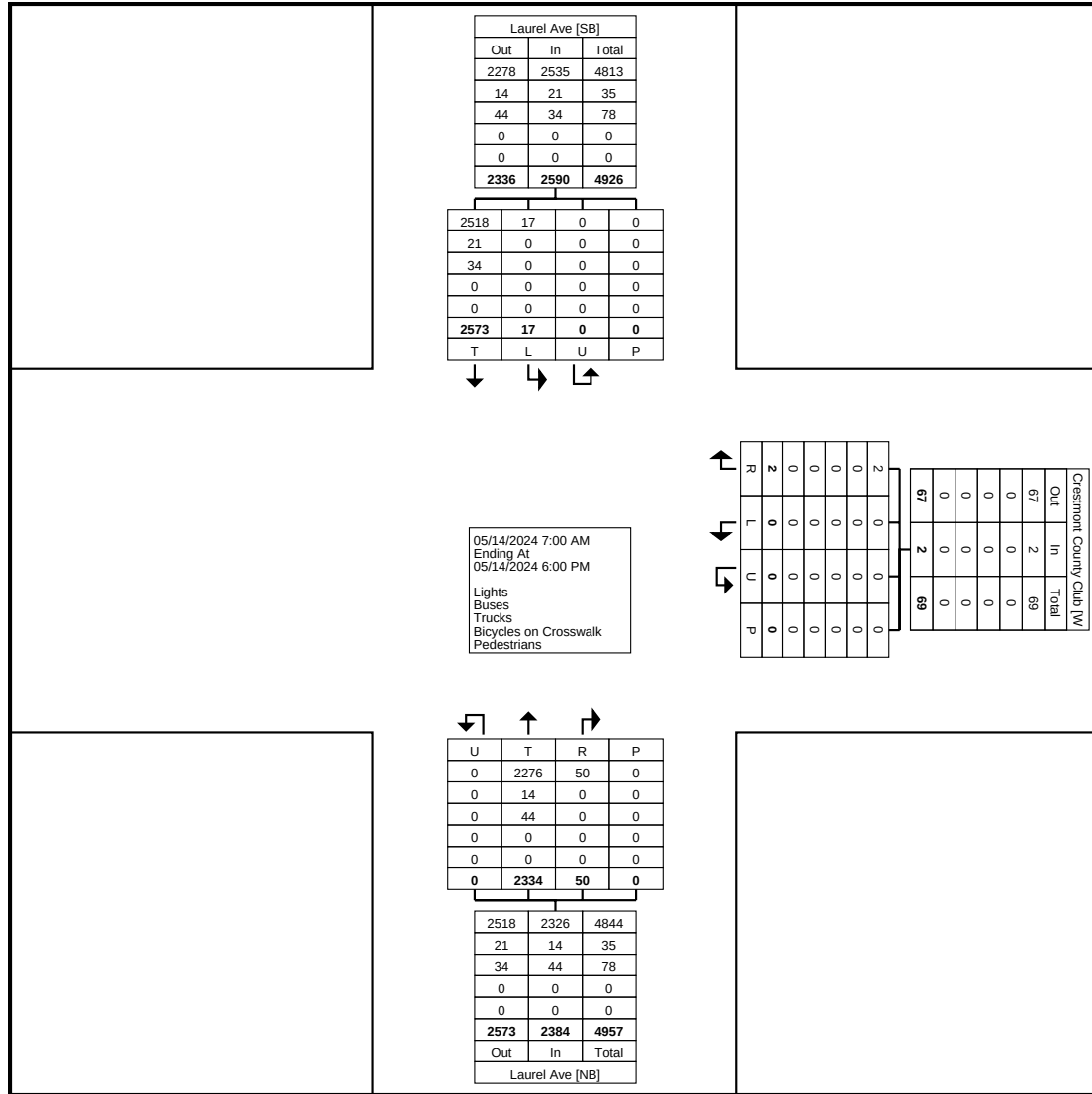
West Orange, NJ
Laurel Ave & Crestmont Country
Club
Tuesday, May 14, 2024
Location: 40.811924, -
74.273607

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Laurel Ave &
Crestmont Country Club
Site Code:
Start Date: 05/14/2024
Page No: 1

Turning Movement Data

Start Time	Crestmont County Club Westbound					Laurel Ave Northbound					Laurel Ave Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
7:00 AM	0	0	0	0	0	50	1	0	0	51	0	142	0	0	142	193
7:15 AM	0	0	0	0	0	87	1	0	0	88	1	162	0	0	163	251
7:30 AM	0	0	0	0	0	88	2	0	0	90	1	209	0	0	210	300
7:45 AM	0	0	0	0	0	131	4	0	0	135	0	191	0	0	191	326
Hourly Total	0	0	0	0	0	356	8	0	0	364	2	704	0	0	706	1070
8:00 AM	0	0	0	0	0	116	8	0	0	124	1	207	0	0	208	332
8:15 AM	0	1	0	0	1	117	7	0	0	124	3	210	0	0	213	338
8:30 AM	0	0	0	0	0	137	6	0	0	143	1	218	0	0	219	362
8:45 AM	0	0	0	0	0	144	2	0	0	146	3	179	0	0	182	328
Hourly Total	0	1	0	0	1	514	23	0	0	537	8	814	0	0	822	1360
9:00 AM	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	2
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	2
4:00 PM	0	0	0	0	0	167	6	0	0	173	2	150	0	0	152	325
4:15 PM	0	0	0	0	0	194	2	0	0	196	1	145	0	0	146	342
4:30 PM	0	0	0	0	0	160	0	0	0	160	1	131	0	0	132	292
4:45 PM	0	0	0	0	0	185	7	0	0	192	1	123	0	0	124	316
Hourly Total	0	0	0	0	0	706	15	0	0	721	5	549	0	0	554	1275
5:00 PM	0	1	0	0	1	172	0	0	0	172	2	144	0	0	146	319
5:15 PM	0	0	0	0	0	191	1	0	0	192	0	146	0	0	146	338
5:30 PM	0	0	0	0	0	183	1	0	0	184	0	104	0	0	104	288
5:45 PM	0	0	0	0	0	210	2	0	0	212	0	112	0	0	112	324
Hourly Total	0	1	0	0	1	756	4	0	0	760	2	506	0	0	508	1269
Grand Total	0	2	0	0	2	2334	50	0	0	2384	17	2573	0	0	2590	4976
Approach %	0.0	100.0	0.0	-	-	97.9	2.1	0.0	-	-	0.7	99.3	0.0	-	-	-
Total %	0.0	0.0	0.0	-	0.0	46.9	1.0	0.0	-	47.9	0.3	51.7	0.0	-	52.0	-
Lights	0	2	0	-	2	2276	50	0	-	2326	17	2518	0	-	2535	4863
% Lights	-	100.0	-	-	100.0	97.5	100.0	-	-	97.6	100.0	97.9	-	-	97.9	97.7
Buses	0	0	0	-	0	14	0	0	-	14	0	21	0	-	21	35
% Buses	-	0.0	-	-	0.0	0.6	0.0	-	-	0.6	0.0	0.8	-	-	0.8	0.7
Trucks	0	0	0	-	0	44	0	0	-	44	0	34	0	-	34	78
% Trucks	-	0.0	-	-	0.0	1.9	0.0	-	-	1.8	0.0	1.3	-	-	1.3	1.6
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Data Plot

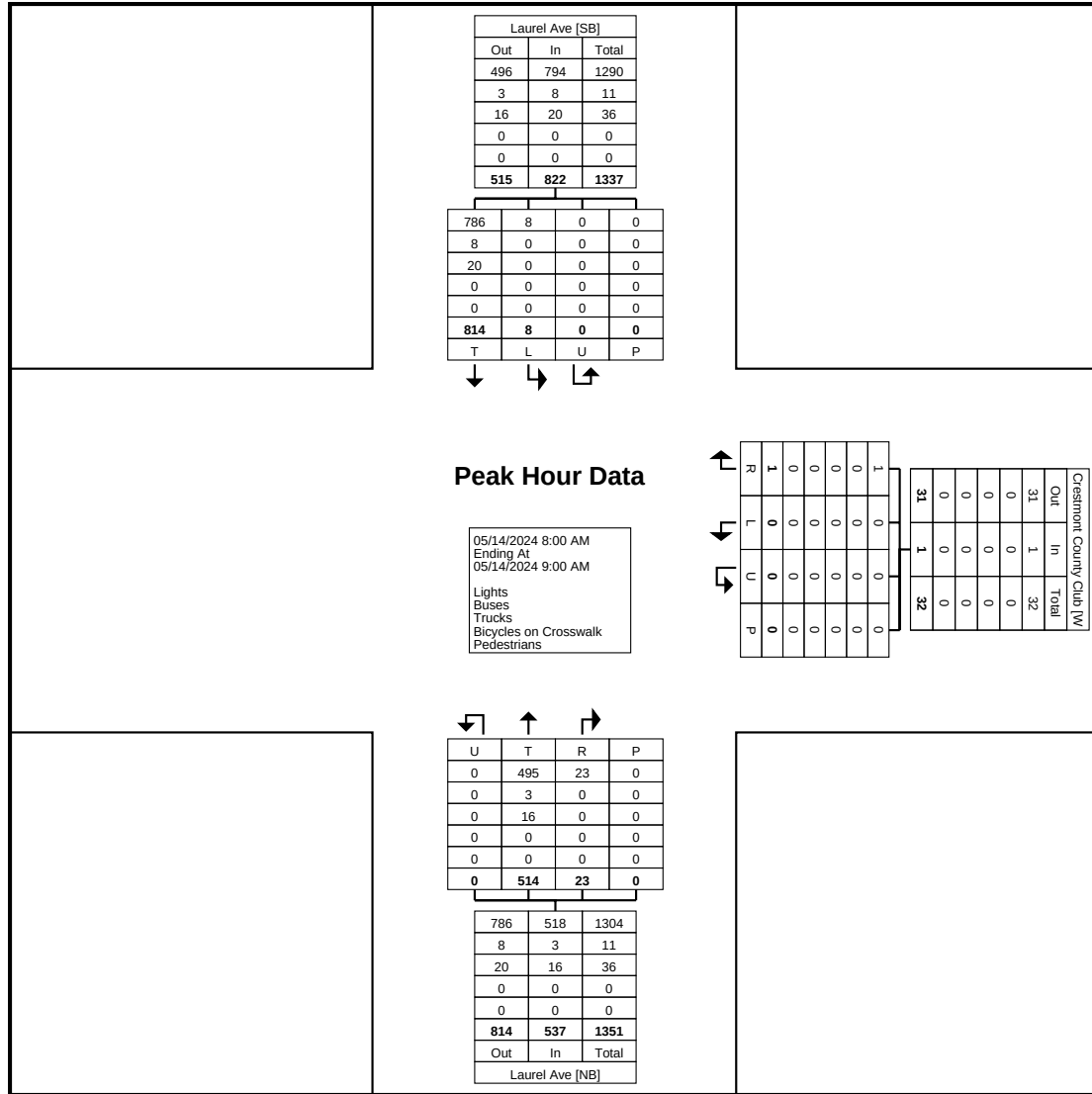
West Orange, NJ
Laurel Ave & Crestmont Country
Club
Tuesday, May 14, 2024
Location: 40.811924, -
74.273607

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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Count Name: Laurel Ave &
Crestmont Country Club
Site Code:
Start Date: 05/14/2024
Page No: 3

Turning Movement Peak Hour Data (8:00 AM)

[illegible]



Turning Movement Peak Hour Data Plot (8:00 AM)

West Orange, NJ
Laurel Ave & Crestmont Country
Club
Tuesday, May 14, 2024
Location: 40.811924, -
74.273607

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Page No: 5

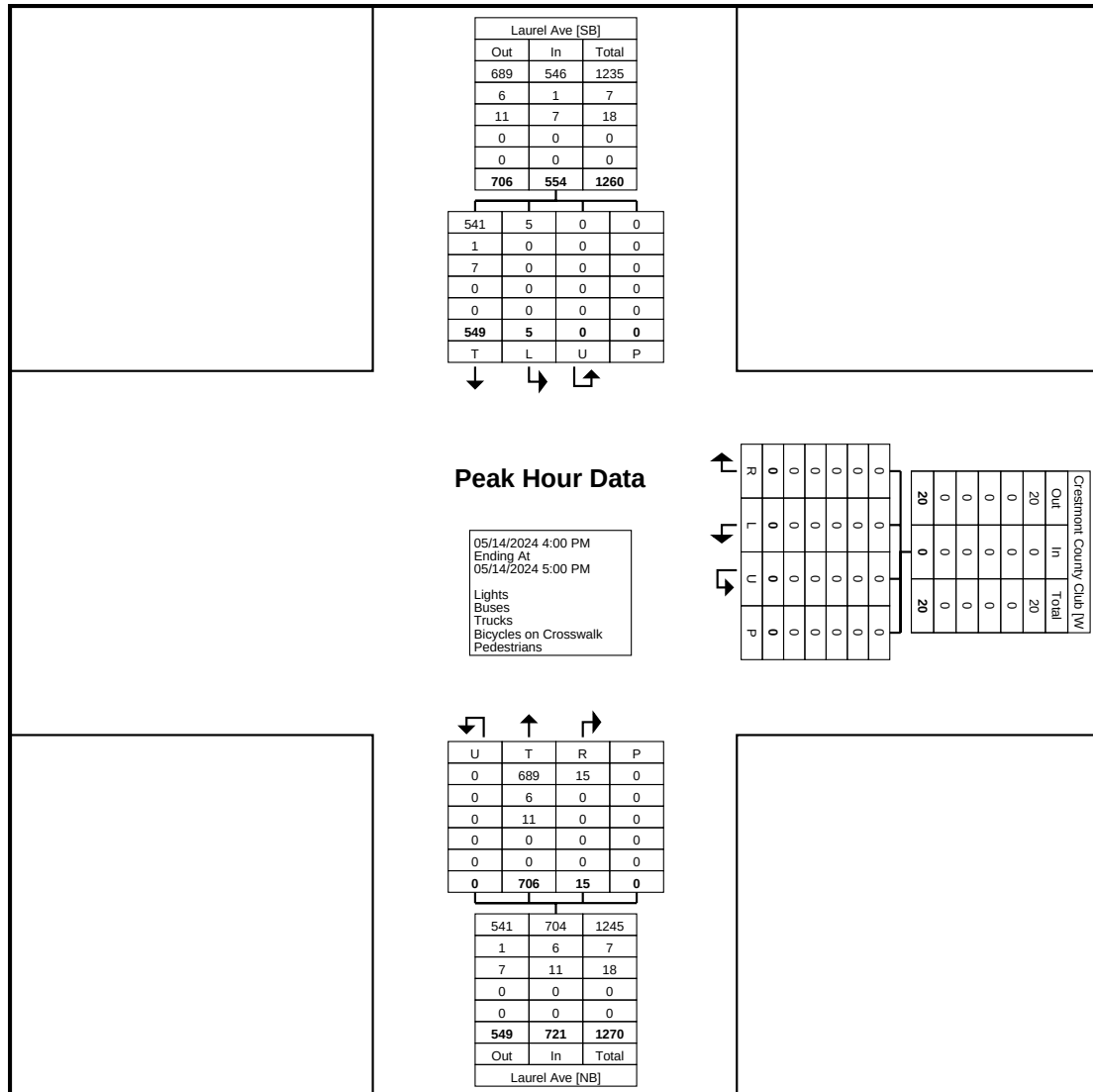
Turning Movement Peak Hour Data (4:00 PM)

Start Time	Crestmont County Club Westbound					Laurel Ave Northbound					Laurel Ave Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
4:00 PM	0	0	0	0	0	167	6	0	0	173	2	150	0	0	152	325
4:15 PM	0	0	0	0	0	194	2	0	0	196	1	145	0	0	146	342
4:30 PM	0	0	0	0	0	160	0	0	0	160	1	131	0	0	132	292
4:45 PM	0	0	0	0	0	185	7	0	0	192	1	123	0	0	124	316
Total	0	0	0	0	0	706	15	0	0	721	5	549	0	0	554	1275
Approach %	0.0	0.0	0.0	-	-	97.9	2.1	0.0	-	-	0.9	99.1	0.0	-	-	-
Total %	0.0	0.0	0.0	-	0.0	55.4	1.2	0.0	-	56.5	0.4	43.1	0.0	-	43.5	-
PHF	0.000	0.000	0.000	-	0.000	0.910	0.536	0.000	-	0.920	0.625	0.915	0.000	-	0.911	0.932
Lights	0	0	0	-	0	689	15	0	-	704	5	541	0	-	546	1250
% Lights	-	-	-	-	-	97.6	100.0	-	-	97.6	100.0	98.5	-	-	98.6	98.0
Buses	0	0	0	-	0	6	0	0	-	6	0	1	0	-	1	7
% Buses	-	-	-	-	-	0.8	0.0	-	-	0.8	0.0	0.2	-	-	0.2	0.5
Trucks	0	0	0	-	0	11	0	0	-	11	0	7	0	-	7	18
% Trucks	-	-	-	-	-	1.6	0.0	-	-	1.5	0.0	1.3	-	-	1.3	1.4
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

West Orange, NJ
Laurel Ave & Crestmont Country
Club
Tuesday, May 14, 2024
Location: 40.811924, -
74.273607

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Page No: 6



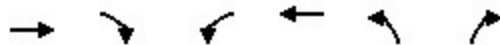
Turning Movement Peak Hour Data Plot (4:00 PM)

APPENDIX C
TIMING DIRECTIVE

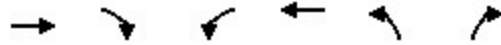
[illegible]

APPENDIX D
CAPACITY ANALYSIS WORKSHEETS

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	278	435	452	357	282	270
Future Volume (vph)	278	435	452	357	282	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	120		0	0
Storage Lanes		0	1		1	1
Taper Length (ft)			50		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.909					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3210	0	1752	3574	1770	1568
Flt Permitted			0.234		0.950	
Satd. Flow (perm)	3210	0	432	3574	1770	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	458					284
Link Speed (mph)	40			40	35	
Link Distance (ft)	265			386	204	
Travel Time (s)	4.5			6.6	4.0	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	3%	3%	1%	2%	3%
Adj. Flow (vph)	293	458	476	376	297	284
Shared Lane Traffic (%)						
Lane Group Flow (vph)	751	0	476	376	297	284
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	10			12	12	
Link Offset(ft)	0			0	25	
Crosswalk Width(ft)	35			10	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		pm+pt	NA	Prot	Prot
Protected Phases	2		1	6	8	8



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Permitted Phases	6					
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	19.0		7.0	29.0	7.0	7.0
Minimum Split (s)	26.0		10.0	36.0	13.0	13.0
Total Split (s)	26.0		15.0	41.0	33.0	33.0
Total Split (%)	35.1%		20.3%	55.4%	44.6%	44.6%
Maximum Green (s)	19.0		12.0	34.0	27.0	27.0
Yellow Time (s)	5.0		3.0	5.0	4.0	4.0
All-Red Time (s)	2.0		0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0		3.0	7.0	6.0	6.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	Min		None	Min	None	None
Act Effect Green (s)	19.1		38.2	34.1	14.5	14.5
Actuated g/C Ratio	0.31		0.62	0.55	0.24	0.24
v/c Ratio	0.57		0.91	0.19	0.71	0.49
Control Delay (s/veh)	9.1		35.9	8.0	31.7	5.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.1		35.9	8.0	31.7	5.8
LOS	A		D	A	C	A
Approach Delay (s/veh)	9.1			23.6	19.0	
Approach LOS	A			C	B	
90th %ile Green (s)	19.0		12.0	34.0	21.4	21.4
90th %ile Term Code	Max		Max	Hold	Gap	Gap
70th %ile Green (s)	19.0		12.0	34.0	17.1	17.1
70th %ile Term Code	Max		Max	Hold	Gap	Gap
50th %ile Green (s)	19.0		12.0	34.0	14.4	14.4
50th %ile Term Code	Max		Max	Hold	Gap	Gap
30th %ile Green (s)	19.0		12.0	34.0	12.0	12.0
30th %ile Term Code	Max		Max	Hold	Gap	Gap
10th %ile Green (s)	19.0		12.0	34.0	8.8	8.8
10th %ile Term Code	Max		Max	Hold	Gap	Gap
Stops (vph)	230		207	167	241	34
Fuel Used(gal)	8		8	4	4	1
CO Emissions (g/hr)	555		552	296	283	68
NOx Emissions (g/hr)	108		107	58	55	13
VOC Emissions (g/hr)	129		128	69	66	16
Dilemma Vehicles (#)	57		0	22	0	0
Queue Length 50th (ft)	43		90	33	102	0
Queue Length 95th (ft)	102		#309	66	174	48
Internal Link Dist (ft)	185			306	124	
Turn Bay Length (ft)			120			
Base Capacity (vph)	1309		525	1977	777	585
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Reduced v/c Ratio	0.57		0.91	0.19	0.38	0.49

Intersection Summary

Area Type: Other

Cycle Length: 74

Actuated Cycle Length: 61.7

Natural Cycle: 60

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.91

Intersection Signal Delay (s/veh): 17.4

Intersection LOS: B

Intersection Capacity Utilization 76.5%

ICU Level of Service D

Analysis Period (min) 15

90th %ile Actuated Cycle: 68.4

70th %ile Actuated Cycle: 64.1

50th %ile Actuated Cycle: 61.4

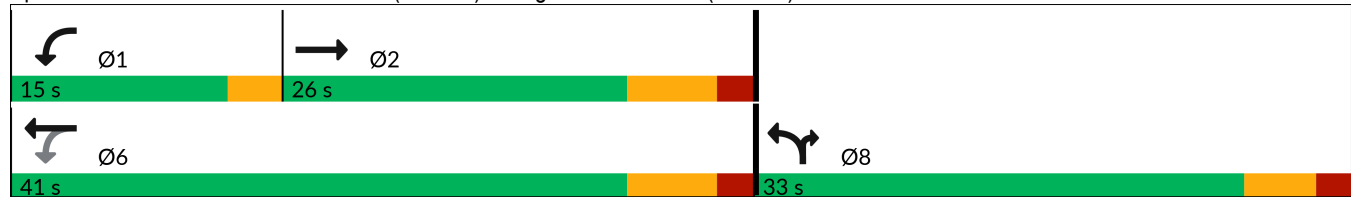
30th %ile Actuated Cycle: 59

10th %ile Actuated Cycle: 55.8

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)



Lanes, Volumes, Timings

2027 Build

1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)

AM Peak Hour

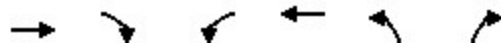
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	294	435	492	408	282	283
Future Volume (vph)	294	435	492	408	282	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	575		0	0
Storage Lanes		0	1		1	1
Taper Length (ft)			50		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.910					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3215	0	1752	3574	1770	1583
Flt Permitted			0.168		0.950	
Satd. Flow (perm)	3215	0	310	3574	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	443					298
Link Speed (mph)	40			40	35	
Link Distance (ft)	265			830	204	
Travel Time (s)	4.5			14.1	4.0	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	3%	3%	1%	2%	2%
Adj. Flow (vph)	309	458	518	429	297	298
Shared Lane Traffic (%)						
Lane Group Flow (vph)	767	0	518	429	297	298
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	10			12	12	
Link Offset(ft)	0			0	25	
Crosswalk Width(ft)	35			15	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		pm+pt	NA	Prot	Prot
Protected Phases	2		1	6	8	8

Lanes, Volumes, Timings

2027 Build

1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)

AM Peak Hour



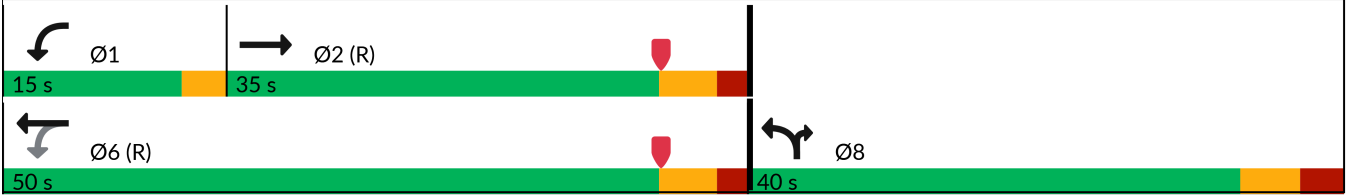
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Permitted Phases	6					
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	20.0		7.0	30.0	25.0	25.0
Minimum Split (s)	26.0		10.0	36.0	32.0	32.0
Total Split (s)	35.0		15.0	50.0	40.0	40.0
Total Split (%)	38.9%		16.7%	55.6%	44.4%	44.4%
Maximum Green (s)	29.0		12.0	44.0	33.0	33.0
Yellow Time (s)	4.0		3.0	4.0	4.0	4.0
All-Red Time (s)	2.0		0.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		3.0	6.0	7.0	7.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	C-Min		None	C-Min	None	None
Act Effect Green (s)	20.8		54.7	51.7	25.3	25.3
Actuated g/C Ratio	0.23		0.61	0.57	0.28	0.28
v/c Ratio	0.71		0.81	0.21	0.60	0.45
Control Delay (s/veh)	16.9		23.6	6.0	33.7	5.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay (s/veh)	16.9		23.6	6.0	33.7	5.5
LOS	B		C	A	C	A
Approach Delay (s/veh)	16.9			15.6	19.6	
Approach LOS	B			B	B	
90th %ile Green (s)	23.8		23.6	50.4	26.6	26.6
90th %ile Term Code	Coord		Max	Coord	Gap	Gap
70th %ile Green (s)	20.0		29.0	52.0	25.0	25.0
70th %ile Term Code	Coord		Max	Coord	Min	Min
50th %ile Green (s)	20.0		29.0	52.0	25.0	25.0
50th %ile Term Code	Coord		Max	Coord	Min	Min
30th %ile Green (s)	20.0		29.0	52.0	25.0	25.0
30th %ile Term Code	Coord		Max	Coord	Min	Min
10th %ile Green (s)	20.0		29.0	52.0	25.0	25.0
10th %ile Term Code	Coord		Max	Coord	Min	Min
Stops (vph)	292		298	167	238	31
Fuel Used(gal)	10		8	4	4	1
CO Emissions (g/hr)	687		563	310	289	68
NOx Emissions (g/hr)	134		110	60	56	13
VOC Emissions (g/hr)	159		131	72	67	16
Dilemma Vehicles (#)	41		0	5	0	0
Queue Length 50th (ft)	86		202	71	146	0
Queue Length 95th (ft)	144		#382	14	225	57
Internal Link Dist (ft)	185			750	124	
Turn Bay Length (ft)			575			
Base Capacity (vph)	1336		636	2051	649	659
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0

Lanes, Volumes, Timings
 1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)

2027 Build
 AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Reduced v/c Ratio	0.57		0.81	0.21	0.46	0.45
Intersection Summary						
Area Type:	Other					
Cycle Length: 90						
Actuated Cycle Length: 90						
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow, Master Intersection						
Natural Cycle: 80						
Control Type: Actuated-Coordinated						
Maximum v/c Ratio: 0.81						
Intersection Signal Delay (s/veh): 17.1				Intersection LOS: B		
Intersection Capacity Utilization 84.4%				ICU Level of Service E		
Analysis Period (min) 15						
# 95th percentile volume exceeds capacity, queue may be longer.						
Queue shown is maximum after two cycles.						

Splits and Phases: 1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)



HCM 7th TWSC
2: Eagle Rock Avenue (CR 611) & Oval Road

2027 No-Build
AM Peak Hour

Intersection						
Int Delay, s/veh	2.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔		↔	
Traffic Vol, veh/h	39	509	740	29	47	70
Future Vol, veh/h	39	509	740	29	47	70
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	96	96	96	96	96	96
Heavy Vehicles, %	0	3	2	7	4	1
Mvmt Flow	41	530	771	30	49	73

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	801	0	0	1132	401
Stage 1	-	-	-	786	-
Stage 2	-	-	-	346	-
Critical Hdwy	4.1	-	-	6.88	6.92
Critical Hdwy Stg 1	-	-	-	5.88	-
Critical Hdwy Stg 2	-	-	-	5.88	-
Follow-up Hdwy	2.2	-	-	3.54	3.31
Pot Cap-1 Maneuver	831	-	-	194	602
Stage 1	-	-	-	404	-
Stage 2	-	-	-	682	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	831	-	-	183	602
Mov Cap-2 Maneuver	-	-	-	183	-
Stage 1	-	-	-	381	-
Stage 2	-	-	-	682	-

Approach	EB	WB	SB
HCM Control Delay, s/v	1.12	0	23.64
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	256	-	-	-	313
HCM Lane V/C Ratio	0.049	-	-	-	0.389
HCM Control Delay (s/veh)	9.6	0.5	-	-	23.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	1.8

2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	509	0	4	735	48	1	0	1	111	0	165
Future Volume (vph)	68	509	0	4	735	48	1	0	1	111	0	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	140		0	0		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.991			0.850				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3505	0	1805	3503	0	1805	1615	0	1770	1599	0
Flt Permitted	0.284			0.455						0.690		
Satd. Flow (perm)	540	3505	0	864	3503	0	1900	1615	0	1285	1599	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					9			412			512	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		830			376			327			217	
Travel Time (s)		14.1			6.4			8.9			5.9	
Peak Hour Factor	0.96	0.96	0.92	0.92	0.96	0.96	0.92	0.92	0.92	0.96	0.92	0.96
Heavy Vehicles (%)	0%	3%	0%	0%	2%	4%	0%	0%	0%	2%	0%	1%
Adj. Flow (vph)	71	530	0	4	766	50	1	0	1	116	0	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	530	0	4	816	0	1	1	0	116	172	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2			6		3	8		7	4	

2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	5	2		6	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		20.0	20.0		15.0	7.0		15.0	7.0	
Minimum Split (s)	10.0	36.0		26.0	26.0		18.0	14.0		18.0	14.0	
Total Split (s)	10.0	53.0		43.0	43.0		23.0	14.0		23.0	14.0	
Total Split (%)	11.1%	58.9%		47.8%	47.8%		25.6%	15.6%		25.6%	15.6%	
Maximum Green (s)	7.0	47.0		37.0	37.0		20.0	7.0		20.0	7.0	
Yellow Time (s)	3.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		0.0	4.0		0.0	4.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0		6.0	6.0		3.0	7.0		3.0	7.0	
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		3.0	2.0		2.0	2.0	
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None	None	
Act Effect Green (s)	67.0	64.0		55.9	55.9		17.2	7.0		17.2	9.4	
Actuated g/C Ratio	0.74	0.71		0.62	0.62		0.19	0.08		0.19	0.10	
v/c Ratio	0.14	0.21		0.01	0.37		0.00	0.00		0.36	0.28	
Control Delay (s/veh)	5.9	6.4		10.5	10.6		25.0	0.0		32.9	1.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay (s/veh)	5.9	6.4		10.5	10.6		25.0	0.0		32.9	1.1	
LOS	A	A		B	B		C	A		C	A	
Approach Delay (s/veh)		6.3			10.6			12.5			13.9	
Approach LOS		A			B			B			B	
90th %ile Green (s)	7.4	52.0		41.6	41.6		15.0	7.0		15.0	7.0	
90th %ile Term Code	Gap	Coord		Coord	Coord		Min	Min		Min	Min	
70th %ile Green (s)	7.0	66.0		56.0	56.0		0.0	0.0		15.0	11.0	
70th %ile Term Code	Min	Coord		Coord	Coord		Skip	Skip		Min	Hold	
50th %ile Green (s)	7.0	66.0		56.0	56.0		0.0	0.0		15.0	11.0	
50th %ile Term Code	Min	Coord		Coord	Coord		Skip	Skip		Min	Hold	
30th %ile Green (s)	7.0	66.0		56.0	56.0		0.0	0.0		15.0	11.0	
30th %ile Term Code	Min	Coord		Coord	Coord		Skip	Skip		Min	Hold	
10th %ile Green (s)	0.0	70.0		70.0	70.0		0.0	7.0		0.0	7.0	
10th %ile Term Code	Skip	Coord		Coord	Coord		Skip	Hold		Skip	Min	
Stops (vph)	23	223		3	379		2	0		91	0	
Fuel Used(gal)	1	6		0	10		0	0		2	1	
CO Emissions (g/hr)	48	400		4	724		1	0		110	52	
NOx Emissions (g/hr)	9	78		1	141		0	0		21	10	
VOC Emissions (g/hr)	11	93		1	168		0	0		25	12	
Dilemma Vehicles (#)	0	20		0	43		0	0		0	0	
Queue Length 50th (ft)	6	45		1	107		1	0		60	0	
Queue Length 95th (ft)	m40	132		7	215		4	0		88	0	
Internal Link Dist (ft)		750			296			247			137	
Turn Bay Length (ft)	150			140								
Base Capacity (vph)	501	2492		536	2180		442	505		419	625	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	

Lanes, Volumes, Timings

2027 Build

2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.14	0.21		0.01	0.37		0.00	0.00		0.28	0.28	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 74 (82%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay (s/veh): 9.6

Intersection LOS: A

Intersection Capacity Utilization 70.3%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

	Ø2 (R)			Ø3			Ø4
53 s			23 s			14 s	
	Ø5		Ø6 (R)		Ø7		Ø8
10 s		43 s		23 s		14 s	

HCM 7th TWSC
3: Crestmont Country Club Drwy & Eagle Rock Avenue (CR 611)

2027 No-Build
AM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	
Traffic Vol, veh/h	556	0	0	768	1	1
Future Vol, veh/h	556	0	0	768	1	1
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	98	98	98	98	98	98
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	567	0	0	784	1	1

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	-	-	959	284
Stage 1	-	-	-	567	-
Stage 2	-	-	-	392	-
Critical Hdwy	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	5.8	-
Follow-up Hdwy	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	-	0	0	258	719
Stage 1	-	0	0	536	-
Stage 2	-	0	0	658	-
Platoon blocked, %	-		-		
Mov Cap-1 Maneuver	-	-	-	258	719
Mov Cap-2 Maneuver	-	-	-	258	-
Stage 1	-	-	-	536	-
Stage 2	-	-	-	658	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	14.52
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	380	-	-
HCM Lane V/C Ratio	0.005	-	-
HCM Control Delay (s/veh)	14.5	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0	-	-

HCM 7th TWSC
4: Laurel Avenue (CR 634) & Crestmont Country Club Drwy

2027 No-Build
AM Peak Hour

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	551	23	8	879
Future Vol, veh/h	0	1	551	23	8	879
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	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	4	0	0	3
Mvmt Flow	0	1	586	24	9	935

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1551	598	0	0	611
Stage 1	598	-	-	-	-
Stage 2	952	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	126	506	-	-	978
Stage 1	553	-	-	-	-
Stage 2	378	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	124	506	-	-	978
Mov Cap-2 Maneuver	124	-	-	-	-
Stage 1	553	-	-	-	-
Stage 2	371	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v12.13		0	0.08
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	506	16
HCM Lane V/C Ratio	-	-	0.002	0.009
HCM Control Delay (s/veh)	-	-	12.1	8.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 7th TWSC
4: Laurel Avenue (CR 634) & Crestmont Country Club Drwy

2027 Build
AM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	564	23	4	923
Future Vol, veh/h	0	1	564	23	4	923
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	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	0	0	3
Mvmt Flow	0	1	600	24	4	982

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1603	612	0	0	624
Stage 1	612	-	-	-	-
Stage 2	990	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	118	497	-	-	967
Stage 1	545	-	-	-	-
Stage 2	363	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	116	497	-	-	967
Mov Cap-2 Maneuver	116	-	-	-	-
Stage 1	545	-	-	-	-
Stage 2	359	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v12.26		0	0.04
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	497	8
HCM Lane V/C Ratio	-	-	0.002	0.004
HCM Control Delay (s/veh)	-	-	12.3	8.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0	0

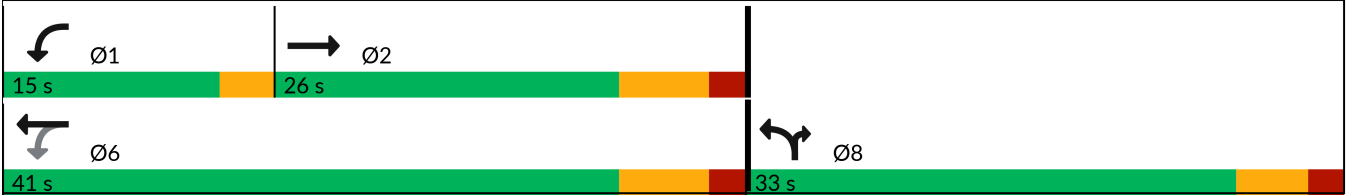
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	413	274	261	293	462	375
Future Volume (vph)	413	274	261	293	462	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	120		0	0
Storage Lanes		0	1		1	1
Taper Length (ft)			50		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.940					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3367	0	1787	3574	1805	1599
Flt Permitted			0.218		0.950	
Satd. Flow (perm)	3367	0	410	3574	1805	1599
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	205					403
Link Speed (mph)	40			40	35	
Link Distance (ft)	265			386	204	
Travel Time (s)	4.5			6.6	4.0	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	2%	1%	1%	0%	1%
Adj. Flow (vph)	444	295	281	315	497	403
Shared Lane Traffic (%)						
Lane Group Flow (vph)	739	0	281	315	497	403
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	10			12	12	
Link Offset(ft)	0			0	25	
Crosswalk Width(ft)	35			10	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		pm+pt	NA	Prot	Prot
Protected Phases	2		1	6	8	8



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Permitted Phases	6					
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	19.0		7.0	29.0	7.0	7.0
Minimum Split (s)	26.0		10.0	36.0	13.0	13.0
Total Split (s)	26.0		15.0	41.0	33.0	33.0
Total Split (%)	35.1%		20.3%	55.4%	44.6%	44.6%
Maximum Green (s)	19.0		12.0	34.0	27.0	27.0
Yellow Time (s)	5.0		3.0	5.0	4.0	4.0
All-Red Time (s)	2.0		0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0		3.0	7.0	6.0	6.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	Min		None	Min	None	None
Act Effect Green (s)	19.2		36.3	32.3	21.8	21.8
Actuated g/C Ratio	0.29		0.54	0.48	0.32	0.32
v/c Ratio	0.67		0.66	0.18	0.85	0.51
Control Delay (s/veh)	19.6		17.8	11.1	36.4	4.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay (s/veh)	19.6		17.8	11.1	36.4	4.5
LOS	B		B	B	D	A
Approach Delay (s/veh)	19.6			14.3	22.1	
Approach LOS	B			B	C	
90th %ile Green (s)	19.0		12.0	34.0	27.0	27.0
90th %ile Term Code	Max		Max	Hold	Max	Max
70th %ile Green (s)	19.0		12.0	34.0	27.0	27.0
70th %ile Term Code	Max		Max	Hold	Max	Max
50th %ile Green (s)	19.0		10.8	32.8	23.6	23.6
50th %ile Term Code	Max		Gap	Hold	Gap	Gap
30th %ile Green (s)	19.0		8.7	30.7	19.1	19.1
30th %ile Term Code	Max		Gap	Hold	Gap	Gap
10th %ile Green (s)	19.0		7.0	29.0	13.8	13.8
10th %ile Term Code	Max		Min	Min	Gap	Gap
Stops (vph)	429		137	156	396	37
Fuel Used(gal)	11		4	4	7	1
CO Emissions (g/hr)	780		263	269	495	82
NOx Emissions (g/hr)	152		51	52	96	16
VOC Emissions (g/hr)	181		61	62	115	19
Dilemma Vehicles (#)	50		0	16	0	0
Queue Length 50th (ft)	105		62	38	190	0
Queue Length 95th (ft)	178		120	66	#339	53
Internal Link Dist (ft)	185			306	124	
Turn Bay Length (ft)			120			
Base Capacity (vph)	1109		470	1829	733	790
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Reduced v/c Ratio	0.67		0.60	0.17	0.68	0.51
Intersection Summary						
Area Type:	Other					
Cycle Length: 74						
Actuated Cycle Length: 67.2						
Natural Cycle: 60						
Control Type: Semi Act-Uncoord						
Maximum v/c Ratio: 0.85						
Intersection Signal Delay (s/veh): 19.2				Intersection LOS: B		
Intersection Capacity Utilization 74.4%				ICU Level of Service D		
Analysis Period (min) 15						
90th %ile Actuated Cycle: 74						
70th %ile Actuated Cycle: 74						
50th %ile Actuated Cycle: 69.4						
30th %ile Actuated Cycle: 62.8						
10th %ile Actuated Cycle: 55.8						
# 95th percentile volume exceeds capacity, queue may be longer.						
Queue shown is maximum after two cycles.						

Splits and Phases: 1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)



Lanes, Volumes, Timings

2027 Build

1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)

PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	451	274	281	318	462	408
Future Volume (vph)	451	274	281	318	462	408
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	575		0	0
Storage Lanes		0	1		1	1
Taper Length (ft)			50		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.943					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3391	0	1787	3574	1805	1615
Flt Permitted			0.216		0.950	
Satd. Flow (perm)	3391	0	406	3574	1805	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	150					426
Link Speed (mph)	40			40	35	
Link Distance (ft)	265			830	204	
Travel Time (s)	4.5			14.1	4.0	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	1%	1%	1%	0%	0%
Adj. Flow (vph)	485	295	302	342	497	439
Shared Lane Traffic (%)						
Lane Group Flow (vph)	780	0	302	342	497	439
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	10			12	12	
Link Offset(ft)	0			0	25	
Crosswalk Width(ft)	35			15	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		pm+pt	NA	Prot	Prot
Protected Phases	2		1	6	8	8



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Permitted Phases	6					
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	20.0		7.0	30.0	25.0	25.0
Minimum Split (s)	26.0		10.0	36.0	32.0	32.0
Total Split (s)	35.0		15.0	50.0	40.0	40.0
Total Split (%)	38.9%		16.7%	55.6%	44.4%	44.4%
Maximum Green (s)	29.0		12.0	44.0	33.0	33.0
Yellow Time (s)	4.0		3.0	4.0	4.0	4.0
All-Red Time (s)	2.0		0.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		3.0	6.0	7.0	7.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	C-Min		None	C-Min	None	None
Act Effect Green (s)	32.5		50.9	47.9	29.1	29.1
Actuated g/C Ratio	0.36		0.57	0.53	0.32	0.32
v/c Ratio	0.59		0.72	0.18	0.85	0.54
Control Delay (s/veh)	21.7		31.1	16.9	43.1	5.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay (s/veh)	21.7		31.1	16.9	43.1	5.2
LOS	C		C	B	D	A
Approach Delay (s/veh)	21.7			23.6	25.4	
Approach LOS	C			C	C	
90th %ile Green (s)	29.0		12.0	44.0	33.0	33.0
90th %ile Term Code	Coord		Max	Coord	Max	Max
70th %ile Green (s)	25.0		16.4	44.4	32.6	32.6
70th %ile Term Code	Coord		Gap	Coord	Gap	Gap
50th %ile Green (s)	31.0		13.5	47.5	29.5	29.5
50th %ile Term Code	Coord		Gap	Coord	Gap	Gap
30th %ile Green (s)	37.6		11.0	51.6	25.4	25.4
30th %ile Term Code	Coord		Gap	Coord	Gap	Gap
10th %ile Green (s)	40.1		8.9	52.0	25.0	25.0
10th %ile Term Code	Coord		Gap	Coord	Min	Min
Stops (vph)	477		225	232	416	43
Fuel Used(gal)	12		6	5	8	1
CO Emissions (g/hr)	862		389	361	550	95
NOx Emissions (g/hr)	168		76	70	107	18
VOC Emissions (g/hr)	200		90	84	127	22
Dilemma Vehicles (#)	40		0	4	0	0
Queue Length 50th (ft)	154		130	72	259	5
Queue Length 95th (ft)	224		#271	127	365	65
Internal Link Dist (ft)	185			750	124	
Turn Bay Length (ft)			575			
Base Capacity (vph)	1350		431	1902	661	810
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0

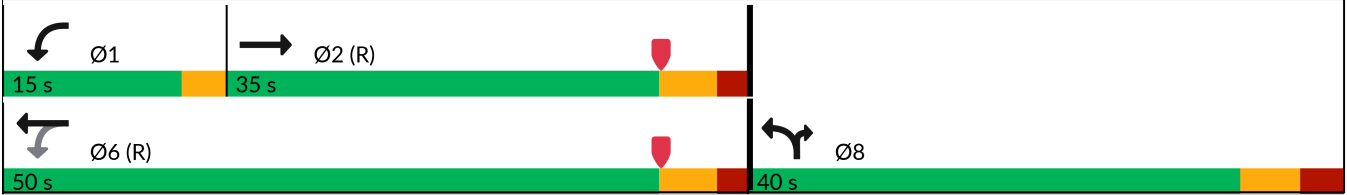
Lanes, Volumes, Timings
 1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)

2027 Build
 PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Reduced v/c Ratio	0.58		0.70	0.18	0.75	0.54

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow, Master Intersection	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay (s/veh): 23.7	Intersection LOS: C
Intersection Capacity Utilization 76.6%	ICU Level of Service D
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: Laurel Avenue (CR 634) & Eagle Rock Avenue (CR 611)



HCM 7th TWSC
2: Eagle Rock Avenue (CR 611) & Oval Road

2027 No-Build
PM Peak Hour

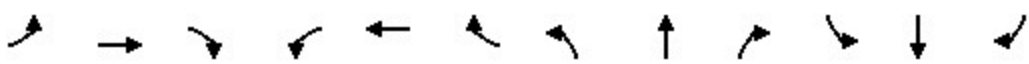
Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕		↕	
Traffic Vol, veh/h	95	693	488	20	40	66
Future Vol, veh/h	95	693	488	20	40	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	0	0	0	3	0
Mvmt Flow	104	762	536	22	44	73
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	558	0	-	0	1137	279
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	590	-
Critical Hdwy	4.12	-	-	-	6.86	6.9
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	2.21	-	-	-	3.53	3.3
Pot Cap-1 Maneuver	1016	-	-	-	194	724
Stage 1	-	-	-	-	541	-
Stage 2	-	-	-	-	514	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1016	-	-	-	169	724
Mov Cap-2 Maneuver	-	-	-	-	169	-
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	514	-
Approach	EB	WB		SB		
HCM Control Delay, s/v	1.88	0		22.32		
HCM LOS	C					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	434	-	-	-	323	
HCM Lane V/C Ratio	0.103	-	-	-	0.361	
HCM Control Delay (s/veh)	9	0.9	-	-	22.3	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.3	-	-	-	1.6	

Lanes, Volumes, Timings

2027 Build

2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	166	693	0	1	473	67	14	0	3	70	0	112
Future Volume (vph)	166	693	0	1	473	67	14	0	3	70	0	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	140		0	0		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50			50			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.981			0.850				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3574	0	1805	3541	0	1805	1615	0	1787	1615	0
Flt Permitted	0.380			0.363						0.690		
Satd. Flow (perm)	722	3574	0	690	3541	0	1900	1615	0	1298	1615	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					21			359				563
Link Speed (mph)		40			40			25				25
Link Distance (ft)		830			376			327				217
Travel Time (s)		14.1			6.4			8.9				5.9
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%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%
Adj. Flow (vph)	182	762	0	1	520	74	15	0	3	77	0	123
Shared Lane Traffic (%)												
Lane Group Flow (vph)	182	762	0	1	594	0	15	3	0	77	123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12				12
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2			6		3	8		7	4	

2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	5	2		6	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		20.0	20.0		15.0	7.0		15.0	7.0	
Minimum Split (s)	10.0	36.0		26.0	26.0		18.0	14.0		18.0	14.0	
Total Split (s)	10.0	53.0		43.0	43.0		23.0	14.0		23.0	14.0	
Total Split (%)	11.1%	58.9%		47.8%	47.8%		25.6%	15.6%		25.6%	15.6%	
Maximum Green (s)	7.0	47.0		37.0	37.0		20.0	7.0		20.0	7.0	
Yellow Time (s)	3.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		0.0	4.0		0.0	4.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0		6.0	6.0		3.0	7.0		3.0	7.0	
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		3.0	2.0		2.0	2.0	
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None	None	
Act Effect Green (s)	67.0	64.0		53.1	53.1		17.2	7.0		17.2	9.4	
Actuated g/C Ratio	0.74	0.71		0.59	0.59		0.19	0.08		0.19	0.10	
v/c Ratio	0.29	0.30		0.00	0.28		0.04	0.01		0.23	0.18	
Control Delay (s/veh)	4.1	5.0		12.0	10.6		26.6	0.0		30.5	0.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay (s/veh)	4.1	5.0		12.0	10.6		26.6	0.0		30.5	0.6	
LOS	A	A		B	B		C	A		C	A	
Approach Delay (s/veh)		4.8			10.6			22.1			12.1	
Approach LOS		A			B			C			B	
90th %ile Green (s)	11.2	52.0		37.8	37.8		15.0	7.0		15.0	7.0	
90th %ile Term Code	Gap	Coord		Coord	Coord		Min	Min		Min	Min	
70th %ile Green (s)	7.5	66.0		55.5	55.5		0.0	0.0		15.0	11.0	
70th %ile Term Code	Gap	Coord		Coord	Coord		Skip	Skip		Min	Hold	
50th %ile Green (s)	7.0	66.0		56.0	56.0		0.0	0.0		15.0	11.0	
50th %ile Term Code	Min	Coord		Coord	Coord		Skip	Skip		Min	Hold	
30th %ile Green (s)	7.0	66.0		56.0	56.0		0.0	0.0		15.0	11.0	
30th %ile Term Code	Min	Coord		Coord	Coord		Skip	Skip		Min	Hold	
10th %ile Green (s)	7.0	70.0		60.0	60.0		0.0	7.0		0.0	7.0	
10th %ile Term Code	Min	Coord		Coord	Coord		Skip	Hold		Skip	Min	
Stops (vph)	47	291		1	252		12	0		55	0	
Fuel Used(gal)	2	7		0	7		0	0		1	0	
CO Emissions (g/hr)	107	522		1	493		11	1		66	35	
NOx Emissions (g/hr)	21	102		0	96		2	0		13	7	
VOC Emissions (g/hr)	25	121		0	114		3	0		15	8	
Dilemma Vehicles (#)	0	22		0	30		0	0		0	0	
Queue Length 50th (ft)	12	53		0	70		7	0		39	0	
Queue Length 95th (ft)	49	137		3	159		20	0		63	0	
Internal Link Dist (ft)		750			296			247			137	
Turn Bay Length (ft)	150			140								
Base Capacity (vph)	632	2541		406	2096		442	456		423	672	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	

2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.29	0.30		0.00	0.28		0.03	0.01		0.18	0.18	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 62 (69%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.30

Intersection Signal Delay (s/veh): 7.8

Intersection LOS: A

Intersection Capacity Utilization 68.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Crestmont Country Club Drwy/Oval Road & Eagle Rock Avenue (CR 611)

	Ø2 (R)			Ø3			Ø4
53 s			23 s			14 s	
	Ø5		Ø6 (R)		Ø7		Ø8
10 s		43 s		23 s		14 s	

HCM 7th TWSC
3: Crestmont Country Club Drwy & Eagle Rock Avenue (CR 611)

2027 No-Build
PM Peak Hour

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↓	
Traffic Vol, veh/h	733	0	0	493	14	3
Future Vol, veh/h	733	0	0	493	14	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, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	780	0	0	524	15	3

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	-	-	-	1042 390
Stage 1	-	-	-	-	780 -
Stage 2	-	-	-	-	262 -
Critical Hdwy	-	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	-	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	-	0	0	-	229 615
Stage 1	-	0	0	-	418 -
Stage 2	-	0	0	-	764 -
Platoon blocked, %	-			-	
Mov Cap-1 Maneuver	-	-	-	-	229 615
Mov Cap-2 Maneuver	-	-	-	-	229 -
Stage 1	-	-	-	-	418 -
Stage 2	-	-	-	-	764 -

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	20.06
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	257	-	-
HCM Lane V/C Ratio	0.07	-	-
HCM Control Delay (s/veh)	20.1	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.2	-	-

HCM 7th TWSC
4: Laurel Avenue (CR 634) & Crestmont Country Club Drwy

2027 No-Build
PM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	836	4	2	533
Future Vol, veh/h	0	1	836	4	2	533
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	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	1	889	4	2	567

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1463	891	0	0	894	0
Stage 1	891	-	-	-	-	-
Stage 2	571	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	143	344	-	-	768	-
Stage 1	404	-	-	-	-	-
Stage 2	569	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	143	344	-	-	768	-
Mov Cap-2 Maneuver	143	-	-	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	567	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	15.5	0	0.04
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	344	7
HCM Lane V/C Ratio	-	-	0.003	0.003
HCM Control Delay (s/veh)	-	-	15.5	9.7
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 7th TWSC
4: Laurel Avenue (CR 634) & Crestmont Country Club Drwy

2027 Build
PM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	869	4	1	554
Future Vol, veh/h	0	1	869	4	1	554
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	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	2	0	0	1
Mvmt Flow	0	1	924	4	1	589

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1518	927	0	0	929
Stage 1	927	-	-	-	-
Stage 2	591	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	132	328	-	-	745
Stage 1	389	-	-	-	-
Stage 2	557	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	132	328	-	-	745
Mov Cap-2 Maneuver	132	-	-	-	-
Stage 1	389	-	-	-	-
Stage 2	556	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	16	0	0.02
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	328	3
HCM Lane V/C Ratio	-	-	0.003	0.001
HCM Control Delay (s/veh)	-	-	16	9.8
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0	0

APPENDIX E
SIGNAL WARRANT ANALYSIS

Warrants Summary Report

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

Intersection Information:

	Major Street	Minor Street
Street Name	Eagle Rock Avenue (CR 611)	Oval Road
Direction	EB/WB	SB
Number of Lanes	2	1
Approach Speed	30	30

Warrant	Met?	Notes
Warrant 1, Eight-Hour Vehicular Volume		
	Yes	
Condition A or B Met?	Yes	11 Hours met (8 required)
Condition A and B Met?	Yes	12 Hours met (8 required)
Warrant 2, Four-Hour Vehicular Volume		
	Yes	11 Hours met (4 required)
Warrant 3, Peak Hour		
	Yes	
Condition A Met?	No	0 Hours met (1 required)
Condition B Met?	Yes	5 Hours met (1 required)

Warrant 1: Eight-hour Vehicular Volume

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

Intersection Information:

Major Street Name: Eagle Rock Avenue (CR 611)

Major Street Direction: EB/WB

Minor Street Direction: SB

WARRANT 1 MET? Yes

Details:

Condition A Met? Yes 8 Hours met (8 required) at 100%

Condition B Met? Yes 11 Hours met (8 required) at 100%

Hour	Major Street Vehicles (Total of Both Approaches)		High Volume Minor Approach Vehicles		100% Standard Met? Cond. A OR Cond. B		80% Standard Met? Cond. A AND Cond. B	
					Condition A 100% Column	Condition B 100% Column	Condition A 80% Column	Condition B 80% Column
07:00 to 08:00	1,107		338		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes				
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes				
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes				
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes				
08:00 to 09:00	1,587		266		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes				
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes				
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes				
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes				
09:00 to 10:00	989		199		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes				
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes				
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes				
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes				

Warrant 1: Eight-hour Vehicular Volume

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

10:00 to 11:00		885		164		Yes*	No	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	No	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
11:00 to 12:00		975		179		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
12:00 to 13:00		1,131		131		No	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	No					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
13:00 to 14:00		1,067		144		No	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	No					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
14:00 to 15:00		1,234		143		No	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	No					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					

Warrant 1: Eight-hour Vehicular Volume

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

15:00 to 16:00		1,550		176		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
16:00 to 17:00		1,532		187		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
17:00 to 18:00		1,668		203		Yes*	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	Yes					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					
18:00 to 19:00		1,378		149		No	Yes*	Yes*	Yes*
Condition A	Volume >= 100% column (600)?	Yes	Volume >= 100% column (150)?	No					
	Volume >= 80% column (480)?	Yes	Volume >= 80% column (120)?	Yes					
Condition B	Volume >= 100% column (900)?	Yes	Volume >= 100% column (75)?	Yes					
	Volume >= 80% column (720)?	Yes	Volume >= 80% column (60)?	Yes					

Warrant 2: Four-hour Vehicular Volume

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

Intersection Information:

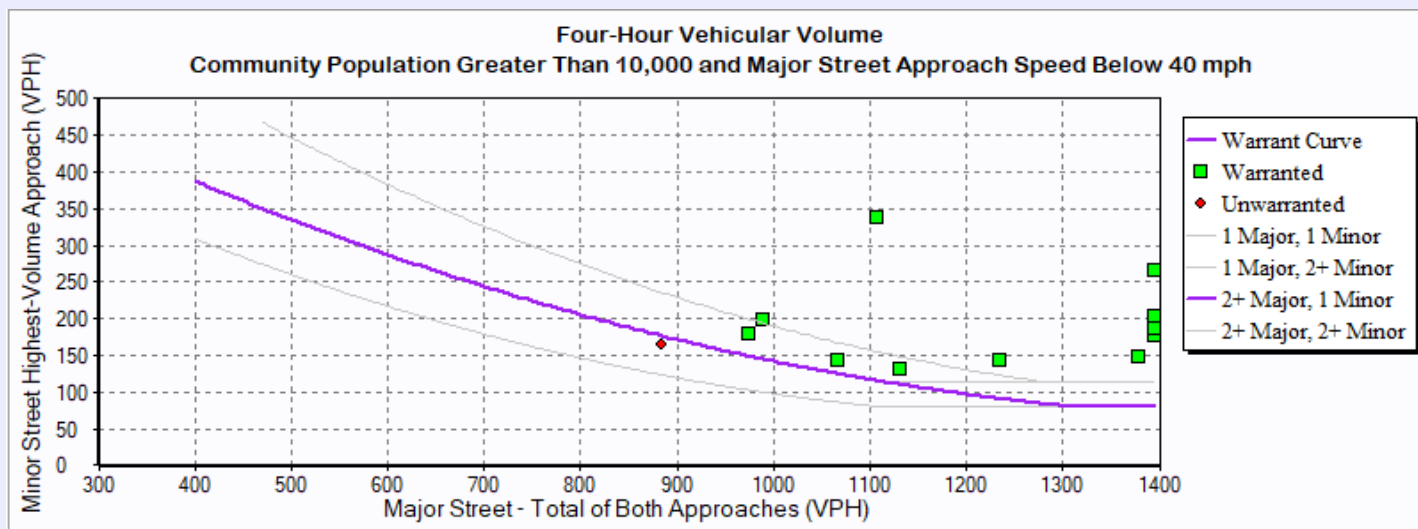
	Major Street	Minor Street
Street Name	Eagle Rock Avenue (CR 611)	Oval Road
Direction	EB/WB	SB
Number of Lanes	2	1
Approach Speed	30	30

Warrant 2 Met? **Yes**

Details:

Notes 11 Hours met (4 required)

Low population? **No**



Warrant 2: Four-hour Vehicular Volume

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

Hourly Volumes

Hour	Major Street Total All Approaches (vph)	Minor Street Highest Volume Approach (vph)
00:00:00 - 01:00:00	0	0
01:00:00 - 02:00:00	0	0
02:00:00 - 03:00:00	0	0
03:00:00 - 04:00:00	0	0
04:00:00 - 05:00:00	0	0
05:00:00 - 06:00:00	0	0
06:00:00 - 07:00:00	0	0
07:00:00 - 08:00:00	1,107	338
08:00:00 - 09:00:00	1,587	266
09:00:00 - 10:00:00	989	199
10:00:00 - 11:00:00	885	164
11:00:00 - 12:00:00	975	179
12:00:00 - 13:00:00	1,131	131
13:00:00 - 14:00:00	1,067	144
14:00:00 - 15:00:00	1,234	143
15:00:00 - 16:00:00	1,550	176
16:00:00 - 17:00:00	1,532	187
17:00:00 - 18:00:00	1,668	203
18:00:00 - 19:00:00	1,378	149
19:00:00 - 20:00:00	0	0
20:00:00 - 21:00:00	0	0
21:00:00 - 22:00:00	0	0
22:00:00 - 23:00:00	0	0

Warrant 2: Four-hour Vehicular Volume

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

23:00:00 - 00:00:00

0

0

Warranted Hours

Hour	Major Street Total All Approaches (vph)	Minor Street Highest Volume Approach (vph)
07:00:00 - 08:00:00	1,107.00	338.00
08:00:00 - 09:00:00	1,587.00	266.00
09:00:00 - 10:00:00	989.00	199.00
11:00:00 - 12:00:00	975.00	179.00
12:00:00 - 13:00:00	1,131.00	131.00
13:00:00 - 14:00:00	1,067.00	144.00
14:00:00 - 15:00:00	1,234.00	143.00
15:00:00 - 16:00:00	1,550.00	176.00
16:00:00 - 17:00:00	1,532.00	187.00
17:00:00 - 18:00:00	1,668.00	203.00
18:00:00 - 19:00:00	1,378.00	149.00

Note: Only data of hours warranted is represented in the above table.

Warrant 3: Peak Hour

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

Intersection Information:

	Major Street	Minor Street
Street Name	Eagle Rock Avenue (CR 611)	Oval Road
Direction	EB/WB	SB
Number of Lanes	2	1
Approach Speed	30	30

Warrant 3 Met? **Yes**

Details

Low Population? **No**

Condition A Met? **No**

Condition B Met? **Yes**

Notes 0 Hours met (1 required)

Notes 5 Hours met (1 required)

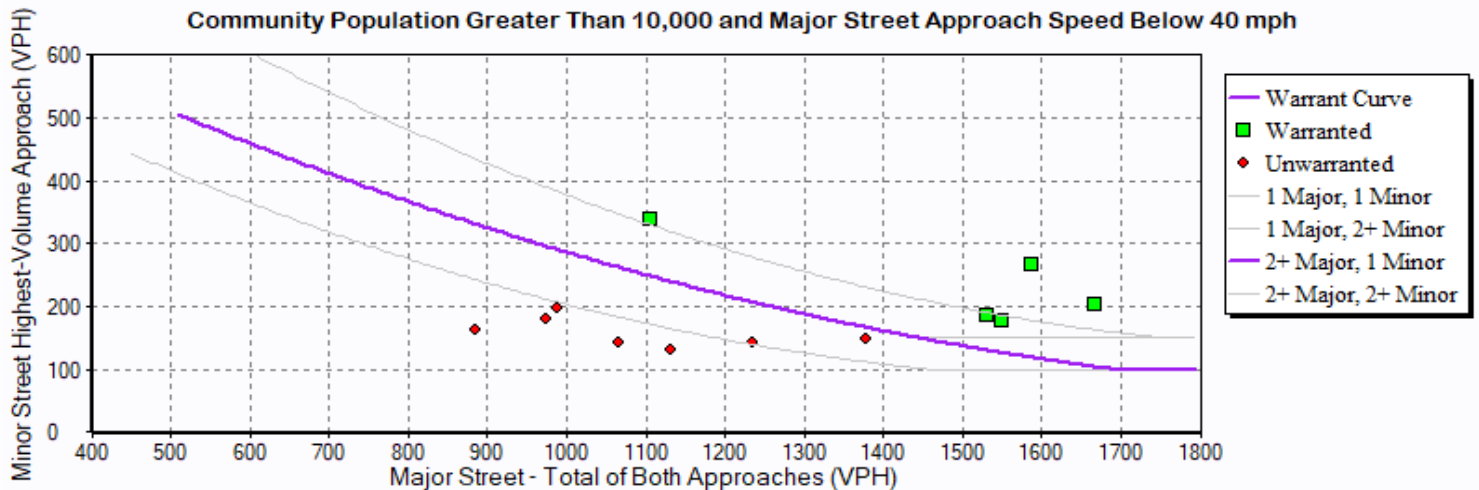
Minor Approach Time Delay Condition Met? **Not Met**

Minor Approach Volume Condition Met? **Met**

Total Entering Intersection Volume Condition Met? **Not Met**

Peak Hour Vehicular Volume

Community Population Greater Than 10,000 and Major Street Approach Speed Below 40 mph



Warrant 3: Peak Hour

1: Eagle Rock Avenue (CR 611) and Oval Road/Crestmont Drwy

Hour	Major Street Total All Approaches (vph)	Minor Street Highest Volume Approach (vph)
7:00	1,107	338
8:00	1,587	266
9:00	989	199
10:00	885	164
11:00	975	179
12:00	1,131	131
13:00	1,067	144
14:00	1,234	143
15:00	1,550	176
16:00	1,532	187
17:00	1,668	203
18:00	1,378	149

APPENDIX F
PRIOR TIS PREPARED BY LUBLANECKI ENGINEERING, INC.



TRAFFIC IMPACT STUDY

for

WEST ESSEX HIGHLANDS RESIDENTIAL DEVELOPMENT APARTMENTS

Block 179, Lot 32

Township of West Orange

Essex County

New Jersey

**February 20, 2018
Revised: November 1, 2018**

Prepared For

**WEST ESSEX HIGHLANDS, INC.
820 Morris Turnpike
Short Hills, New Jersey 07078**

Prepared By:

**LUBLANECKI ENGINEERING, INC.
Certificate of Authorization No. 24GA28024600
52 Glen Ridge Drive
Long Valley, New Jersey 07853
908- 852-8508**

A handwritten signature in black ink, appearing to read 'Walter M. Lublanecki', is written over a horizontal line.

Walter M. Lublanecki, P.E.
President
NJ Prof. Eng. Lic. No. 21959

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INTRODUCTION

The purpose of this study is to evaluate the impact that the proposed West Essex residential development, identified as Block 179, Lot 32, in the Township of West Orange, Essex County, New Jersey, will have on traffic conditions in the surrounding area. The proposed development will ultimately consist of 683 mid-rise apartments in nine three and four story buildings. Eight buildings, consisting of 607 apartments, will have access to Warner Road, either directly or through Kuzik Drive, which intersects Warner Road. One single building, consisting of 76 mid-rise apartments will have access to Bayowski Road. Warner Road is a two-lane roadway providing access for the Highlands at West Essex townhouse development. Warner Road connects to Oval Road, another two-lane roadway, which intersects Eagle Rock Avenue. Bayowski Road is a residential access street within the Highlands at West Essex townhouse development. Oval Road, which also provides access for the Highlands at West Essex townhouse development, as well as the Grande at Pleasantdale residential development of single family detached houses and the Pleasantdale Chateau banquet facility, is blocked just north of Warner Road. (See Figure 1, Project Location, at the end of this report). The traffic impact evaluation, which focuses on Warner Road, Oval Road, and several of the intersections within the townhouse development as well as the intersections of Eagle Rock Avenue with Oval Road and Laurel Avenue, was accomplished by performing the following tasks:

1. A field investigation of Warner Road, Oval Road, the intersections of Eagle Rock Avenue with Oval Road and Laurel Avenue, and the following intersections within and in the vicinity of the Highlands at West Essex townhouse development.
 - Oval Road and Rappleeye Court
 - Oval Road and Bongart Drive
 - Warner Road and Davey Drive

- Warner Road and Reger Lane
 - Warner Road and Kuzik Drive-Sullivan Drive
 - Kuzik Drive and Lapis Circle-Luft Lane
 - Sullivan Drive and Davey Drive
 - Davey Drive and Bongart Drive
2. Turning movement traffic counts conducted on a typical weekday from 6:00 AM to 7:00 PM at the intersections of Eagle Rock Avenue with Oval Road and Laurel Avenue and from 6:00 AM to 9:00 AM and 4:00 PM to 7:00 PM at the aforementioned intersections within and in the vicinity of the Highlands at West Essex townhouse development.
 3. Investigation of background traffic growth.
 4. Determination of traffic to be generated by the proposed development in stages consisting of 350 units, 550 units and 683 units.
 5. Determination of the directional distribution of the traffic generated by the proposed development.
 6. Capacity analyses of the study area intersections for existing, no-build and build conditions.
 7. A site layout evaluation with respect to the New Jersey Residential Site Improvement Standards (RSIS).
 8. Drawing of conclusions as to the traffic impact of the proposed development.

EXISTING CONDITIONS

Eagle Rock Avenue is an urban minor arterial (as classified by the New Jersey Department of Transportation) running in a general east/west direction through western Essex County. At the intersection with Oval Road, Eagle Rock Avenue consists of two lanes in each direction with curbing. Left and right turning movements are made out of the through lanes. The posted speed limit on this section of Eagle Rock Avenue is 40 miles per hour. The intersection of Eagle Rock Avenue and Oval Road is a tee intersection with Oval Road on the north side of Eagle Rock Avenue forming the stem of the tee. The Oval Road approach is currently stop controlled and striped for one lane, however, due to the ample width of the approach lane, left and right turning vehicles may exit Oval Road at the same time.

Laurel Avenue is also classified by the New Jersey Department of Transportation as an urban minor arterial and runs in a general northeast/southwest direction through the Townships of West Orange and Livingston. The intersection of Eagle Rock Avenue and Laurel Avenue is a signalized tee intersection with Laurel Avenue forming the stem of the tee. At the intersection Laurel Avenue consists of two northbound approach lanes, a left turn lane and a right turn lane. Eagle Rock Avenue consists of two westbound through lanes with an exclusive westbound left turn lane and two eastbound approach lanes, a through lane and a shared through/right turn lane. The signal consists of three phases, an Eagle Rock Avenue westbound lead phase, an Eagle Rock Avenue right-of-way phase and a Laurel Avenue right-of-way phase. Right turns on red are permitted on both the Eagle Rock Avenue and Laurel Avenue approaches.

Oval Road is approximately forty feet wide and curbed running in a general north/south direction from Eagle Rock Avenue to a point just north of Warner Road. Rappleye Court, the main access road serving the Grande at Pleasantdale residential development and the Pleasantdale Chateau, intersects Oval Road north of Eagle Rock Avenue forming a right angle tee intersection. Rappleye Court is stop controlled. Bongart Drive, an access road serving the Highlands at West Essex townhouse development, intersects Oval Road

north of Rappleye Court and south of Warner Road at a skew angle forming a tee intersection and is also stop controlled. The Intersection of Oval Road and Warner Road is a right angle tee intersection with Warner Road forming the stem of the tee. Due to the fact that Oval Road is closed off just north of Warner Road the through movements at the intersection of Oval Road and Warner Road are the northbound right turn movement from Oval Road to Warner Road and the westbound left turn movement from Warner Road to Oval Road.

Warner Road is curbed and forty feet wide running in a general east/west direction from its intersection with Oval Road to the area of the proposed site intersecting with several of the local access streets serving the West Essex Highlands townhouse development. Davey Drive intersects Warner Road just east of Oval Road at a skew angle forming a tee intersection and is stop controlled. Reger Lane intersects Warner Road just east of Davey Drive at a right angle forming a tee intersection and is stop controlled. Kuzik Drive and Sullivan Drive, which is just east of Kuzik Drive, intersect Warner Road at right angles forming two tee intersections in close proximity. Kuzik Drive, which is also curbed and forty feet wide, is stop controlled at its intersection with Warner Road. Kuzik Drive and Sullivan Drive are the eastern most streets intersecting Warner Road, and the eastern leg of Warner Road at the intersection is just a stub section of roadway leading to the West Essex Highlands site.

To the north of Warner Road, Kuzik Drive intersects Lapis Circle and Luft Lane forming a four-way right angle intersection. The northern leg of Kuzik Drive is also a stub section of roadway leading to the West Essex Highlands site.

To the south of Warner Road, Sullivan Drive intersects Davey Drive forming a right angle four-way stop controlled intersection and continues south to intersect with Bayowski Road. Bayowski Road is curbed and approximately thirty feet wide. To the west of Sullivan Drive, Bongart Drive intersects Davey Drive at a right angle forming a tee intersection. Bongart Drive is stop controlled at the intersection.

Existing total approach peak hour traffic volumes for the aforementioned intersections are as follows:

**Intersection of Eagle Rock Avenue and Oval Road
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Eagle Rock Avenue E.B.	459	783
Eagle Rock Avenue W.B.	851	471
Oval Road S.B.	135	105

**Intersection of Eagle Rock Avenue and Laurel Avenue
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Eagle Rock Avenue E.B.	802	792
Eagle Rock Avenue W.B.	907	496
Laurel Avenue N.B.	449	764

**Intersection of Oval Road and Rappleye Court
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Oval Road N.B.	60	111
Oval Road S.B.	92	72
Rappleye Court W.B.	46	35

**Intersection of Oval Road and Bongart Drive
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Oval Road N.B.	40	84
Oval Road S.B.	66	53
Bongart Drive W.B.	32	15

**Intersection of Warner Road and Davey Drive
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Warner Road E.B.	25	57
Warner Road W.B.	63	51
Davey Drive N.B.	7	9

**Intersection of Warner Road and Reger Lane
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Warner Road E.B.	22	49
Warner Road W.B.	50	39
Reger Lane S.B.	16	25

**Intersection of Warner Road and Kuzik Drive - Sullivan Drive
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Warner Road E.B.	12	49
Sullivan Drive N.B.	49	33
Kuzik Drive S.B.	10	6

**Intersection of Kuzik Drive and Lapis Circle-Luft Lane
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Kuzik Drive N.B.	3	8
Lapis Circle E.B.	7	4
Luft Lane W.B.	7	4

**Intersection of Sullivan Drive and Davey Drive
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Sullivan Drive N.B.	36	25
Sullivan Drive S.B.	15	44
Davey Drive E.B.	10	13
Davey Drive W.B.	15	10

**Intersection of Davey Drive and Bongart Drive
Existing Approach Peak Hour Traffic Volumes**

Approach	AM	PM
Davey Drive N.B.	26	16
Davey Drive S.B.	5	12
Bongart Drive E.B.	3	14

Existing AM and PM peak hour turning movement traffic volumes are presented in Figures 2 and 3, respectively, at the end of this report. Traffic count summary sheets are presented in the appendix of this report.

BACKGROUND TRAFFIC GROWTH

Future no-build AM and PM peak hour traffic volumes were determined by applying a traffic growth factor to existing volumes. The formula for the traffic growth factor is as follows:

$$GF = (1 + GR)^n$$

Where:

GF = Traffic Growth Factor

GR = Annual Traffic Growth Rate

n = number of years to full build-out

The annual traffic growth rate was determined by using information from the New Jersey Department of Transportation, “Annual Background Growth Rate Table”. The New Jersey Department of Transportation classifies Eagle Rock Avenue and Laurel Avenue in this area as urban minor arterial streets. The projected annual growth rate of an urban minor arterial street in Essex County is 1.75%. It is assumed that the proposed West Essex residential development will be fully built out and occupied by 2023, five years.

Therefore, the regional traffic growth factor is:

$$GF = (1 + .0175)^5 = 1.091$$

The existing AM and PM peak hour traffic volumes were grown to the build year of 2023 by multiplying by the traffic growth factor. No-build AM and PM peak hour traffic volumes are presented in Figures 4 and 5, respectively, at the end of this report.

SITE TRIP GENERATION

The tenth edition of the "Trip Generation Manual" published by the Institute of Transportation Engineers was used as a guide in estimating the number of motor vehicle trips expected to be generated by the proposed residential development during the peak hours. Land Use Code 221 – Multifamily Housing (Mid-Rise) was selected as best representing the site. The Residential Site Improvement Standards (RSIS), New Jersey Administrative Code, Title 5, Chapter 21, was used in determining the number of average daily motor vehicle trips expected to be generated by the proposed residential development. Trips were determined for the AM and PM peak hours of adjacent street traffic as well as for a typical day for the following development scenarios: 350 units, 550 units, 683 units. The estimated trip generation for the site is as follows:

West Essex Highlands Residential Development
Estimated Site Trip Generation
Land Use Code 221 – Multifamily Housing (Mid-Rise) - 350 Units

Time Period	Relationship T = total vehicle trips x = Dwelling Units	R ²	Avg. Rate	Std. Dev.	SD/AR	Vehicle Trips		
						Total	Ent.	Exit
AM Peak Hour of Adj. St. Traffic	Ln(T) = 0.98 Ln(X) – 0.98 Entering = 26%, Exiting = 74% **	0.67	0.36	0.19	0.53	126	33	93
PM Peak Hour of Adj. St. Traffic	Ln(T) = 0.96 Ln(X) – 0.63 Entering = 61%, Exiting = 39% **	0.72	0.44	0.19	0.43	154	94	60
Typical Day	T= 5.50(X) Entering = 50%, Exiting = 50%	-	5.50	-	-	1926	963	963

* The Regression Equation was used to determine vehicle trips

** The Average Rate was used to determine vehicle trips

West Essex Highlands Residential Development
Estimated Site Trip Generation
Land Use Code 221 – Multifamily Housing (Mid-Rise) - 550 Units

Time Period	Relationship T = total vehicle trips x = Dwelling Units	R ²	Avg. Rate	Std. Dev.	SD/AR	Vehicle Trips		
						Total	Ent.	Exit
AM Peak Hour of Adj. St. Traffic	Ln(T) = 0.98 Ln(X) – 0.98 *** Entering = 26%, Exiting = 74%	0.67	0.36	0.19	0.53	198	51	147
PM Peak Hour of Adj. St. Traffic	Ln(T) = 0.96 Ln(X) – 0.63 *** Entering = 61%, Exiting = 39%	0.72	0.44	0.19	0.43	242	148	94
Typical Day	T= 5.50(X) Entering = 50%, Exiting = 50%	-	5.50	-	-	3,026	1,513	1,513

* The Regression Equation was used to determine vehicle trips

** The Average Rate was used to determine vehicle trips

West Essex Highlands Residential Development
Estimated Site Trip Generation
Land Use Code 221 – Multifamily Housing (Mid-Rise) - 683 Units

Time Period	Relationship T = total vehicle trips x = Dwelling Units	R ²	Avg. Rate	Std. Dev.	SD/ AR	Vehicle Trips		
						Total	Ent.	Exit
AM Peak Hour of Adj. St. Traffic	Ln(T) = 0.98 Ln(X) – 0.98 ** Entering = 26%, Exiting = 74%	0.67	0.36	0.19	0.53	246	64	182
PM Peak Hour of Adj. St. Traffic	Ln(T) = 0.96 Ln(X) – 0.63 ** Entering = 61%, Exiting = 39%	0.72	0.44	0.19	0.43	301	184	117
Typical Day	T= 5.50(X) Entering = 50%, Exiting = 50%	-	5.50	-	-	3,758	1,879	1,879

* The Regression Equation was used to determine vehicle trips

** The Average Rate was used to determine vehicle trips

West Essex Highlands Residential Development
Estimated Site Trip Generation
Bayowski Road Extension
Land Use Code 221 – Multifamily Housing (Mid-Rise) - 76 Units

Time Period	Relationship T = total vehicle trips x = Dwelling Units	R ²	Avg. Rate	Std. Dev.	SD/ AR	Vehicle Trips		
						Total	Ent.	Exit
AM Peak Hour of Adj. St. Traffic	Ln(T) = 0.98 Ln(X) – 0.98 ** Entering = 26%, Exiting = 74%	0.67	0.36	0.19	0.53	27	7	20
PM Peak Hour of Adj. St. Traffic	Ln(T) = 0.96 Ln(X) – 0.63 ** Entering = 61%, Exiting = 39%	0.72	0.44	0.19	0.43	33	20	13
Typical Day	T= 5.50(X) Entering = 50%, Exiting = 50%	-	5.50	-	-	418	209	209

* The Regression Equation was used to determine vehicle trips

** The Average Rate was used to determine vehicle trips

SITE TRIP DISTRIBUTION

The site trips generated on the loop roads of the development are assumed to be evenly split between Warner Road and Kuzik Drive. The site trips generated by the single building on the extension of Bayowski Road will, of course, only have access to Bayowski Road. The following tables show the site trip distribution by access roadway.

West Essex Highlands Residential Development Estimated Site Trip Generation – 350 Units Access Roadway Assignments

Time Period	Access Roadway	Vehicle Trips		
		Total	Entering	Exiting
AM	Warner Road	50	13	37
	Kuzik Drive	49	13	36
	Bayowski Road	27	7	20
	Totals	126	33	93
PM	Warner Road	61	37	24
	Kuzik Drive	60	37	23
	Bayowski Road	33	20	13
	Totals	154	94	60
Typical Day	Warner Road	754	377	377
	Kuzik Drive	754	377	377
	Bayowski Road	418	209	209
	Totals	1,926	963	963

West Essex Highlands Residential Development
Estimated Site Trip Generation – 550 Units
Access Roadway Assignments

Time Period	Access Roadway	Vehicle Trips		
		Total	Entering	Exiting
AM	Warner Road	86	22	64
	Kuzik Drive	85	22	63
	Bayowski Road	27	7	20
	Totals	198	51	147
PM	Warner Road	105	64	41
	Kuzik Drive	104	64	40
	Bayowski Road	33	20	13
	Totals	242	148	94
Typical Day	Warner Road	1,304	652	652
	Kuzik Drive	1,304	652	652
	Bayowski Road	418	209	209
	Totals	3,026	1,513	1,513

West Essex Highlands Residential Development
Estimated Site Trip Generation – 683 Units
Access Roadway Assignments

Time Period	Access Roadway	Vehicle Trips		
		Total	Entering	Exiting
AM	Warner Road	110	29	81
	Kuzik Drive	109	28	81
	Bayowski Road	27	7	20
	Totals	246	64	182
PM	Warner Road	134	82	52
	Kuzik Drive	134	82	52
	Bayowski Road	33	20	13
	Totals	301	184	117
Typical Day	Warner Road	1,670	835	835
	Kuzik Drive	1,670	835	835
	Bayowski Road	418	209	209
	Totals	3,758	1,879	1,879

The site trips are assigned to the study area roadway system based on the existing traffic distribution patterns as determined from the traffic counts at the intersections.

The AM and PM site generated peak hour traffic volumes for the three development scenarios, 350 apartment units, 550 apartment units and 780 apartment units, are presented in Figures 6 through 11 at the end of this report. Future 2023 build AM and PM peak hour traffic volumes for each development scenario were determined by adding the site generated peak hour traffic volumes for that scenario to the no-build volumes. Build AM and PM peak hour volumes for the three development scenarios are presented in Figures 12 through 17 at the end of this report.

TRAFFIC ANALYSIS

Capacity analyses of the weekday AM and PM peak hours were performed for all of the study area intersections for the existing, future no-build and the three future build scenarios. It should be noted that the intersection of Oval Road and Warner Road has no conflicting movements (with the exception of an occasional service vehicle accessing the blocked off section of Oval Road just north of Warner Road); and, therefore, capacity analyses was not performed for this intersection. It is assumed that the intersection of Eagle Rock Avenue and Oval Road will be signalized in all three future build scenarios (a three phase signal operation with an eastbound lead phase was analyzed). In order to present a valid comparison between the no-build and build conditions, the intersection of Eagle Rock Avenue and Oval Road is analyzed as both unsignalized and signalized in the no-build condition. The following is a warrant analysis for the intersection of Eagle Rock Avenue and Oval Road in the no-build condition.

Warrant Analysis

In the no-build condition the intersection of Eagle Rock Avenue and Oval Road satisfies the requirements of Traffic Signal Warrant 3, Peak Hour (70% Factor) as presented in the

Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) published by the Federal Highway Administration. Warrant 3, Peak Hour (70% Factor) was selected due to field observations indicating that the travel speed on Eagle Rock Avenue is greater than the posted 40 miles per hour speed. The no build AM and PM peak hour approach volumes for the intersection are as follows:

**Intersection of Eagle Rock Avenue and Oval Road
No-Build Approach Volumes**

Peak Hour	No-Build Approach Volumes			
	Eagle Rock Avenue			Oval Road
	EB	WB	Total	SB
AM	501	929	1,430	148
PM	855	514	1,369	115

Figure 4C-4 of the MUTCD, Warrant 3, Peak Hour (70% Factor) (A copy of which is included in the Appendix of this report), indicates that for a total peak hour approach volume on the major street of 1,300 vehicles the peak hour approach volume on the minor street must exceed 100 vehicles for an intersection with all two lane approaches. Both no-build AM and PM peak hour volumes satisfy this criteria.

Eagle Rock Avenue Traffic Flow Model

The Signalized intersections of Eagle Rock Avenue and Laurel Avenue and Eagle Rock Avenue and Oval Road were analyzed as a system using the Highway Capacity Software (HCS 7) traffic capacity model for street segments and intersections developed by the McTrans Center at the University of Florida. For the scenarios in which the intersection of Eagle Rock Avenue and Oval Road is unsignalized in the existing and no-build conditions, the intersection of Eagle Rock Avenue and Laurel Avenue is analyzed as an isolated signalized intersection.

The results of the capacity analyses of the weekday AM and PM peak hours for all study area intersections are as follows:

**Intersection of Eagle Rock Avenue and Laurel Avenue
AM Peak Hour Levels of Service**

Approach/Movement	Existing *		No-Build *	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave. EB Thru	B	18.9	C	23.1
Eagle Rock Ave. EB RT	B	17.6	C	21.2
Eagle Rock Ave. EB App.	B	18.1	C	22.0
Eagle Rock Ave. WB LT	B	12.4	B	19.1
Eagle Rock Ave. WB Thru	A	5.6	A	6.1
Eagle Rock Ave. WB App.	A	9.5	B	13.6
Laurel Ave. NB LT	D	38.2	D	39.5
Laurel Ave NB RT	C	30.7	C	30.0
Laurel Ave. NB Approach	C	35.0	D	35.4
Overall For Intersection	B	17.9	C	21.1

*Analyzed as an isolated intersection.

**Intersection of Eagle Rock Avenue and Laurel Avenue
PM Peak Hour Levels of Service**

Approach/Movement	Existing *		No-Build *	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave. EB Thru	C	24.9	C	32.7
Eagle Rock Ave. EB RT	C	22.9	C	29.2
Eagle Rock Ave. EB App.	C	23.7	C	30.7
Eagle Rock Ave. WB LT	B	15.9	C	25.6
Eagle Rock Ave. WB Thru	A	8.8	A	9.8
Eagle Rock Ave. WB App.	B	12.1	B	17.3
Laurel Ave. NB LT	D	38.1	D	39.7
Laurel Ave NB RT	C	25.5	C	25.1
Laurel Ave. NB Approach	C	32.7	C	33.4
Overall For Intersection	C	24.3	C	28.3

*Analyzed as an isolated intersection.

Intersection of Eagle Rock Avenue and Oval Road
UnSignalized
AM Peak Hour Levels of Service

Approach/Movement	Existing		No-Build	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave. EB LT	B	10.1	B	10.5
Eagle Rock Ave. EB App.	-	0.9	-	1.0
Oval Road SB LT	E	36.0	F	50.6
Oval Road SB RT	B	13.3	B	14.2
Oval Road SB Approach	C	21.7	D	27.7

Intersection of Eagle Rock Avenue and Oval Road
UnSignalized
PM Peak Hour Levels of Service

Approach/Movement	Existing		No-Build	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave. EB LT	A	8.7	A	8.9
Eagle Rock Ave. EB App.	-	1.2	-	1.3
Oval Road SB LT	D	26.9	D	34.8
Oval Road SB RT	B	10.5	B	10.8
Oval Road SB Approach	C	16.9	C	20.2

**Intersection of Eagle Rock Avenue and Laurel Avenue
AM Peak Hour Levels of Service**

Approach/ Movement	No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave EB Thru	C	24.8	C	27.1	C	29.5	C	30.4
Eagle Rock Ave EB RT	C	21.0	C	22.8	C	24.3	C	25.1
Eagle Rock Ave EB Approach	C	22.6	C	24.6	C	26.4	C	27.3
Eagle Rock Ave WB LT	B	17.9	C	21.7	C	26.2	C	32.8
Eagle Rock Ave WB Thru	A	7.7	A	7.5	A	7.1	A	6.9
Eagle Rock Ave WB Approach	B	13.6	B	15.7	B	18.1	C	21.9
Laurel Ave NB LT	D	39.5	D	39.5	D	39.5	D	39.5
Laurel Ave NB RT	C	30.0	C	30.3	C	30.5	C	30.6
Laurel Ave NB Approach	D	35.4	D	35.4	D	35.4	D	35.5
Overall For Intersection	C	21.2	C	22.6	C	24.2	C	26.4

**Segment of Eagle Rock Avenue between Laurel Avenue and Oval Road
AM Peak Hour Levels of Service**

Direction	No-Build		Build 350		Build 550		Build 683	
	Level of Service	Through Delay (sec/veh)	Level of Service	Through Delay (sec/veh)	Level of Service	Through Delay (sec/veh)	Level of Service	Through Delay (sec/veh)
Eastbound	B	3.19	C	4.76	C	6.42	C	7.61
Westbound	C	7.69	C	7.45	C	7.07	C	6.92

Intersection of Eagle Rock Avenue and Oval Road
Signalized
AM Peak Hour Levels of Service

Approach/ Movement	No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave EB LT	A	3.7	A	6.2	A	8.3	A	9.7
Eagle Rock Ave EB Thru	A	2.5	A	3.3	A	4.7	A	5.8
Eagle Rock Ave EB Approach	A	3.2	A	4.9	A	6.6	A	7.9
Eagle Rock Ave WB Thru	B	12.7	B	15.1	B	16.7	B	17.8
Eagle Rock Ave WB RT	B	12.1	B	14.5	B	16.0	B	17.1
Eagle Rock Ave WB Approach	B	12.4	B	14.8	B	16.3	B	17.4
Oval Road SB LT	C	33.7	C	30.9	C	29.5	C	28.7
Oval Road SB RT	D	37.6	D	35.5	C	34.3	C	33.7
Oval Road SB Approach	D	36.2	C	33.8	C	32.6	C	31.8
Overall For Intersection	B	11.7	B	14.5	B	16.2	B	17.3

**Intersection of Eagle Rock Avenue and Laurel Avenue
PM Peak Hour Levels of Service**

Approach/ Movement	No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave EB Thru	C	31.6	C	33.9	D	37.5	D	38.3
Eagle Rock Ave EB RT	C	28.2	C	30.3	C	32.5	C	33.3
Eagle Rock Ave EB Approach	C	29.7	C	31.9	C	34.7	D	35.5
Eagle Rock Ave WB LT	B	19.9	C	22.9	C	26.0	C	28.3
Eagle Rock Ave WB Thru	B	14.8	B	16.4	B	16.9	B	17.4
Eagle Rock Ave WB Approach	B	17.2	B	19.4	C	21.2	C	22.5
Laurel Ave NB LT	D	43.3	D	43.2	D	43.1	D	43.1
Laurel Ave NB RT	C	26.1	C	27.9	C	29.1	C	30.2
Laurel Ave NB Approach	D	35.9	D	36.4	D	36.8	D	37.1
Overall For Intersection	C	28.9	C	30.4	C	31.9	C	32.7

**Segment of Eagle Rock Avenue between Laurel Avenue and Oval Road
PM Peak Hour Levels of Service**

Direction	No-Build		Build 350		Build 550		Build 683	
	Level of Service	Through Delay (sec/veh)	Level of Service	Through Delay (sec/veh)	Level of Service	Through Delay (sec/veh)	Level of Service	Through Delay (sec/veh)
Eastbound	C	4.44	C	5.94	C	6.16	C	6.09
Westbound	D	14.78	D	16.38	D	16.93	D	17.37

Intersection of Eagle Rock Avenue and Oval Road
Signalized
PM Peak Hour Levels of Service

Approach/ Movement	No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Eagle Rock Ave EB LT	A	5.2	A	8.0	A	8.8	A	8.9
Eagle Rock Ave EB Thru	A	3.6	A	4.1	A	4.0	A	3.9
Eagle Rock Ave EB Approach	A	4.5	A	6.2	A	6.6	A	6.7
Eagle Rock Ave WB Thru	C	20.1	C	21.0	C	21.3	C	21.4
Eagle Rock Ave WB RT	B	19.5	C	20.3	C	20.7	C	20.7
Eagle Rock Ave WB Approach	B	19.8	C	20.6	C	20.9	C	21.0
Oval Road SB LT	C	29.7	C	29.7	C	30.0	C	30.1
Oval Road SB RT	C	30.5	C	31.0	C	31.5	C	32.0
Oval Road SB Approach	C	30.2	C	30.5	C	30.9	C	31.3
Overall For Intersection	B	12.5	B	14.5	B	15.3	B	15.6

Intersection of Oval Road and Rappleye Court
AM Peak Hour Levels of Service

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Rappleye Court WB Approach	A	9.5	A	9.6	B	10.4	B	10.9	B	11.3
Oval Road SB LT	A	8.3	A	8.3	A	8.5	A	8.5	A	8.6
Oval Road SB Approach	-	0.1	-	0.1	-	0.1	-	0.0	-	0.0

**Intersection of Oval Road and Rappleye Court
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Rapleye Court WB Approach	A	9.6	A	9.7	B	10.8	B	11.6	B	12.1
Oval Road SB LT	A	8.5	A	8.6	A	8.9	A	9.2	A	9.4
Oval Road SB Approach	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1

**Intersection of Oval Road and Bongart Drive
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Bongart Drive WB Approach	A	9.1	A	9.1	A	9.7	B	10.2	B	10.5
Oval Road SB LT	A	7.3	A	7.3	A	7.4	A	7.4	A	7.5
Oval Road SB Approach	-	0.1	-	0.1	-	0.1	-	0.0	-	0.0

**Intersection of Oval Road and Bongart Drive
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Bongart Drive WB Approach	A	9.0	A	9.1	A	9.8	B	10.2	B	10.6
Oval Road SB LT	A	7.4	A	7.4	A	7.6	A	7.8	A	7.9
Oval Road SB Approach	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1

**Intersection of Warner Road and Davey Drive
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Davey Drive NB Approach	A	9.0	A	9.0	A	9.6	A	9.9	B	10.2
Warner Road WB LT	A	7.3	A	7.3	A	7.3	A	7.4	A	7.4
Warner Road WB Approach	-	0.1	-	0.1	-	0.1	-	0.0	-	0.0

**Intersection of Warner Road and Davey Drive
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Davey Drive NB Approach	A	8.9	A	8.9	A	9.5	A	9.8	B	10.1
Warner Road WB LT	A	7.3	A	7.3	A	7.5	A	7.6	A	7.7
Warner Road WB Approach	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1

**Intersection of Warner Road and Reger Lane
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Reger Lane SB Approach	A	8.7	A	8.8	A	9.3	A	9.7	A	10.0
Warner Road EB LT	A	7.4	A	7.5	A	7.7	A	7.8	A	7.9
Warner Road EB Approach	-	3.1	-	3.1	-	2.0	-	1.7	-	1.5

**Intersection of Warner Road and Reger Lane
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Reger Lane SB Approach	A	8.9	A	9.0	A	9.6	A	10.0	B	10.3
Warner Road EB LT	A	7.3	A	7.3	A	7.5	A	7.5	A	7.6
Warner Road EB Approach	-	1.5	-	1.5	-	1.1	-	1.1	-	1.1

**Intersection of Warner Road and Kuzik Drive – Sullivan Drive
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Warner Road EB LT	A	7.5	A	7.5	A	7.6	A	7.7	A	7.8
Warner Road EB Approach	-	1.9	-	1.7	-	2.6	-	2.9	-	3.0
Warner Road WB LT	A	7.2	A	7.2	A	7.3	A	7.3	A	7.3
Warner Road WB Approach	-	0.0	-	0.0	-	0.6	-	0.5	-	0.5
Sullivan Drive NB Approach	A	8.9	A	8.9	A	9.7	B	10.3	B	10.8
Kuzik Drive SB Approach	A	8.8	A	8.8	A	8.9	A	9.2	A	9.4

**Intersection of Warner Road and Kuzik Drive – Sullivan Drive
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Warner Road EB LT	A	7.5	A	7.5	A	7.6	A	7.7	A	7.8
Warner Road EB Approach	-	1.1	-	1.2	-	2.3	-	2.8	-	3.1
Warner Road WB LT	A	7.3	A	7.3	A	7.4	A	7.5	A	7.5
Warner Road WB Approach	-	0.0	-	0.0	-	0.6	-	0.6	-	0.5
Sullivan Drive NB Approach	A	8.9	A	9.0	B	10.0	B	10.8	B	11.5
Kuzik Drive SB Approach	A	8.6	A	8.6	A	8.8	A	9.2	A	9.5

**Intersection of Kuzik Drive and Lapis Circle – Luft Lane
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Kuzik Drive NB LT	A	8.5	A	8.5	A	8.7	A	8.8	A	8.8
Kuzik Drive NB Approach	-	5.7	-	5.7	-	2.2	-	1.8	-	1.8
Kuzik Drive SB LT	A	7.2	A	7.2	A	7.2	A	7.3	A	7.3
Kuzik Drive SB Approach	-	0.0	-	0.0	-	0.2	-	0.1	-	0.1
Lapis Circle EB Approach	A	8.4	A	8.4	A	8.5	A	8.6	A	8.7
Luft Lane WB Approach	A	8.7	A	8.7	A	9.0	A	9.3	A	9.5

**Intersection of Kuzik Drive and Lapis Circle – Luft Lane
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Kuzik Drive NB LT	A	8.5	A	8.5	A	8.6	A	8.7	A	8.7
Kuzik Drive NB Approach	-	2.2	-	1.9	-	0.9	-	0.6	-	0.6
Kuzik Drive SB LT	A	7.2	A	7.2	A	7.3	A	7.4	A	7.4
Kuzik Drive SB Approach	-	0.0	-	0.0	-	0.3	-	0.2	-	0.1
Lapis Circle EB Approach	A	8.5	A	8.5	A	8.3	A	8.4	A	8.6
Luft Lane WB Approach	A	8.7	A	8.7	A	9.1	A	9.5	A	9.7

**Intersection of Sullivan Drive and Davey Drive
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Sullivan Drive NB Approach	A	7.6	A	7.7	A	7.8	A	7.8	A	7.8
Sullivan Drive SB Approach	A	7.1	A	7.1	A	7.1	A	7.0	A	7.0
Davey Drive EB Approach	A	6.9	A	6.9	A	7.0	A	7.1	A	7.1
Davey Drive WB Approach	A	6.8	A	6.8	A	6.8	A	6.9	A	6.9
Overall For Int.	A	7.3	A	7.3	A	7.4	A	7.4	A	7.4

**Intersection of Sullivan Drive and Davey Drive
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Sullivan Drive NB Approach	A	7.7	A	7.8	A	7.9	A	7.9	A	7.9
Sullivan Drive SB Approach	A	7.2	A	7.2	A	7.4	A	7.4	A	7.4
Davey Drive EB Approach	A	6.9	A	6.8	A	7.0	A	7.1	A	7.2
Davey Drive WB Approach	A	6.8	A	6.8	A	6.9	A	6.9	A	6.9
Overall For Int.	A	7.3	A	7.3	A	7.4	A	7.4	A	7.4

**Intersection of Davey Drive and Bongart Drive
AM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Bongart Drive EB Approach	A	8.7	A	8.7	A	8.7	A	8.7	A	8.7
Davey Drive NB LT	A	7.2	A	7.2	A	7.3	A	7.3	A	7.3
Davey Drive NB Approach	-	5.3	-	5.3	-	5.7	-	5.8	-	5.9

**Intersection of Davey Drive and Bongart Drive
PM Peak Hour Levels of Service**

Approach/ Movement	Existing		No-Build		Build 350		Build 550		Build 683	
	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)
Bongart Drive EB Approach	A	8.6	A	8.6	A	8.6	A	8.6	A	8.6
Davey Drive NB LT	A	7.4	A	7.4	A	7.4	A	7.4	A	7.4
Davey Drive NB Approach	-	3.2	-	3.3	-	4.2	-	4.5	-	4.6

Level of Service Criteria Signalized Intersections

Levels of service for a signalized intersection are determined by the computed or measured control delay and are defined for lane groups, intersection approaches and the intersections as a whole. The Highway Capacity Manual (HCM) published by the Transportation Research Board of the National Research Council, defines control delay as:

“The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.”

Control delay is the portion of the total delay attributed to traffic signal operation for signalized intersections. Control delay includes initial deceleration delay, queue move-up time, stopped delay and final acceleration delay.

Level of service criteria as defined by the Highway Capacity Manual is as follows.

Level of Service	Average Control Delay (sec./veh.)
A	0-10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Level of Service Criteria Unsignalized Intersections

Levels of service for an unsignalized intersection are determined by the computed or measured control delay and are defined for each minor movement. Level of service is not defined for the intersection as a whole. The Highway Capacity Manual published by the Transportation Research Board of the National Research Council defines control delay as:

“The component of delay that results when a control signal (in this case a stop sign) causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.”

Level of service criteria as defined by the Highway Capacity Manual is as follows:

Level of Service	Average Control Delay (sec./veh.)
A	0-10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Capacity analyses summary sheets are presented in the appendix of this report.

INTERSECTION SIGHT DISTANCE

The intersections of Bongart Drive and Oval Road and Warner Road and Davey Drive have been identified as having questionably inadequate intersection sight distance from the minor stop controlled approaches. Specifically the sight distances from Bongart Drive to the north and south and the sight distances from Davey Drive to the east and west are in question. Both Bongart Drive and Davey Drive form the stems of their respective tee intersections.

The standards for intersection sight distance are found in “A Policy on Geometric Design of Highways and Streets” published by The American Association of State Highway and Transportation Officials (AASHTO). This design manual is referred to as the “AASHTO Green Book or AASHTO Manual” and contains most of the standards for highway and roadway design. The Manual states that sight distance from an intersection approach is measured from a point 14.5 feet back from the edge of travel way of the intersecting street and 3’6” above the pavement to a point in the middle of the intersecting street’s approach lane, also 3’6” above the pavement. The driver’s eye is conservatively assumed to be 3’6” above the pavement which is lower than the driver’s eye in most vehicles. The required sight distance, measured along the major intersecting street, is a function of the speed of vehicles on the major street. The speed of vehicles on Warner Road in the vicinity of Davey Drive is conservatively assumed to be 25 miles per hour. It is probably lower due to speed bumps on Warner Road. The speed of vehicles on Oval Road in the vicinity of Bongart Drive is assumed to be 30 miles per hour.

The AASHTO manual states that the required intersection sight distance for a stop controlled approach to a street with a travel speed of 25 miles per hour is 280 feet and to a street with a travel speed of 30 miles per hour is 335 feet. Therefore, the required sight distance from Davey Drive at its intersection with Warner Road is 280 feet; and the required distance from Bongart Drive at its intersection with Oval Road is 335 feet.

Figures 18 and 19 illustrate the intersection sight distance lines from Bongart Drive at Oval Road, and Figures 20 and 21 illustrate the intersection sight distance lines from Davey Drive at Warner Road. Figures 18-21 are presented at the end of this report. It appears that the sight line from Davey Drive to the east on Warner Road is obstructed by the trees in the south east quadrant of the intersection (see Figure 21 “Intersection Sight Distance, Davey Drive Approach at Warner Road to the East.”) Those trees should be relocated so as not to obstruct the sight line and to create a safer intersection. The sight line from Davey Drive to the west appears unobstructed as well as the sight lines from Bongart Drive to the north and south.

RSIS SITE EVALUATION

The proposed West Essex Highlands Residential Development, will consist of 683 mid – rise apartments in the ultimate build scenario. The main section of the development, consisting of eight three and four story buildings with 607 apartments, will be served by a loop-configured minor collector street connecting to Warner Road on one end and Kuzik Drive on the other end. An additional four story building, consisting of 76 apartments will be located on an extension of Bayowski Street.

The Residential Site Improvement Standards (RSIS), New Jersey Administrative Code, Title 5, Chapter 21, which governs this type of development, states in Table 4.2, *Residential Street Hierarchy Definitions*, the following.

Under Minor Collector:

“Each half of a loop-configured minor collector may be classified as a single minor collector street, but the total traffic volume conveyed on the loop should not exceed 3500 ADT, nor should it exceed 1,750 ADT at any point of traffic concentration.”

Under Multifamily Access Cul-de-sacs:

“A street with a single means of ingress and egress, which serves multifamily development, that provides a means for vehicles to turn around.” The maximum allowable ADT is 1000.

Under the ultimate development scenario of 607 mid-rise apartment units served by a loop-configured minor collector street, the ADT on the loop-configured street would be 3,339 vehicles (607 units x 5.5 trips per unit), resulting in approximately half of the vehicles, 1,670 ADT, accessing the development through Warner Road and the other half through Kuzik Drive. Therefore, the ADT on the loop-configured street does not exceed RSIS criteria. Both Warner Road and Kuzik Drive are curbed and forty feet wide, well in excess of minor collector street standards.

In addition, 76 mid-rise apartment units will be served by an extension of Bayowski Road. The ADT on the proposed extended portion of the cul-de-sac will be 418 (76 units x 5.5 trips per unit), therefore not exceeding RSIS criteria.

Based on the preceding criteria, the West Essex Highlands Residential Development consisting of 683 mid-rise apartments, 607 of which will be served by the main loop road and 76 of which will be served by an extension to Bayowski Road, will not require an exception to the RSIS

CONCLUSIONS

A comparison of the ultimate build scenario (683 units) and no-build capacity analyses for the signalized intersections of Eagle Rock Avenue and Laurel Avenue and Eagle Rock Avenue and Oval Road indicates that no intersection in the AM or PM peak hours experiences more than a minor deterioration of level-of-service or increase in average delay time due to traffic from the proposed residential development, even in the ultimate build scenario. In the scenario where the intersection of Eagle Rock Avenue and Oval Road remains unsignalized in the no-build condition, the levels of service improve

significantly on the Oval Road southbound approach going from the unsignalized no-build condition to the signalized ultimate build condition. In the AM peak hour the level of service goes from “D” to “B” with a reduction in approximately ten seconds of average delay, and in the PM peak hour the level of service goes from “C” to “B” with a reduction in approximately five seconds of average delay.

Assuming that the intersection of Eagle Rock Avenue and Oval Road is signalized in the no-build condition, the increases in overall average control delay (with the corresponding levels of service, LOS) from the no-build condition to the ultimate build condition, are as follows:

Intersection of Eagle Rock Avenue and Laurel Avenue

AM Peak Hour: From LOS “C”, 21.2 seconds to LOS “C”, 26.4 seconds

PM Peak Hour: From LOS “C”, 28.9 seconds to LOS “C”, 32.7 seconds

Intersection of Eagle Rock Avenue and Oval Road

AM Peak Hour: From LOS “B”, 11.7 seconds to LOS “B”, 17.3 seconds

PM Peak Hour: From LOS “B”, 12.5 seconds to LOS “B”, 15.6 seconds

Comparisons of the levels of service and average control delay times for the unsignalized intersections in the West Essex Townhouse development show minimal increases in average control delay from the no-build condition to the ultimate build condition. All approaches and movements at all the intersections within the Townhouse development remain in the LOS range of “A” to “B”.

It should be noted that in order to achieve these minimum traffic impacts from the West Essex Highlands Residential Development, improvements to the traffic signal system on Eagle Rock Avenue must be implemented. Specifically, traffic signalization with detectorization must be installed at the intersection of Eagle Rock Avenue and Oval Road

with the capability of interconnection (wireless interconnection is satisfactory) to the intersection of Eagle Rock Avenue and Laurel Avenue. In addition the existing traffic signal controller at the intersection of Eagle Rock Avenue and Laurel Avenue must be modified or replaced to be capable of interconnection; and new detectorization must be installed at the approaches. The signal controllers at both intersections must also be capable of accommodating the software that can accomplish the signal coordination assumed in the analyses presented in this report.

Based on the results of the capacity analyses and assuming the implementation of the aforementioned traffic signal recommendations, the proposed West Essex Residential Development, consisting of 683 apartment units in the ultimate build scenario, will have a minimal impact on traffic in the West Essex Townhouse development and on traffic on Eagle Rock Avenue in the vicinity of Oval Road and Laurel Avenue.

FIGURES

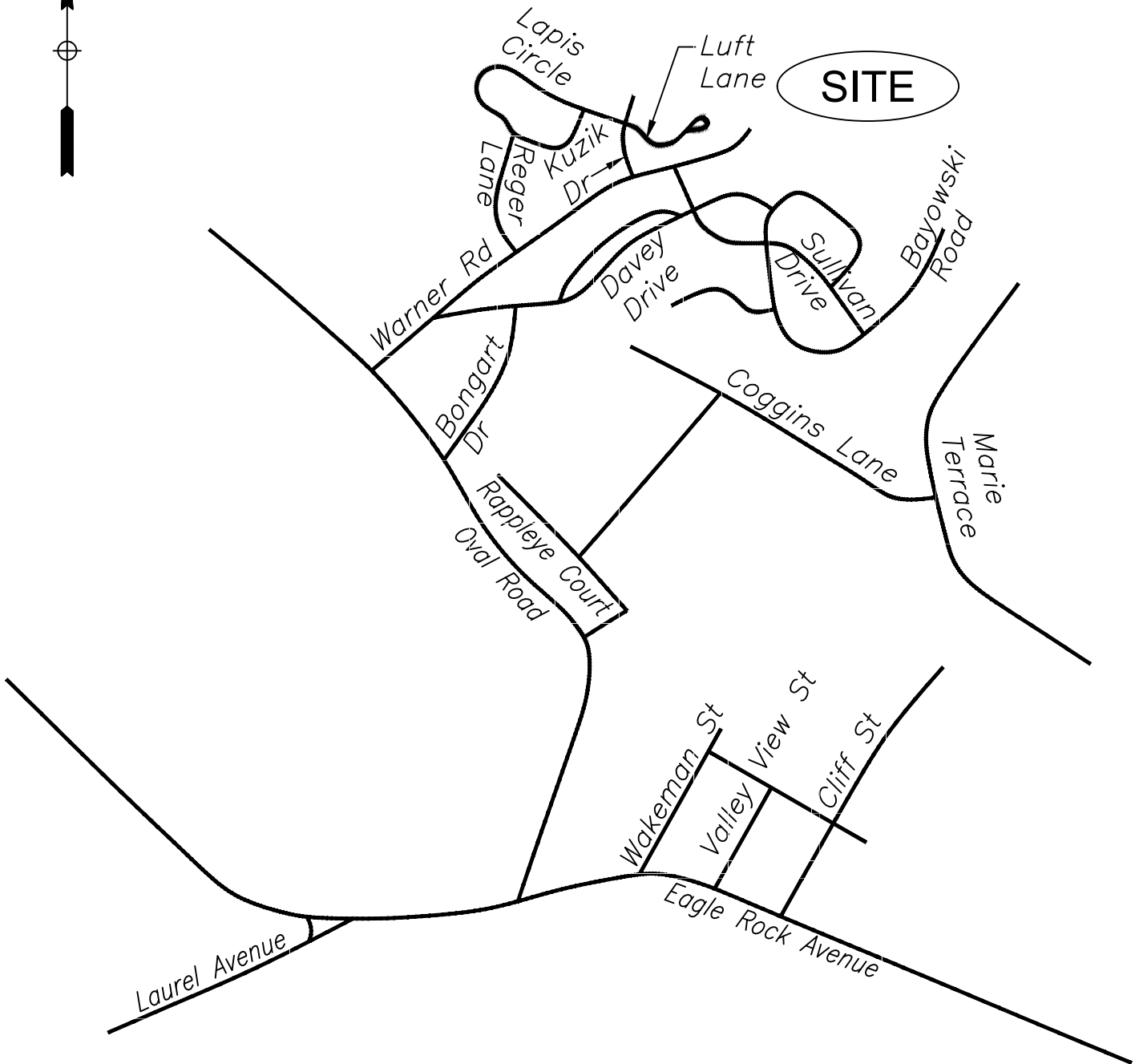


Figure 1

**West Essex Highlands Residential Development
Apartments**

TRAFFIC IMPACT STUDY

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

PROJECT LOCATION



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

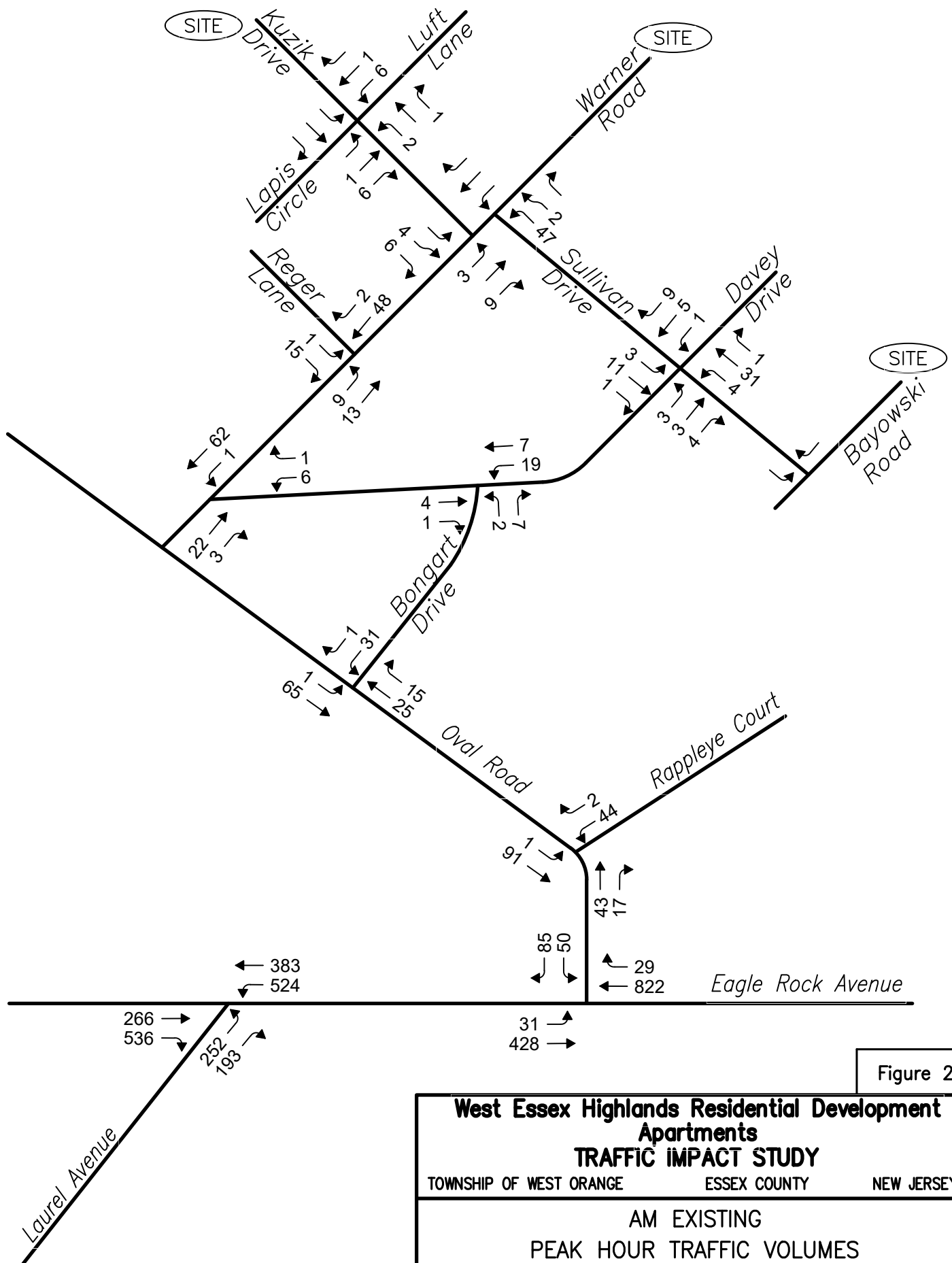


Figure 2

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

**AM EXISTING
PEAK HOUR TRAFFIC VOLUMES**



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

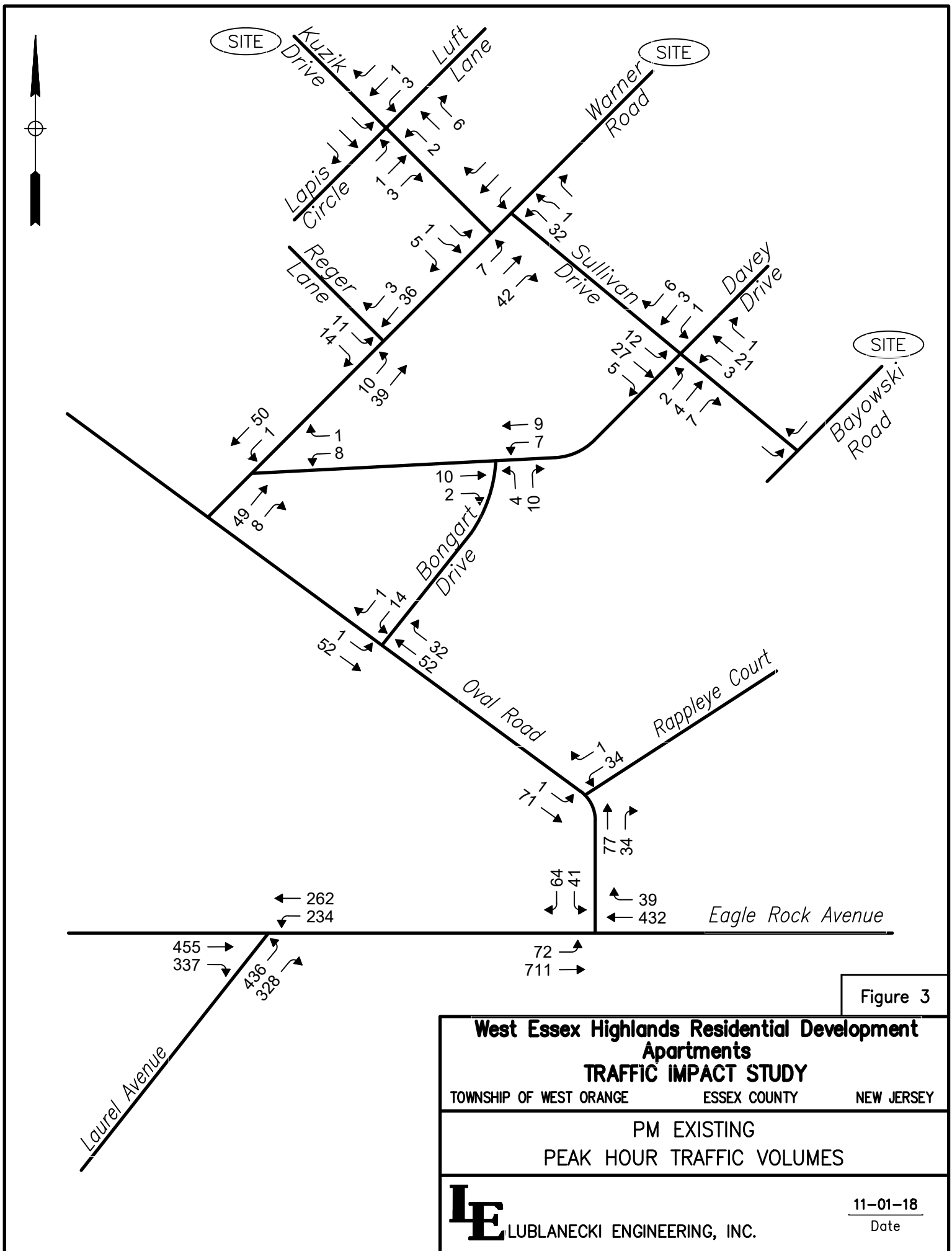


Figure 3

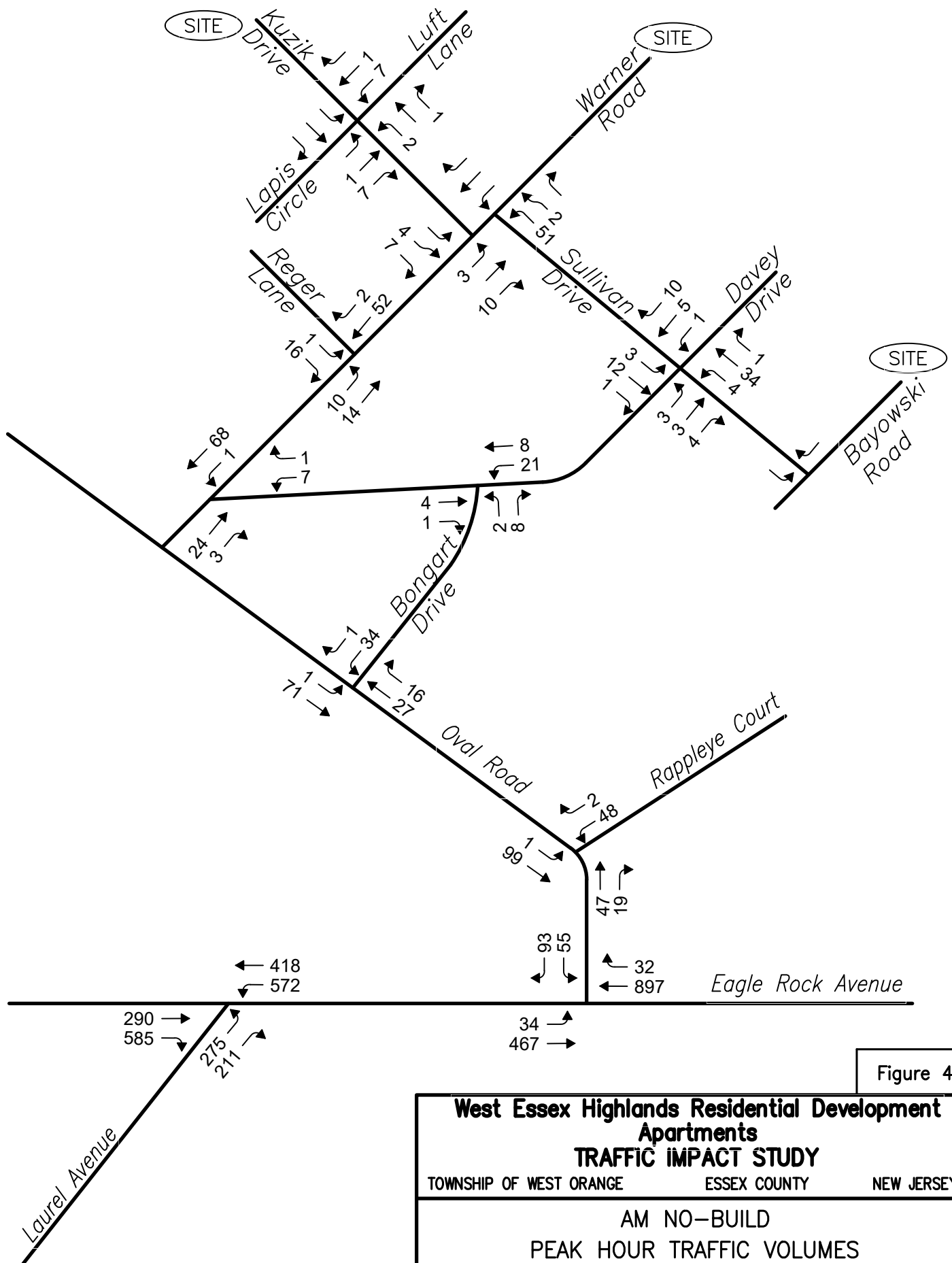


Figure 4

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

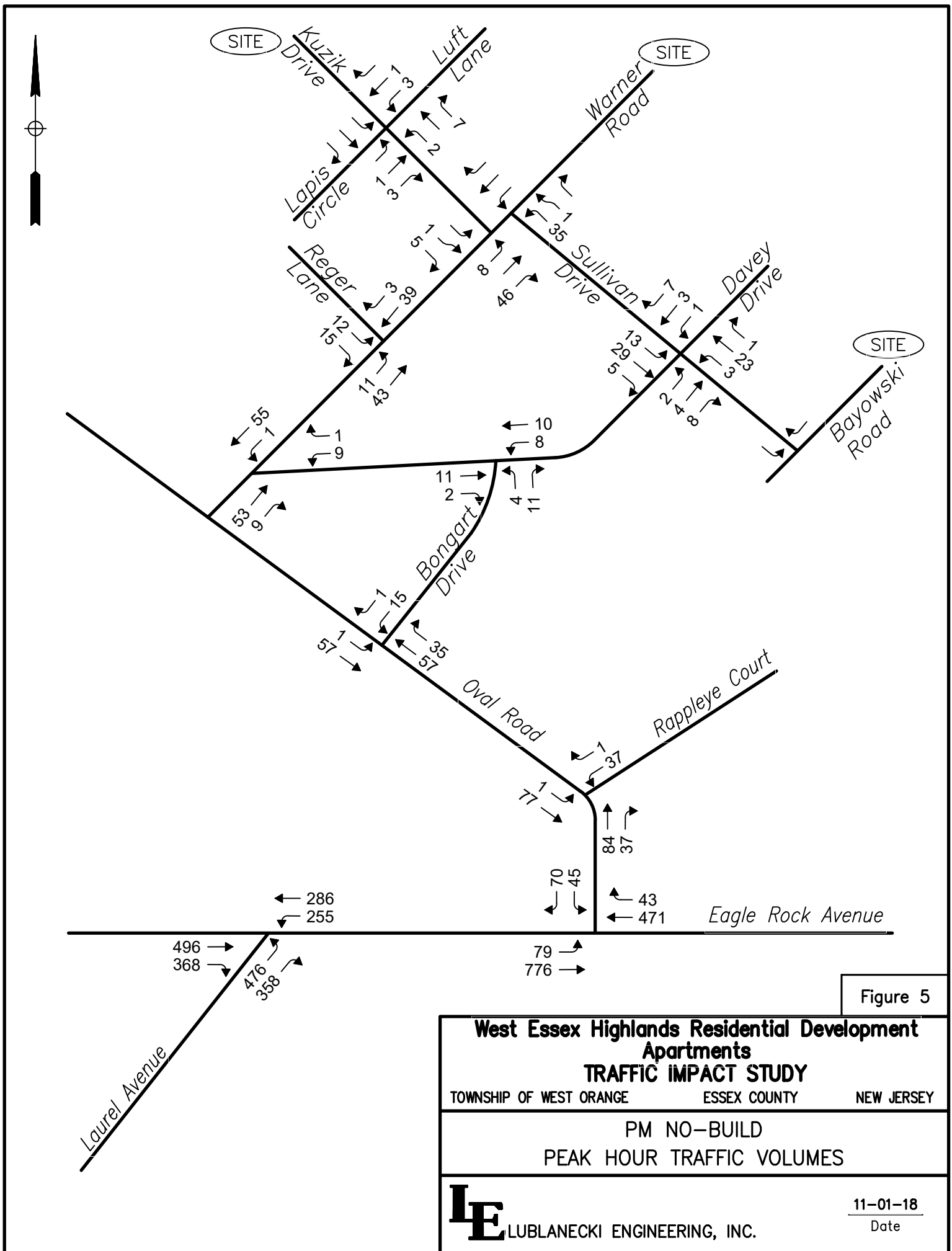
AM NO-BUILD
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18

Date



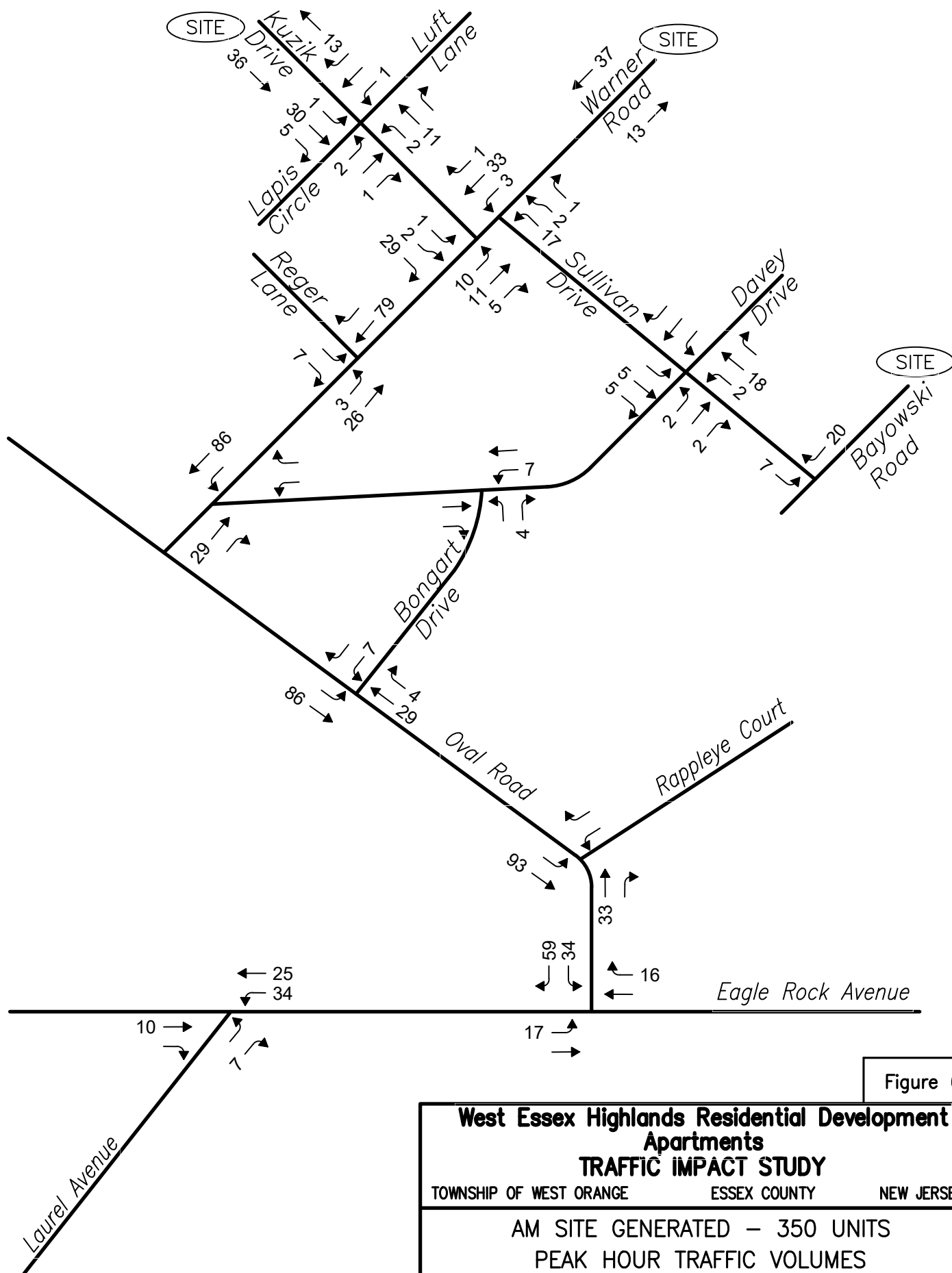


Figure 6

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

AM SITE GENERATED – 350 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18
Date

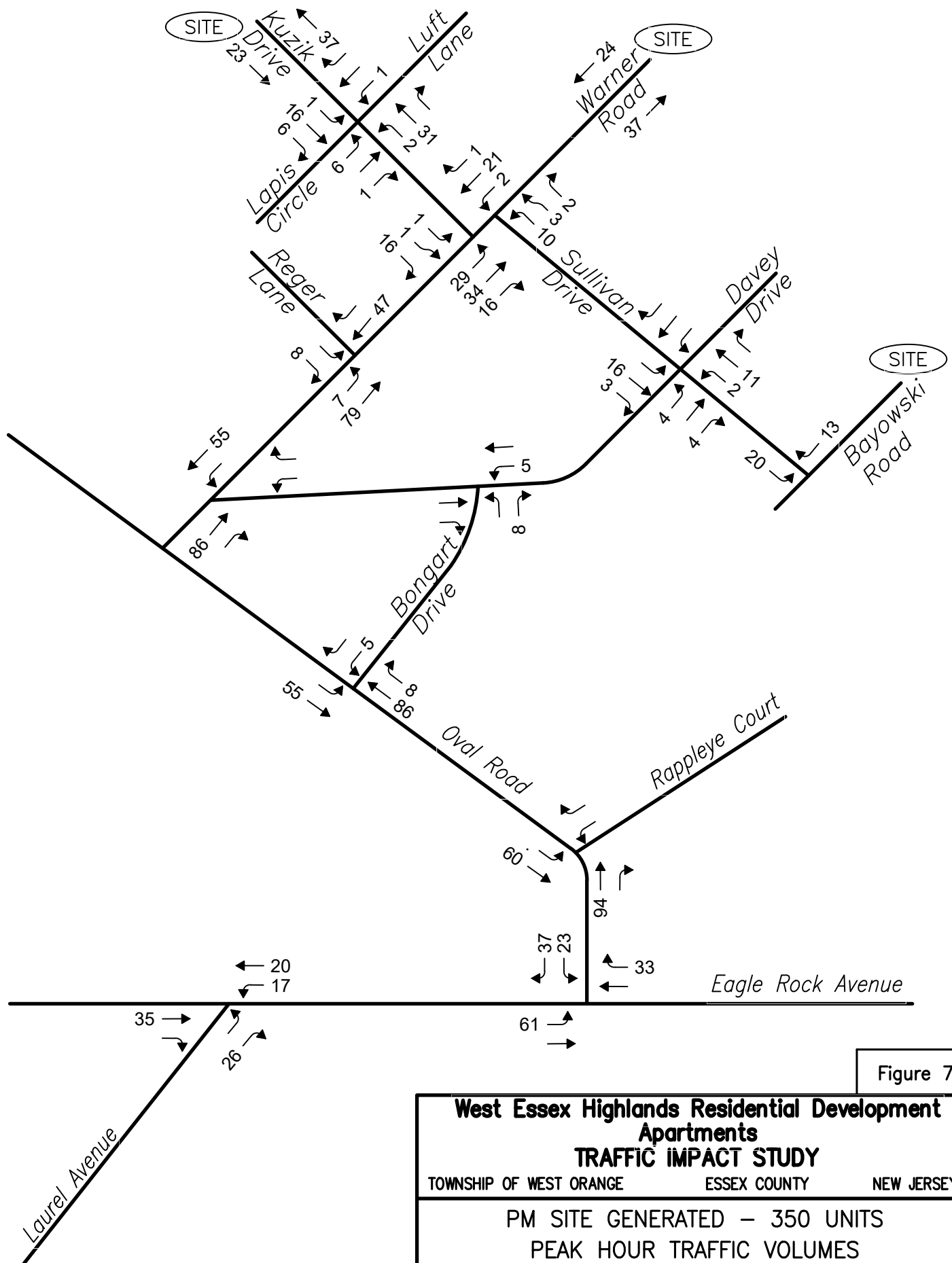


Figure 7

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

PM SITE GENERATED – 350 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

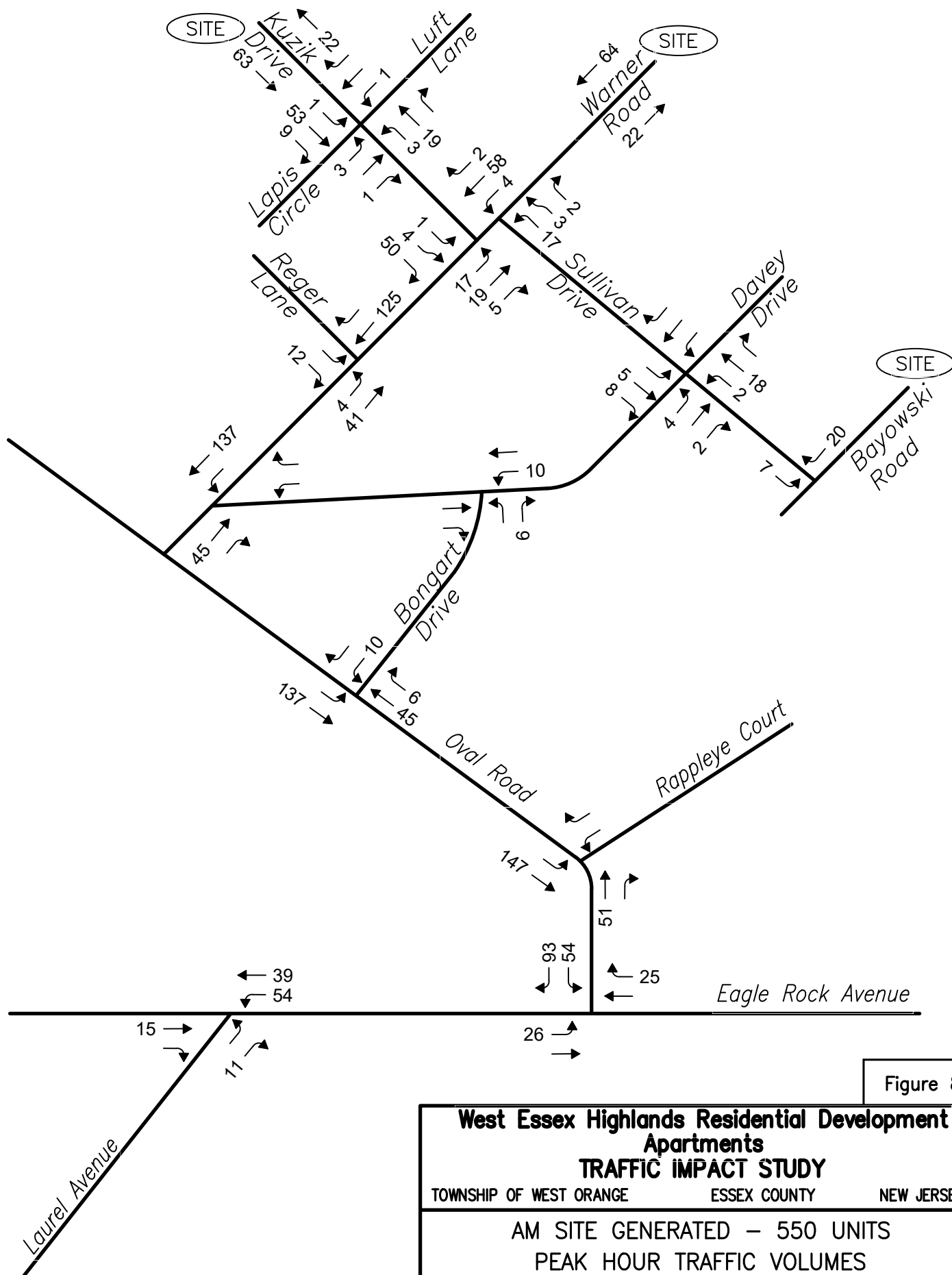


Figure 8

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

AM SITE GENERATED - 550 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

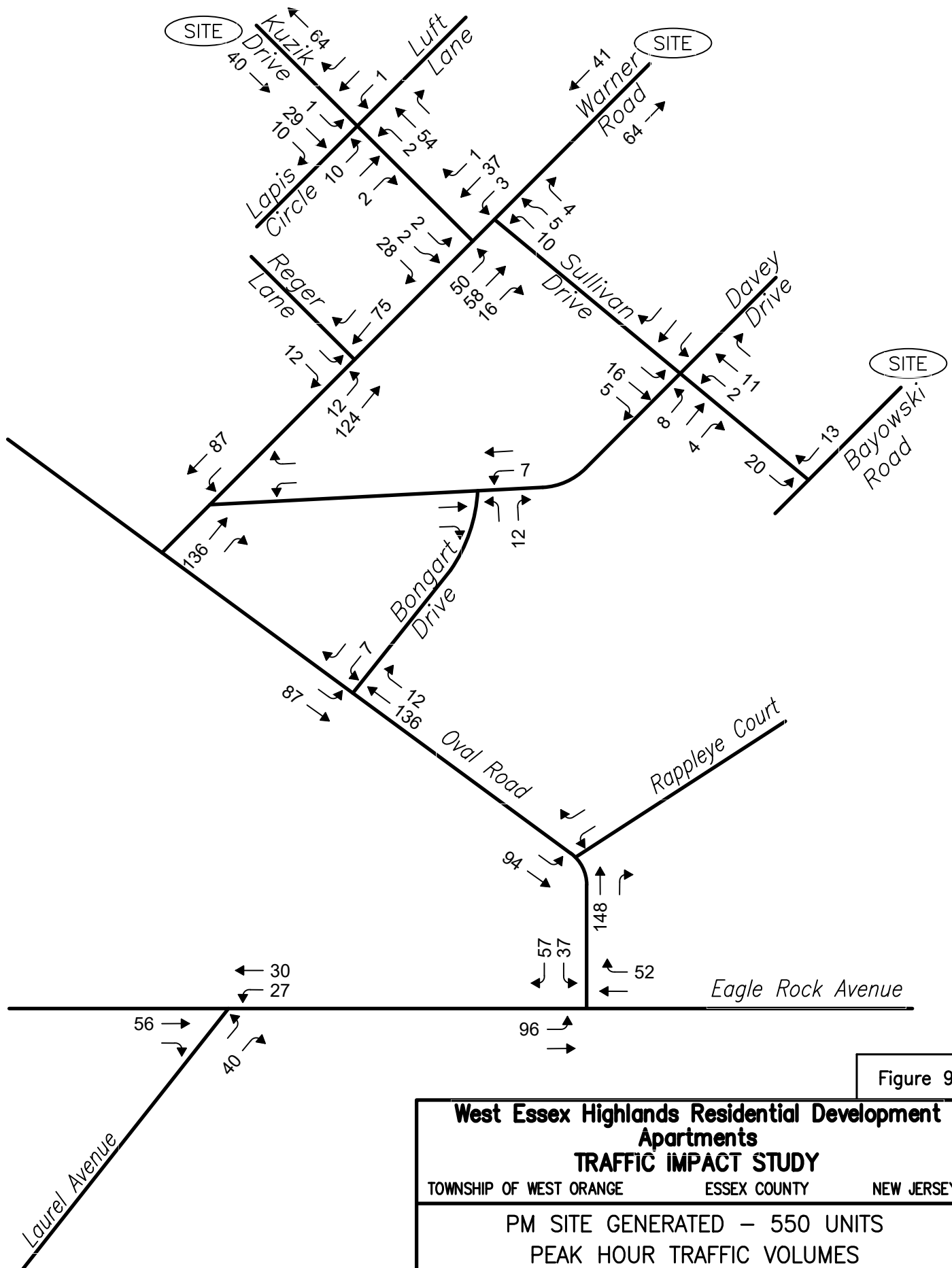


Figure 9

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

PM SITE GENERATED - 550 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

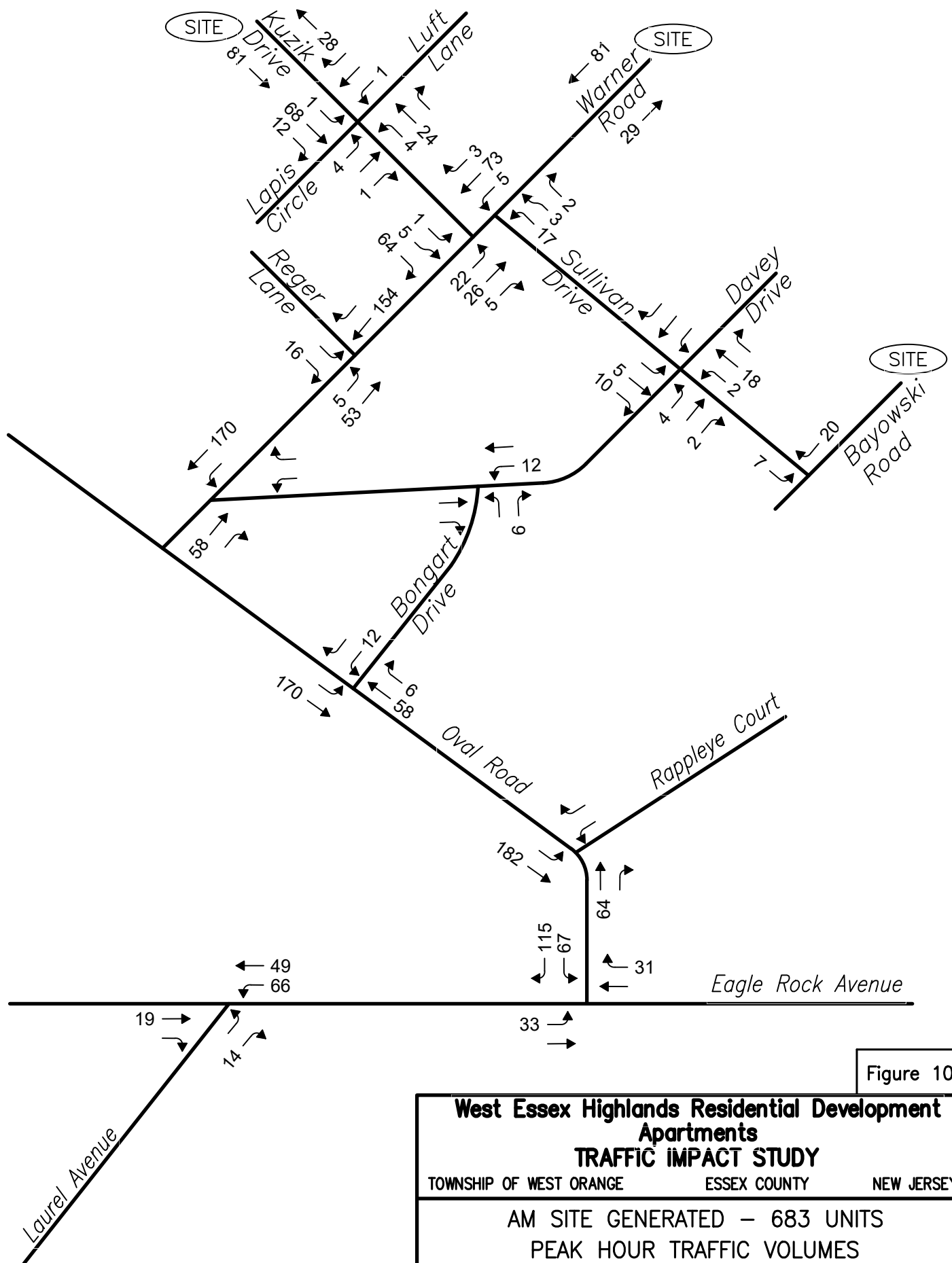


Figure 10

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

AM SITE GENERATED – 683 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

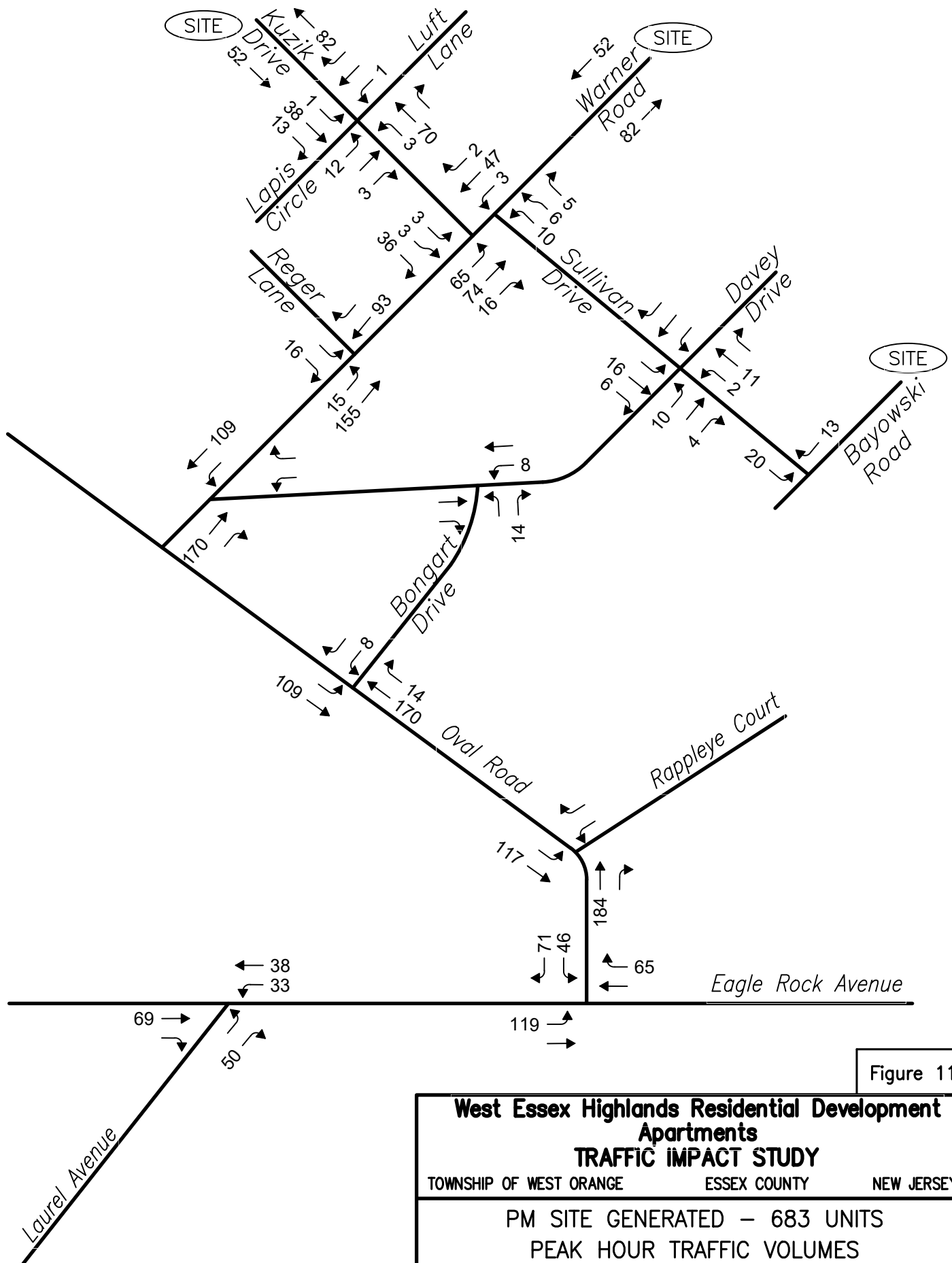


Figure 11

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

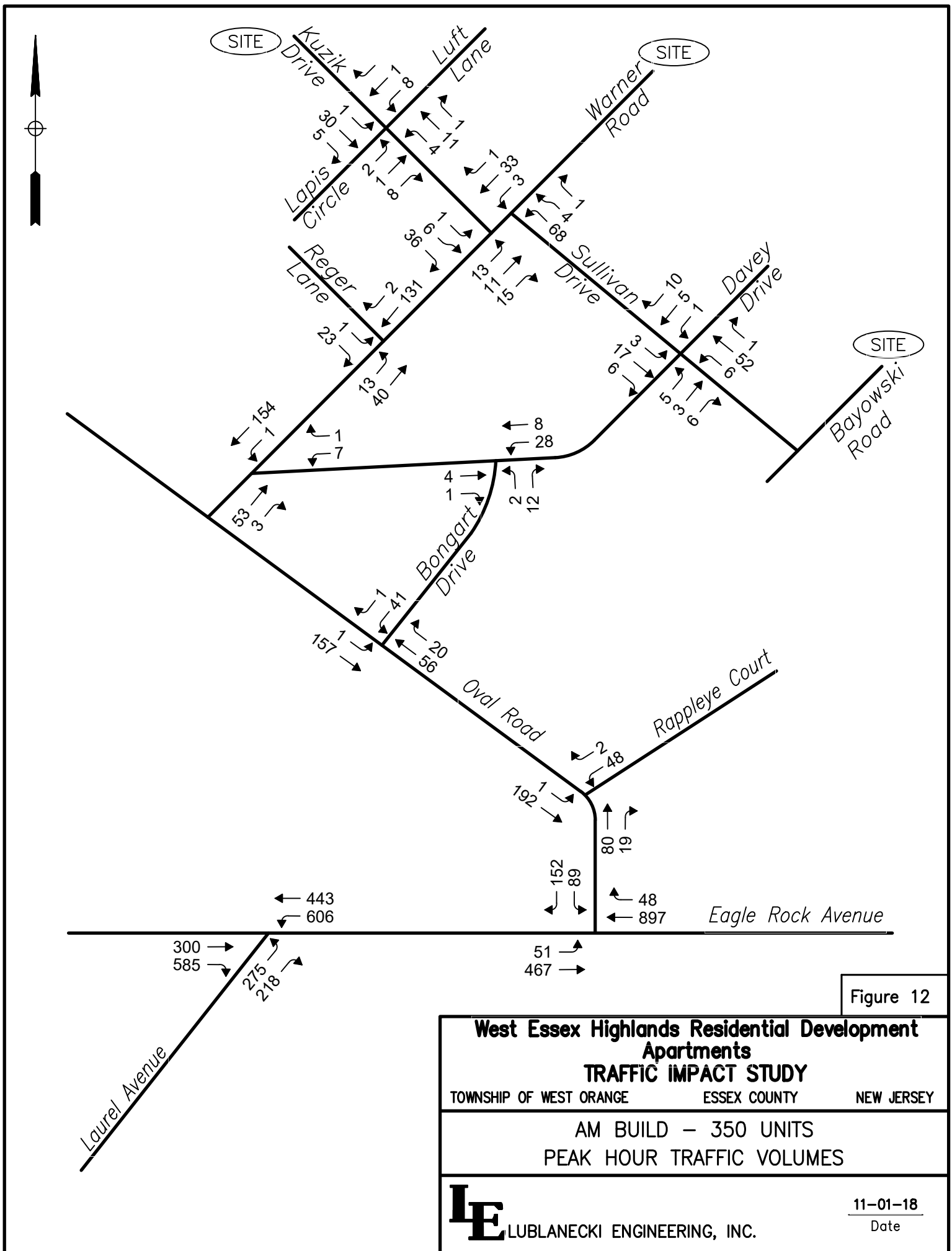
PM SITE GENERATED - 683 UNITS
PEAK HOUR TRAFFIC VOLUMES

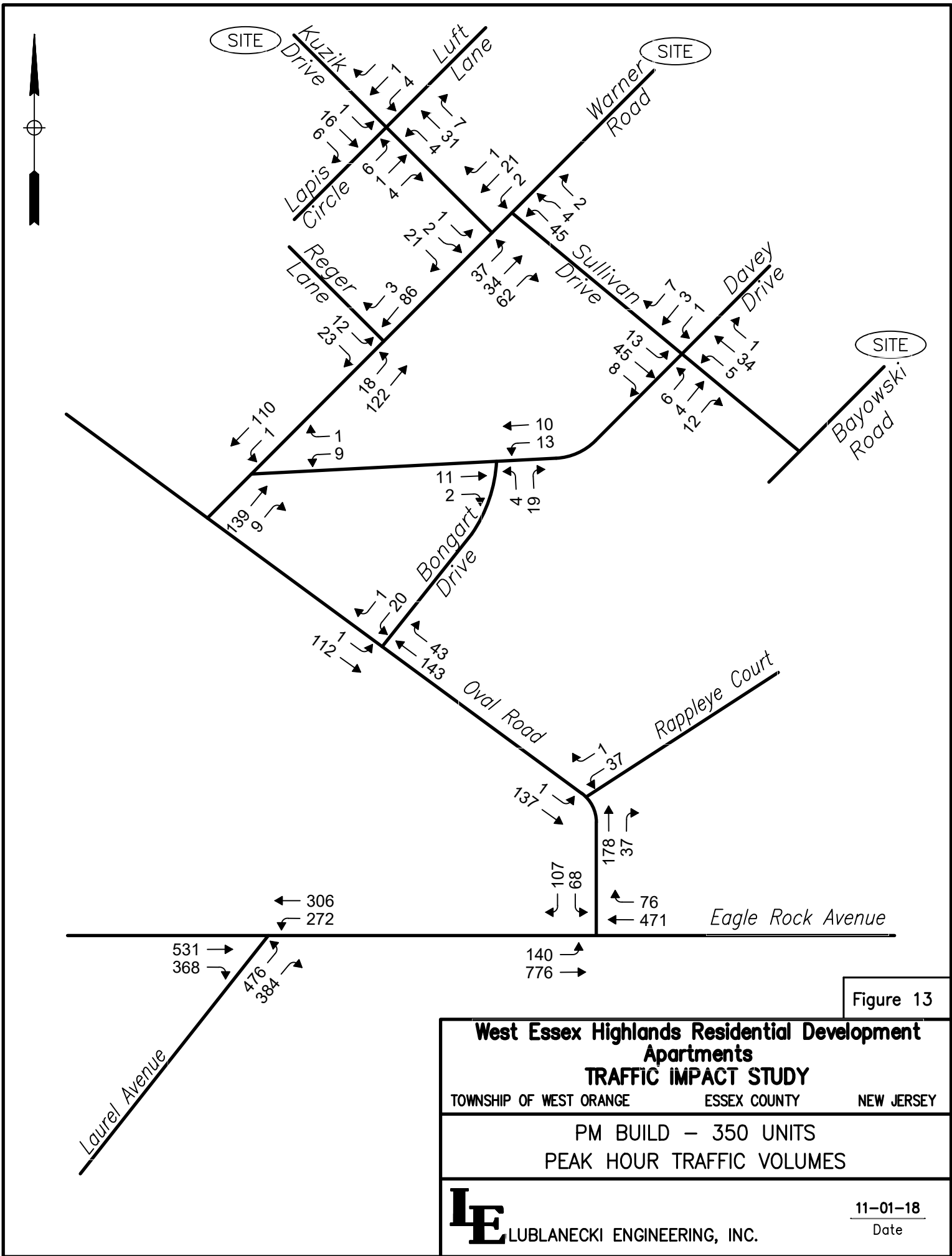


LUBLANECKI ENGINEERING, INC.

11-01-18

Date





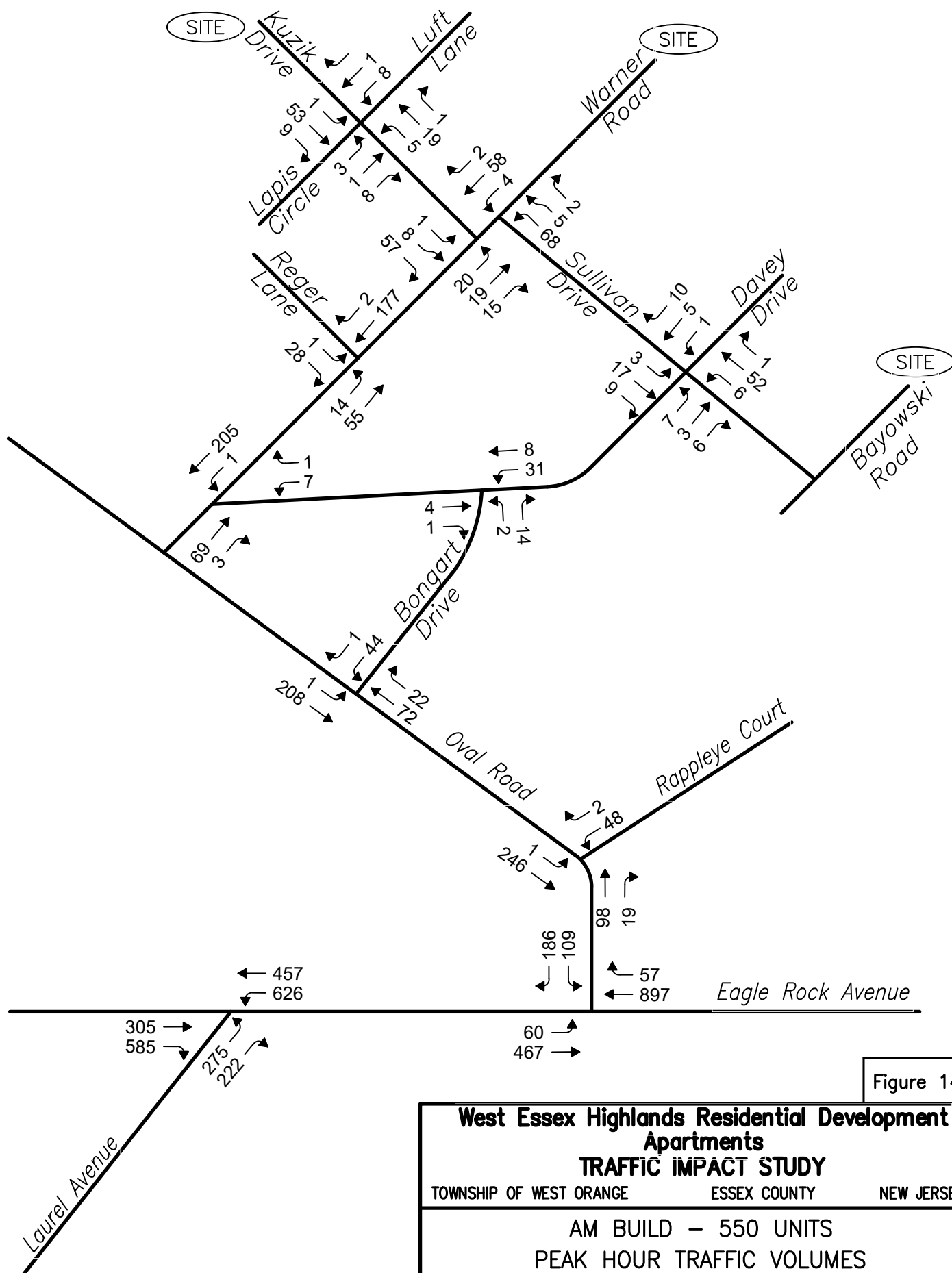


Figure 14

West Essex Highlands Residential Development Apartments TRAFFIC IMPACT STUDY

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

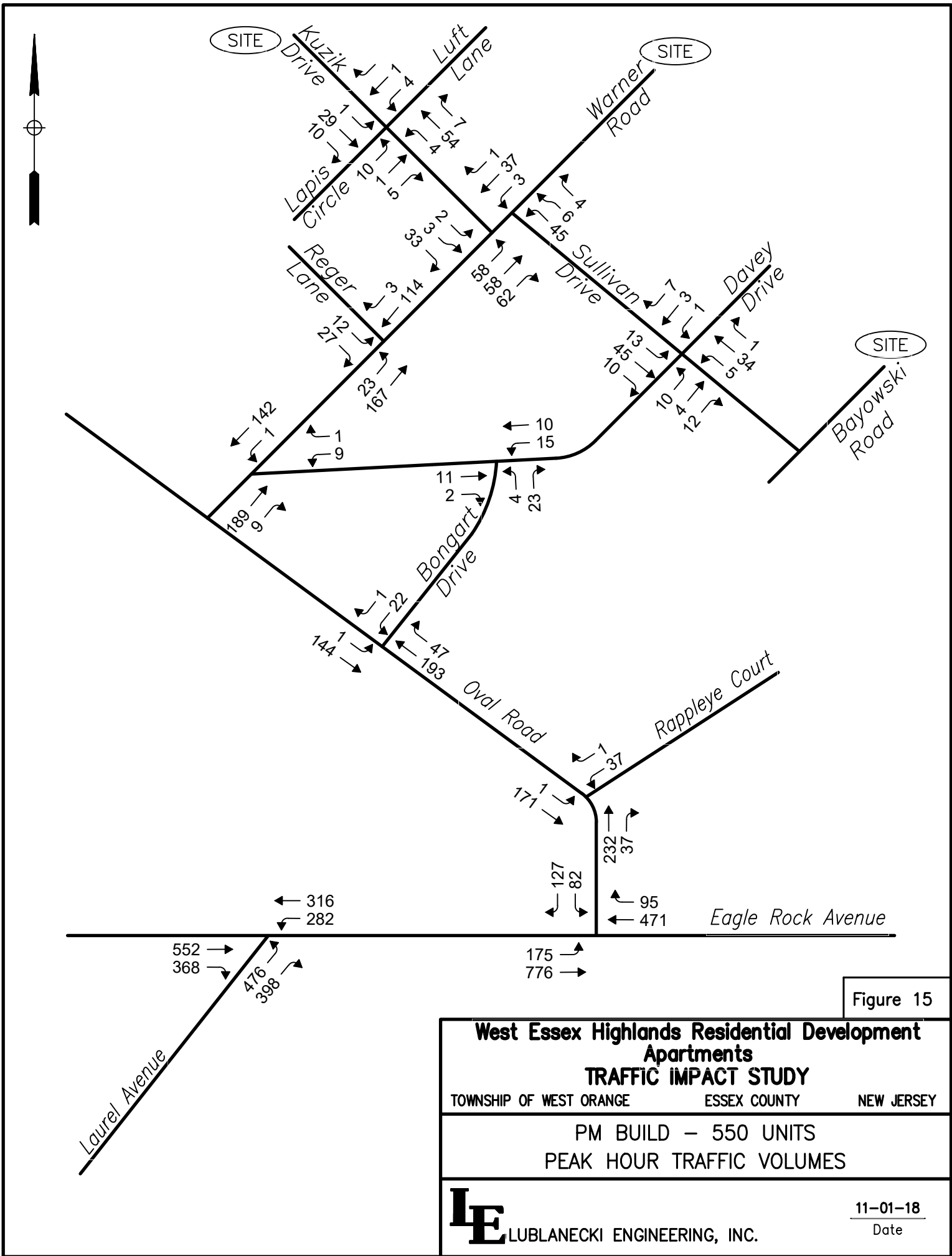
NEW JERSEY

AM BUILD – 550 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18
Date



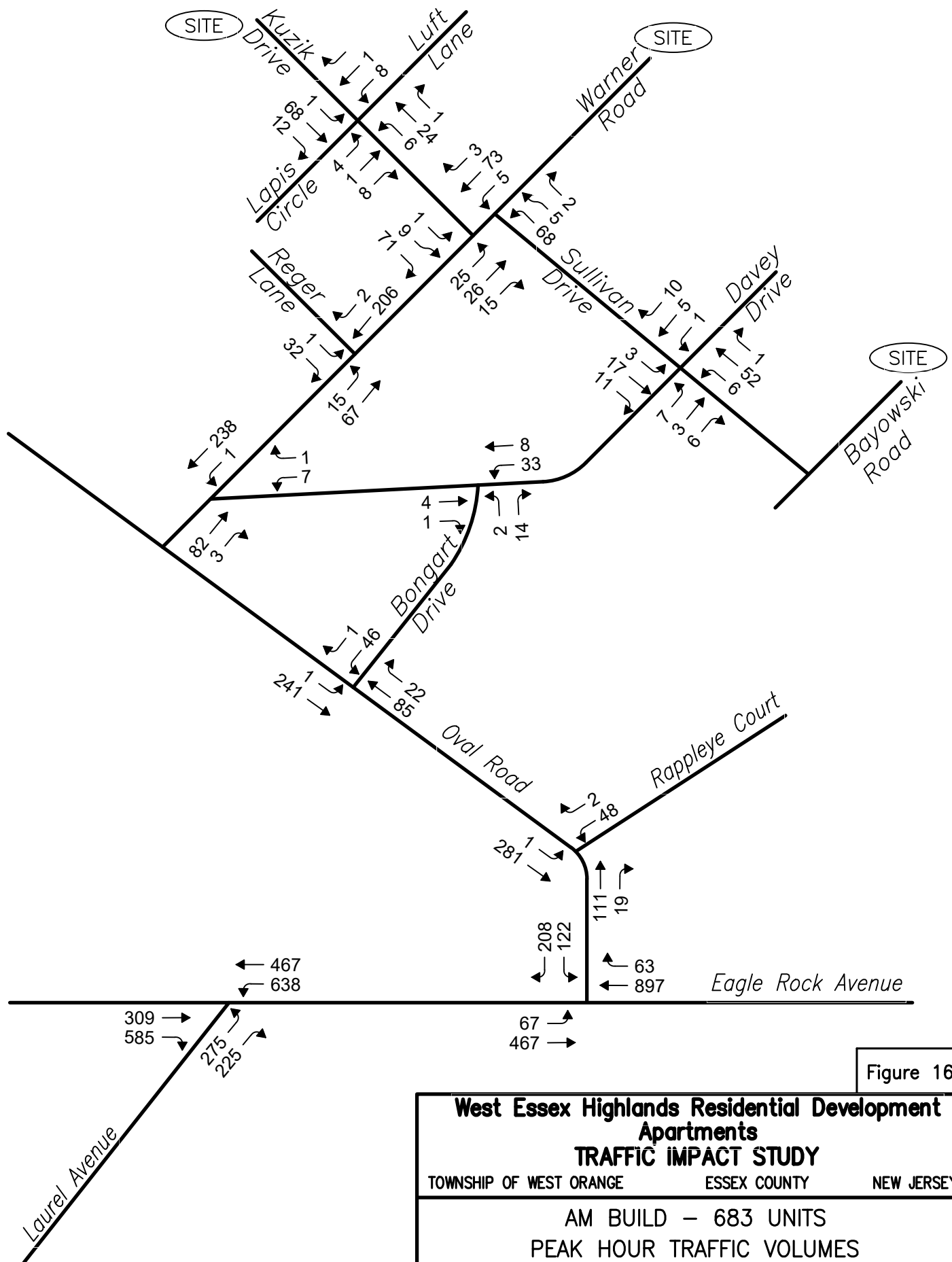


Figure 16

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

AM BUILD – 683 UNITS
PEAK HOUR TRAFFIC VOLUMES



LUBLANECKI ENGINEERING, INC.

11-01-18

Date

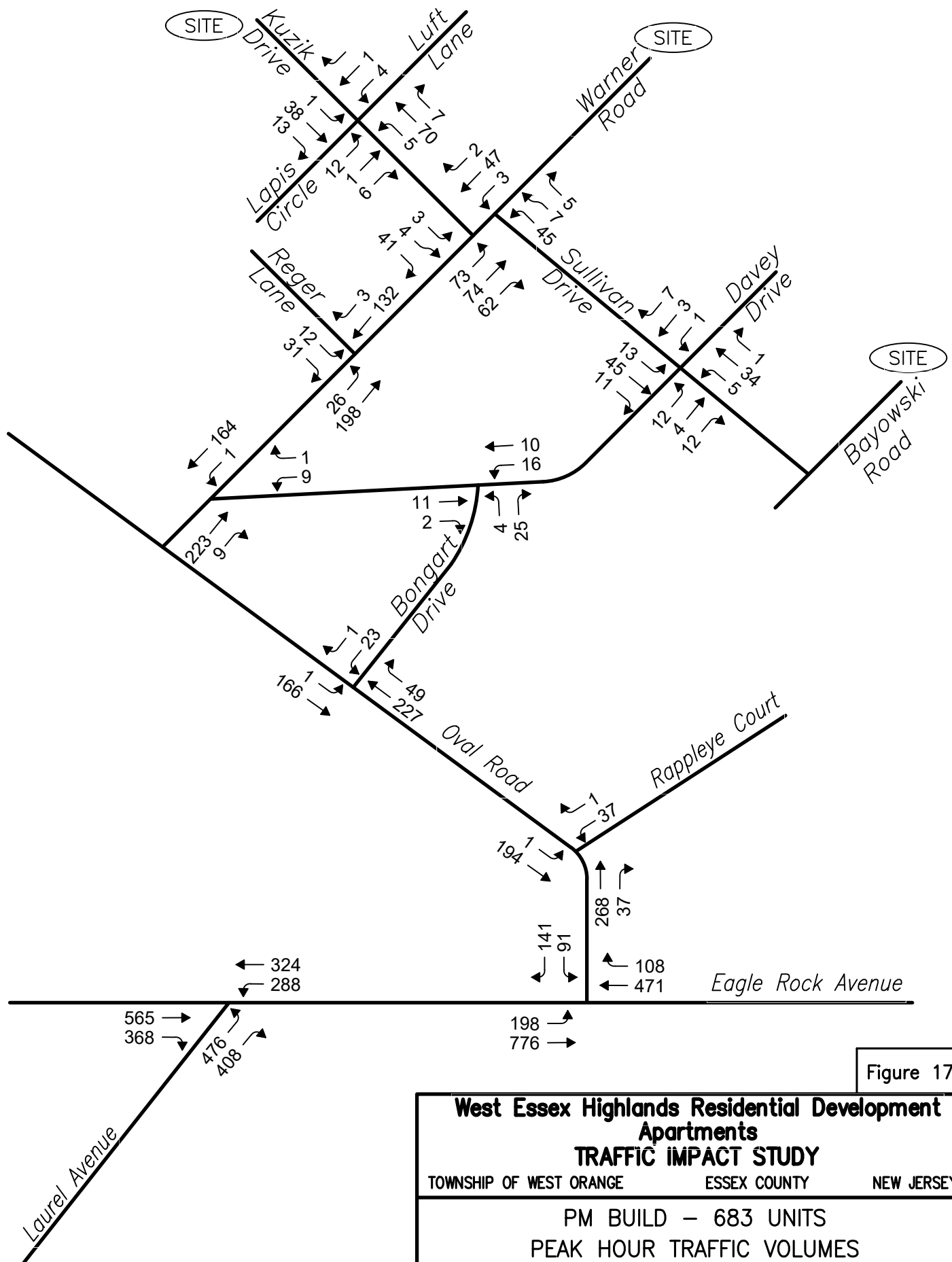


Figure 17

West Essex Highlands Residential Development Apartments		
TRAFFIC IMPACT STUDY		
TOWNSHIP OF WEST ORANGE	ESSEX COUNTY	NEW JERSEY
PM BUILD – 683 UNITS		
PEAK HOUR TRAFFIC VOLUMES		
 LUBLANECKI ENGINEERING, INC.		11-01-18 Date



Figure 18

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE ESSEX COUNTY NEW JERSEY

INTERSECTION SIGHT DISTANCE
BONGART DR APPROACH AT OVAL RD
TO THE SOUTH

LE LUBLANECKI ENGINEERING, INC.

11-01-18
Date

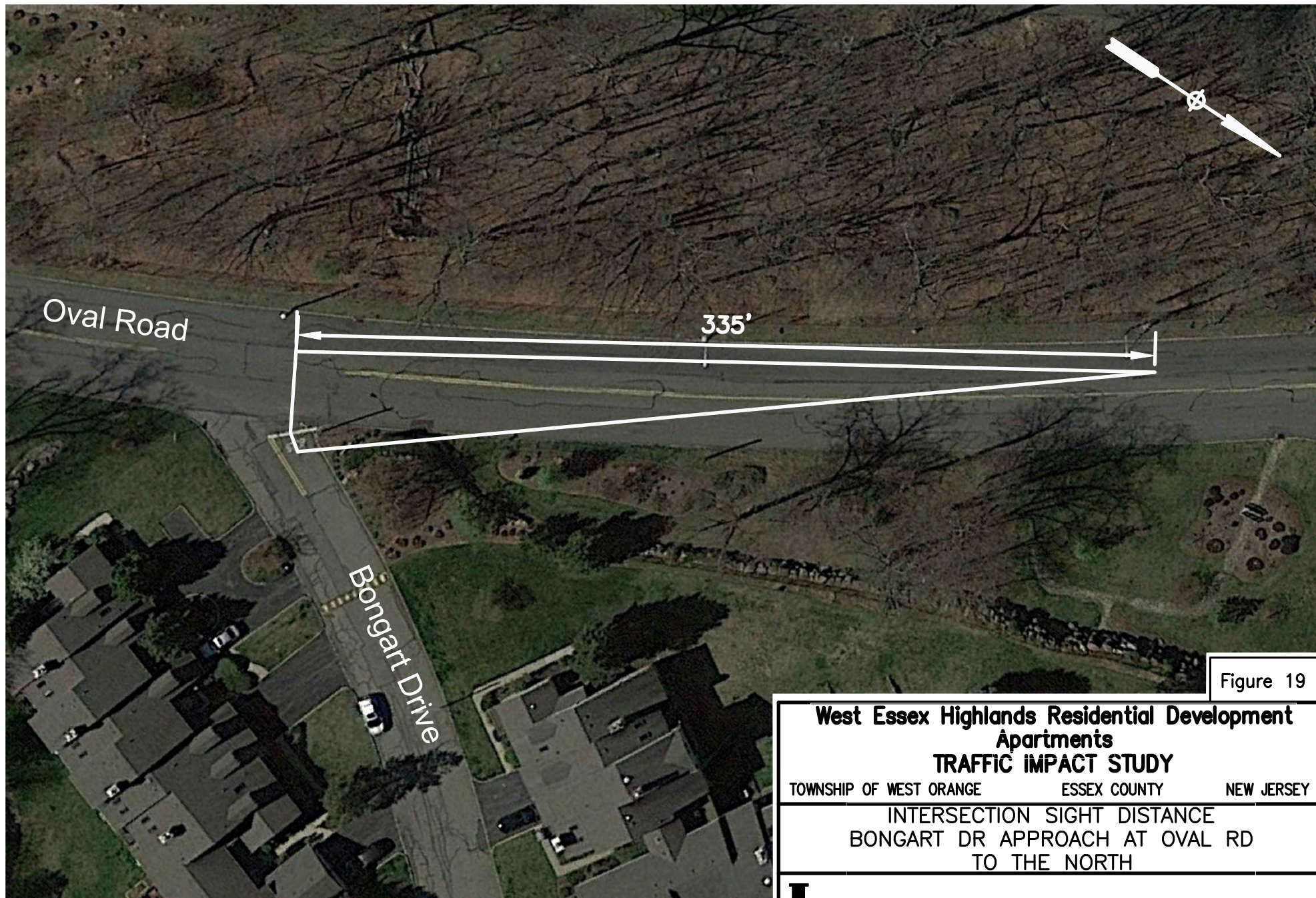


Figure 19

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

INTERSECTION SIGHT DISTANCE
BONGART DR APPROACH AT OVAL RD
TO THE NORTH

LE LUBLANECKI ENGINEERING, INC.

11-01-18
Date

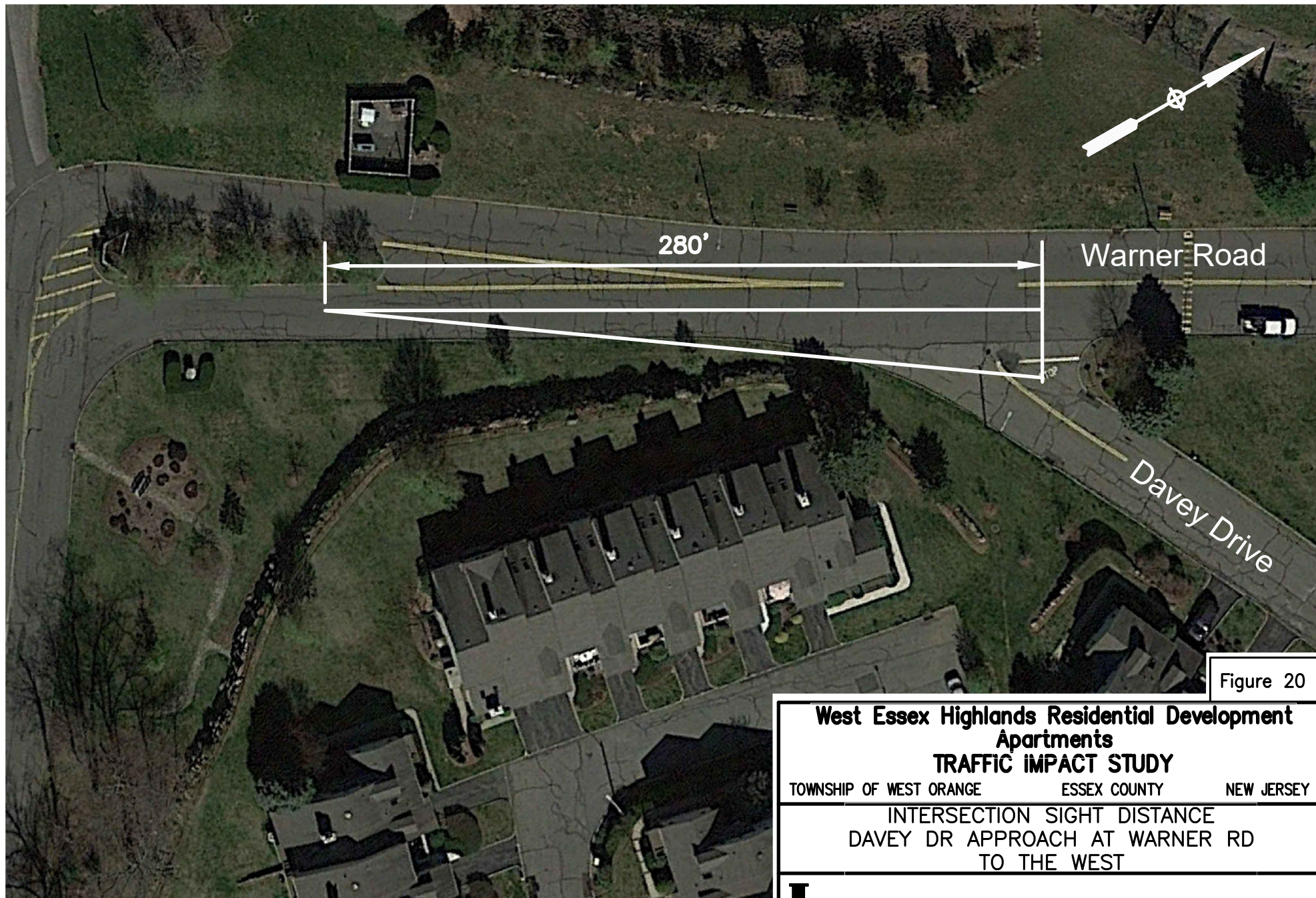


Figure 20

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

INTERSECTION SIGHT DISTANCE
DAVEY DR APPROACH AT WARNER RD
TO THE WEST

LE LUBLANECKI ENGINEERING, INC.

11-01-18
Date

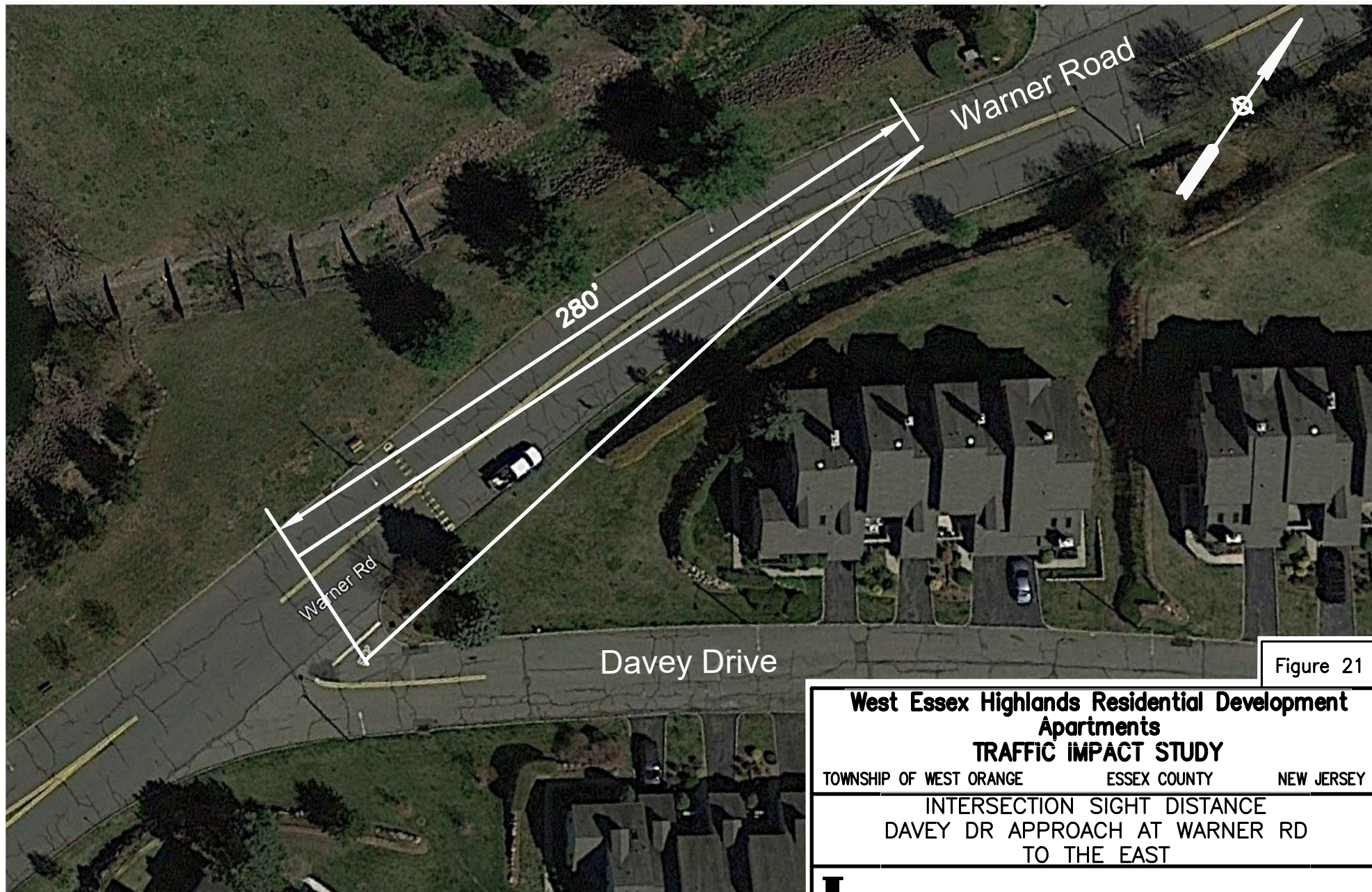


Figure 21

**West Essex Highlands Residential Development
Apartments
TRAFFIC IMPACT STUDY**

TOWNSHIP OF WEST ORANGE

ESSEX COUNTY

NEW JERSEY

INTERSECTION SIGHT DISTANCE
DAVEY DR APPROACH AT WARNER RD
TO THE EAST

LE LUBLANECKI ENGINEERING, INC.

11-01-18
Date