GHA GEWALT HAMILTON ASSOCIATES, INC.
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TRAFFIC SIGNAL WARRANT STUDY

To: Mr. John McHale
Bridge Street Properties

From: Dan Brinkman, P.E., PTOE
David Westergreen, EI

Date: October 29, 2024

Subject: Eola Preserve Townhomes
Eola Road at Waterstone Drive
Aurora, IL

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the existing traffic data, recent crash history, and the MUTCD criteria, it is our finding that the Waterstone Drive intersection with Eola Road does not meet the minimum criteria to warrant a traffic signal.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an intersection location map, while ***Exhibit 2*** provides an aerial map for intersection context. Pertinent comments include:

Eola Road

- Eola Road is a north-south Minor Arterial roadway under the jurisdiction of the DuPage County Division of Transportation.
- Eola Road provides two travel lanes in each direction with a wide (approximately 16-foot), landscaped median in the vicinity of the subject intersection.
- At the intersection with Waterstone Drive, a northbound left-turn lane is provided along Eola Road.
- Eola Road has a posted speed limit of 45 miles-per-hour (mph) in the intersection vicinity.
- The nearest traffic signal along Eola Road is located approximately 1,850 feet south of the subject intersection at Liberty Steet, and the nearest traffic signal north of the subject intersection is located approximately 2,700 feet north at Sheffer Road. These signals are part of a separate coordinated signal system.
- No street lighting is present along Eola Road, as well as at the subject intersection.
- The Annual Average Daily Traffic (AADT) volume along Eola Road is 48,000 vehicles per day as of 2017 traffic, obtained from IDOT's website: www.gettingaroundillinois.com – 2017 traffic is the last non-2020 daily traffic count taken along Eola Road.

Waterstone Drive

- Waterstone Drive is an east-west Local roadway under the jurisdiction of the City of Aurora
- Waterstone Drive provides one travel lane in each direction and has a posted speed limit of 25 mph.
- No historic AADT volume along Waterstone Drive is available from IDOT's website: www.gettingaroundillinois.com .

Traffic Volumes

GHA utilized turning movement counts provided by CEMCON, Ltd. that were completed on December 20, 2023.

Exhibit 3 tabulates the prime 4-hours (7:00 to 9:00 AM; 4:00 to 6:00 PM) of traffic count data. The traffic count summary sheets are included as ***Appendix A***.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as ***Exhibit 4***.

Traffic generated by the proposed development was calculated using the 11th Edition of the Institute of Transportation Engineers (ITE) manual *Trip Generation.* Daily trips for the proposed 54-unit development were estimated and distributed to the Waterstone Drive approach to Eola Road based on the estimated hourly distribution for the land use. Recall that because of the planned right-out only access to be constructed, only left turning traffic from the proposed development was assigned to Waterstone Drive. Excerpts from the ITE manual are included in ***Appendix B.***

The proposed development trips are tabulated in ***Exhibit 5.***

Because Waterstone Drive is proposed to provide a designated right turn lane, approach volumes along Waterstone Drive were initially reduced by 60 percent in accordance with lane configuration #2 in Part 1 of Pagones' Theorem. The RTOR reduction was further adjusted based on through traffic volumes along Eola Road in accordance with Part 2 of Pagones' Theorem. For the purpose of our analysis, it is assumed that the observed southbound through volumes are evenly split between the two lanes. Right turn volumes were ultimately reduced by between 10 and 40 percent. These volumes and adjusted volumes are tabulated in ***Exhibit 6***.

Warrant Analyses

For the purpose of this analysis, GHA reviewed all available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). The volume requirements were reduced, when necessary, based on the MUTCD guidelines. Each of the nine available warrants and their results are discussed below.

As only four hours of data was collected during the December 2023 counts we made two assumptions: 1) total through volume on Eola Road was at least 1,000 vehicles per hour between 7:00 am and 7:00 pm and 2) that Waterstone approach volumes were never higher than 16, which was the lowest of the observed four hour counts, throughout the day.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the proposed lane configuration at the Eola Road at Waterstone Drive intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as ***Exhibit 7*** is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection and posted speed limit along Eola Road, the minimum major street (Eola Road) volumes are 420 and 630 vehicles per hour respectively for Condition A and Condition B. Similarly, the minimum minor street (Waterstone Drive) volumes are 140 and 70 vehicles per hour during the same hour.

Condition A is currently not met for any hour of the day, Condition B is currently not met for any hour of the day. This warrant is not satisfied.

Warrant #2 – Four Hour Volume

Exhibit 8 presents Figure 4C-2 from the MUTCD, which was utilized to determine if the Four-Hour Warrant was met. As can be seen, based on the intersection geometrics, the minimal volume threshold for the minor street is 80 vehicles per hour. The minor street volumes did not meet this requirement at any hour throughout the day. Therefore, this warrant is not satisfied.

Warrant #3 – Peak Hour Volume

Exhibit 9 presents Figure 4C-4 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. As can be seen, based on the intersection geometrics, the minimal volume threshold for the minor street is 100 vehicles in an hour. This volume threshold is not met at any hour throughout the day. Therefore, this warrant is not satisfied.

Warrant #4 – Pedestrian Volume

Exhibit 10 presents Figure 4C-6 from the MUTCD which was utilized to determine if Warrant 4, Pedestrian Volume was met. Based on the intersection location, pedestrians are not expected to be crossing Eola Road, and no pedestrian data was included in the December 2023 counts. As such, this warrant was not met.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. No school is located along Eola Road in the vicinity of the Waterstone Drive intersection. Accordingly, this warrant was not considered.

Warrant #6 – Coordinated Signal System

The need for progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals to maintain proper platooning of vehicles. There is already a coordinated signal system along Eola Road. In the Traffic Impact Study completed for the development we conducted a Gap Study as requested by DuPage County. In that study we determined that sufficient gaps exist in through traffic on Eola for the anticipated number of left turns to be made leaving Waterstone Drive. While some left-turn movements will need to be made in two stages, sufficient gaps exist. Ultimately a decision on this warrant will have to be made by DuPage County. We feel that this warrant is not met.

Warrant #7 – Crash Experience

When the frequency and severity of angle and pedestrian crashes are experienced over a One- or Three-Year period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that traffic volume criteria (80% of one of the Warrant #1 8-hour conditions) or Pedestrian volume (80% of the Warrant #4 criteria) must also be met. ***Exhibit 11*** presents tables 4C-4 and 4C-5 which establish the crash history requirements for the intersection configuration.

Crash data from was obtained from the IDOT Bureau of Safety in Springfield. ***Table 1*** summarizes the five-year crash history at the intersection.

Table 1 2019-2023 Crash Data[A]

Location	No. Of Crashes	Severity[B]																		Percent During Wet/Icy Conditions
		PD	PI[C]			F	A	AN	FO	FTF	FTR	ONC	OO	OT	PMV	SOD	SSD	T		
			A	B	C															
Intersections - Crashes within 300' of intersection																				
Eola Road at Waterstone Drive	26	21	-	3	2	-	-	1	4	1	14	-	-	1	-	-	5	-		42%
Total (2019-23)	**26**	**21**	**0**	**3**	**2**	**0**	**0**	**1**	**4**	**1**	**14**	**0**	**0**	**1**	**0**	**0**	**5**	**0**		**42%**

[A] Source: IDOT Division of Transportation Safety for the 2019-2023 calendar years.

[B] PD = property damage only; PI = personal injury; F = fatality.

[C] Type A (incapacitating injury); Type B (non-incapacitating injury); Type C (possible injury).

[D] A = Angle; AN = Animal; FO = Fixed Object; FTF = Front to Front; FTR = Front to Rear; ONC = Other, Non Collision; OO = Other Object; OT = Overturned; PMV = Parked Motor Vehicle; SOD = Sideswipe, Opposide Direction; SSD = Sideswipe, Same Direction; T = Turning

As can be seen, 26 crashes occurred during the five-year analysis period, which is an average of around five (5) crashes per year. No turning or angle type crashes were reported over the five-year period. No Pedestrian or Bicyclist crashes were reported, and no Fatal crashes were reported. Accordingly, this warrant is not currently met.

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Warrant Summary

Exhibit 12 provides a detailed review of the various MUTCD warrants described and discussed above. Currently, the estimated future volumes as well as the crash history at Eola Road at Waterstone Drive do not meet any of the published warrants.

Part V. Conclusions & Recommendations

A signal warrant study was conducted for the intersection of Eola Road and Waterstone Drive in Aurora, Illinois. Based on the MUTCD criteria, a traffic signal is not warranted at the intersection at this time.

Part VI. Technical Addendum

The following *Exhibits* and *Appendices* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

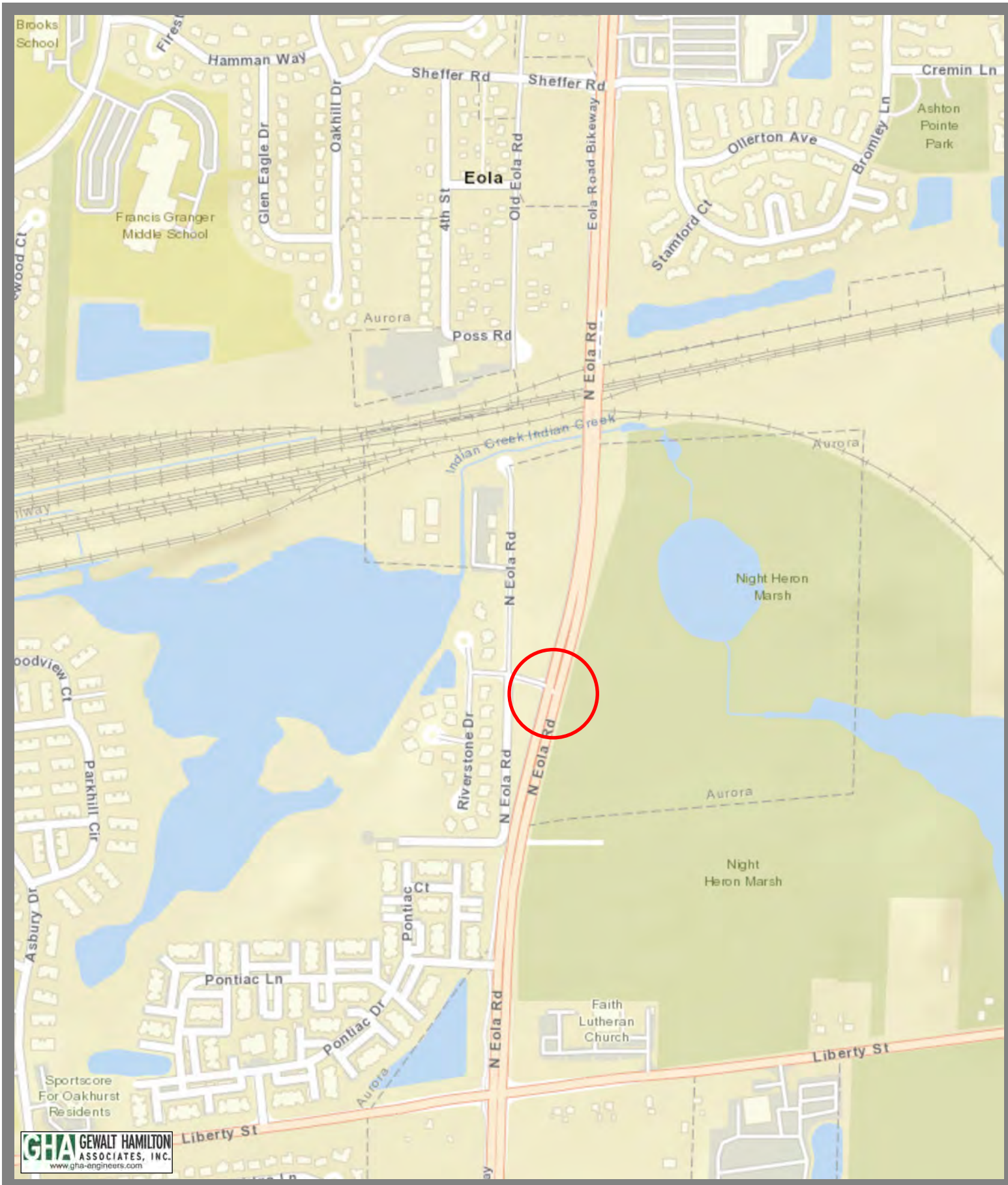
Exhibits

1. Location Map
2. Intersection Context
3. Existing Traffic Volumes
4. Analysis Parameters – "Pagones' Theorem"
5. Development Traffic
6. Warrant Volumes
7. Eight Hour Traffic Signal Warrant Requirements
8. Four Hour Signal Warrant Test
9. Peak Hour Signal Warrant Test
10. Pedestrian Signal Warrant Test
11. Crash History Signal Warrant Test
12. Signal Warrant Review Sheet

Appendices

A. Traffic Count Summary Sheets
B. ITE Trip Generation manual excerpts

6101.900 Eola Road at Waterstone Drive Traffic Signal Warrant.docx



N

1 inch = 750 Feet

Exhibit 1 - Location Map

Eola Road at Waterstone Drive
Aurora, IL

Map Center: 88.24248°W 41.77208°N

N

1 inch = 100 Feet

Exhibit 2 - Intersection Context

Eola Road at Waterstone Drive
Aurora, IL

Map Center: 88.24168°W 41.7716°N

Exhibit 3
Existing Traffic Volumes
Proposed Eola Preserve Townhomes

Intersection Eola Road at Waterstone Court **Municipality** Aurora **Count Date**
County DuPage

	Major Street = Eola Road									Minor Street = Waterstone Court				
	Northbound		Eola Road		Southbound		Eola Road		Major Street	Eastbound		Waterstone Ct		Intersection Total
Hour Beginning	Left	Thru	Right	Subtotal	Left	Thru	Right	Subtotal	Total	Left	Thru	Right	Subtotal	Volumes
	1	2	3	4	5	6	7	8	9=4+8	10	11	12	13	19=9+13
7:00 AM	2	1,815	0	1,817	0	1,175	4	1,179	2,996	9	0	3	12	2,996
8:00 AM	3	1,527	0	1,530	0	1,138	3	1,141	2,671	6	0	6	12	2,683
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	12
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	8	1,620	0	1,628	0	2,249	6	2,255	3,883	5	0	6	11	3,894
5:00 PM	3	1,484	0	1,487	0	2,109	5	2,114	3,601	4	0	7	11	3,612
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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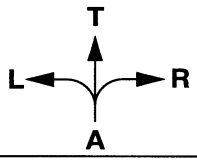
Exhibit 4

Analysis Parameters – "Pagone's Theorem"

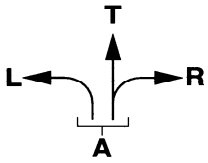
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A ; 0.7A ≥ R > 0.35A ; R ≤ 0.35A } THEN { reduce R by 60% ; reduce R by 40% ; reduce R by 20% }

2



IF { R > 3T ; 3T ≥ R > T/3 ; R ≤ T/3 } THEN { reduce R by 60% ; reduce R by 40% ; reduce R by 20% }

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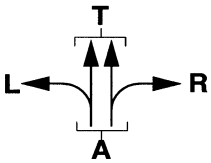
3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

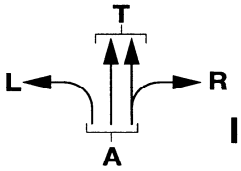
Reduce R by 75% in all cases.

4



IF { R > (T + L) ; L > (T + R) ; L ≈ T ≈ R (±10 veh.) ; L ≈ T > 3R ; R ≈ T > 3L ; all other cases } THEN { reduce R by 65% ; use situation 2 ; reduce R by 40% ; reduce R by 20% ; reduce R by 50% ; reduce R by 30% }

5



IF { R > T ; T ≥ R > T/2 ; T/2 ≥ R > T/4 ; R ≤ T/4 } THEN { reduce R by 75% ; reduce R by 50% ; reduce R by 30% ; reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 5
Trip Assignments By Development Component
Eola Road at Waterstone Court
Proposed Eola Preserve Townhomes

MINOR APPROACH 1

Hour	DEVELOPMENT Trips			
Beginning	Left	Thru	Right	Subtotal
	1	2	3	4
7:00 AM	15	0	0	15
8:00 AM	15	0	0	15
9:00 AM	9	0	0	9
10:00 AM	5	0	0	5
11:00 AM	5	0	0	5
12:00 PM	5	0	0	5
1:00 PM	4	0	0	4
2:00 PM	5	0	0	5
3:00 PM	5	0	0	5
4:00 PM	7	0	0	7
5:00 PM	7	0	0	7
6:00 PM	8	0	0	8
7:00 PM	7	0	0	7

Projected Left turn volumes by hour

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Exhibit 6
Warrant Volumes
Eola Road at Waterstone Court
Proposed Eola Preserve Townhomes

Eastbound Approach

Hour	Existing Trips From Exhibit 3			Sum of Trips From Exhibit 5				RTOR	Warrant Traffic			
Beginning	Left	Thru	Right	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Adj. Right	Total
	1	2	3	4	5	6	7	8	9	10	11	12
7:00 AM	9	0	3	15	0	3	30	50%	24	0	3	27
8:00 AM	6	0	6	15	0	6	33	50%	21	0	6	27
9:00 AM	0	0	0	9	0	0	9	60%	9	0	0	9
10:00 AM	0	0	0	5	0	0	5	60%	5	0	0	5
11:00 AM	0	0	0	5	0	0	5	60%	5	0	0	5
12:00 PM	0	0	0	5	0	0	5	60%	5	0	0	5
1:00 PM	0	0	0	4	0	0	4	60%	4	0	0	4
2:00 PM	0	0	0	5	0	0	5	60%	5	0	0	5
3:00 PM	0	0	0	5	0	0	5	60%	5	0	0	5
4:00 PM	5	0	6	7	0	6	24	20%	12	0	10	22
5:00 PM	4	0	7	7	0	7	25	25%	11	0	11	22
6:00 PM	0	0	0	8	0	0	8	60%	8	0	0	8
7:00 PM	0	0	0	7	0	0	7	60%	7	0	0	7

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Exhibit 7

Eight Hour Traffic Signal Warrant Requirements

Proposed Eola Preserve Townhomes

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Eola Road meets minimum volume requriements (600 vph or 900 vph) but Waterstone does not meet even 1 hour at 100 vph and 8 are required

Major Street Eola Road **Number of Lanes** 2

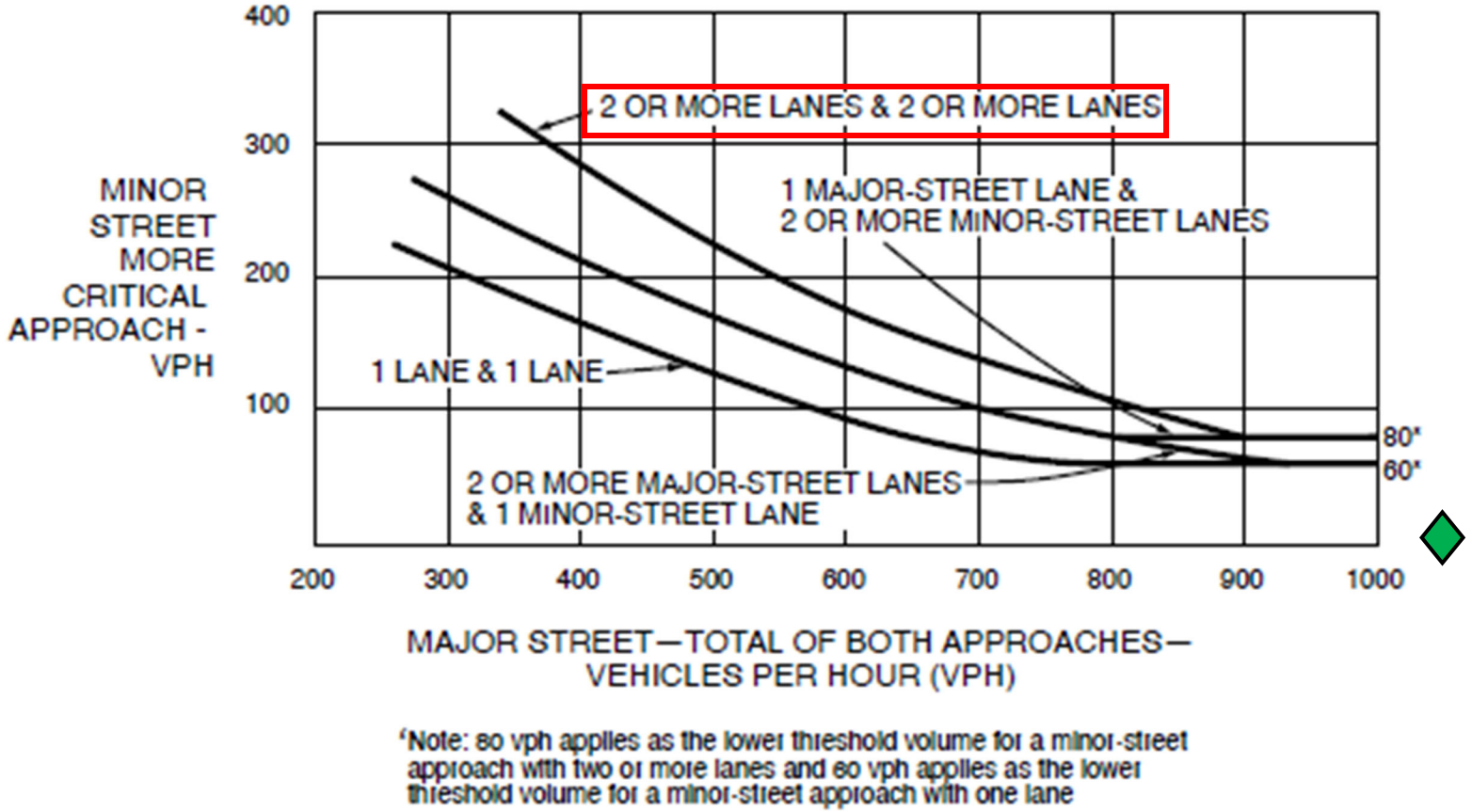
Minor Street Waterstone Court **Number of Lanes** 2

Exhibit 8

Four Hour Traffic Signal Warrant Test

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane

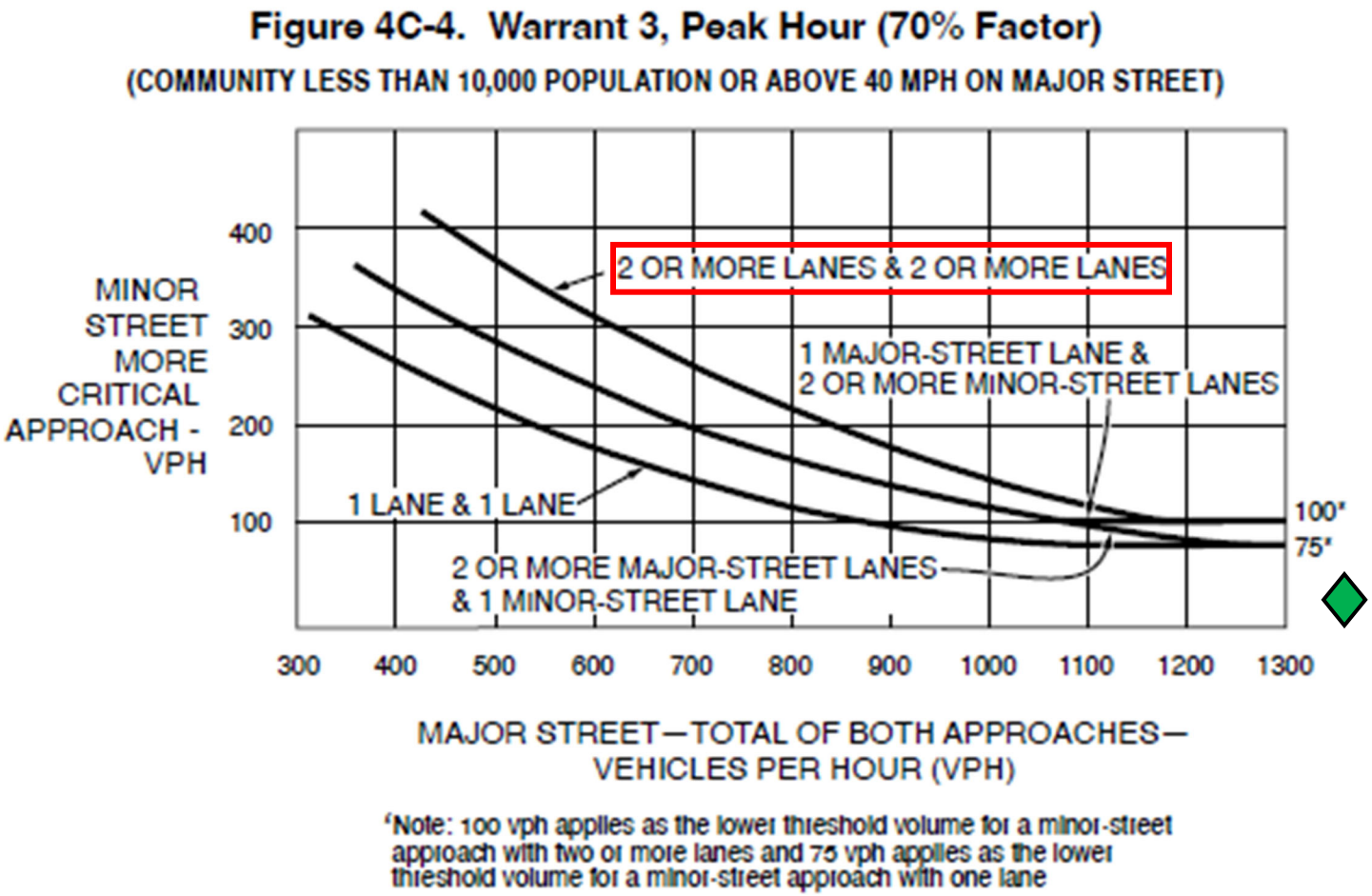
Discussion Eola Road meets minimum volume requirements. Waterstone Drive peak volume after development is 27 vph and a minimum of 80 vph for 4 hours is required.

Volumes

- Major Street – Eola Road = 2,996 VPH (7:00 AM)
- Minor Street – Waterstone Drive = 27 VPH (7:00 AM)
  Intersection Volume requirements met for 0 hours.

Exhibit 9

Traffic Signal Warrant Test



Discussion

- Focus on Weekday Morning Peak Hour, because intersection minor street approach values are highest at that time.

Volumes

- Major Street – Eola Road = 2,996 VPH (7:00 AM)
- Minor Street – Waterstone Drive = 27 VPH (7:00 AM)

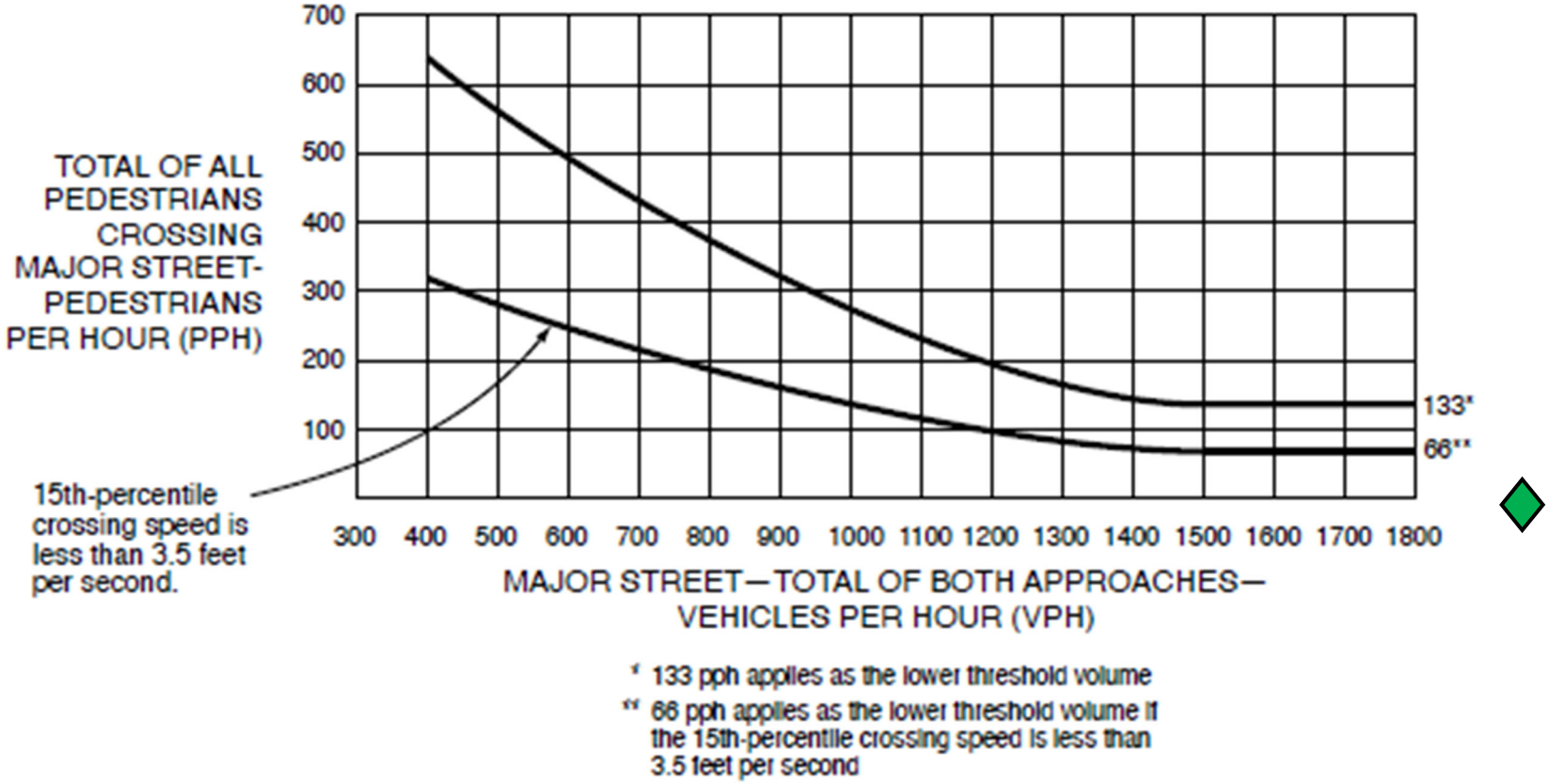
Result

- Intersection volume does **not** meet Warrant #3 Peak Hour

Exhibit 10

Traffic Signal Warrant Test

Figure 4C-6. Warrant 4, Pedestrian Peak Hour



Discussion

- Focus on Weekday Evening Peak Hour, because intersection major street approach values are highest at that time.

Volumes

- Major Street – Eola Road = 3,883 VPH
- Pedestrian Volume = 0 Pedestrians

Result

- Intersection volume does **not** meet Warrant #4 Peak Hour Pedestrian Volume

Exhibit 11
Traffic Signal Warrant Test

Table 4C-4. Minimum Number of Reported Crashes in a One-Year Period

Community less than 10,000 population or above 40 mph on major street					
Number of through lanes on each approach		Total of angle and pedestrian crashes (all severities)[a]		Total of fatal-and-injury angle and pedestrian crashes[a]	
Major Street	Minor Street	Four Legs	Three Legs	Four Legs	Three Legs
1	1	4	3	3	3
2 or more	1	10	9	6	6
2 or more	2 or more	10	9	6	6
1	2 or more	4	3	3	3

[a] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street

Table 4C-5. Minimum Number of Reported Crashes in a Three-Year Period

Community less than 10,000 population or above 40 mph on major street					
Number of through lanes on each approach		Total of angle and pedestrian crashes (all severities)[a]		Total of fatal-and-injury angle and pedestrian crashes[a]	
Major Street	Minor Street	Four Legs	Three Legs	Four Legs	Three Legs
1	1	6	5	4	4
2 or more	1	16	13	9	9
2 or more	2 or more	16	13	9	9
1	2 or more	6	5	4	4

[a] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street

Discussion

- Intersection has three legs
- Crash History for the years 2019-2023 was reviewed.

Crash History

- 0 Angle and Pedestrian Crashes One Year / 0 Fatal, Injury Angle and Pedestrian Crashes One Year
- 0 Angle and Pedestrian Crashes Three Years / 0 Fatal, Injury Angle and Pedestrian Crashes Three Years

Result

- Intersection volume does **not** meet Warrant #7 Crash History

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Exhibit 12
Signal Warrant Review Sheet
Source: Manual on Uniform Traffic Control Devices (MUTCD) 2024

Intersection: Eola Road at Waterstone Court **SRA:** Yes
Municipality: Aurora **County:** DuPage
Speed limit of major route: 45 MPH **Number of lanes for major approach:** 2

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	0						
7:00	2,996	27					
8:00	2,671	27					
9:00	0	9					
10:00	0	5					
11:00	0	5					
12:00	0	5					
1:00	0	4					
2:00	0	5					
3:00	0	5					
4:00	3,883	22					
5:00	3,601	22					
6:00	0	8					
7:00	0	7					
8:00	0	0					
		Hours Met:	0	0	0	0	0

Volume Requirements:

	Major	Minor				
1A	420	140	140	70	112	56
1B	630	70				

Review Information

Counts Used: CEMCON Ltd.
Count Date: 12/20/2023
Date Reviewed: DWW
Reviewed By: DPB

Comments

WARRANT 1	Yes	No
Warrant 1 is met if any of the following conditions are met:		
Condition A Minimum Vehicular Volume	Yes	No
Condition B Interruption of Continuous Traffic	Yes	No
Condition A/B Combination of Warrants	Yes	No
WARRANT 2 Four-Hour Volume	Yes	No
WARRANT 3 Peak-Hour Volume	Yes	No
WARRANT 4 Pedestrian Volume	Yes	No
WARRANT 5 School Crossing	Yes	No
WARRANT 6 Coordinated Signal	Yes	No
WARRANT 7 Accident Experience	Yes	No
WARRANT 8 Roadway Network	Yes	No
WARRANT 9 Intersection Near a Grade Crossing	Yes	No

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			
OVERALL ADJUSTMENT FACTOR =			
STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING			
D (clear storage distance) =			

GEWALT HAMILTON ASSOCIATES, INC.

Aurora, IL Weather: Cold and Dry 12/21/23
Eola Rd and Waterstone Drive 11:26:05
Wednesday December 20, 2023 Multi Unit Trucks Only

TEAPAC[Ver 9.50.02] - 60-Minute Volumes: by Movement

Int# 3 eola/waterstone/multi

Begin Time	N-Approach RT	N-Approach TH	N-Approach LT	E-Approach RT	E-Approach TH	E-Approach LT	S-Approach RT	S-Approach TH	S-Approach LT	W-Approach RT	W-Approach TH	W-Approach LT	Int Total
700	0	7	0	0	0	0	0	18	0	0	0	0	25
715	0	7	0	0	0	0	0	27	0	0	0	0	34
730	0	7	0	0	0	0	0	27	0	0	0	0	34
745	0	12	0	0	0	0	0	30	1	1	0	0	44
800	0	15	0	0	0	0	0	26	1	1	0	0	43
815	0	13	0	0	0	0	0	16	1	1	0	0	31*
830	0	11	0	0	0	0	0	13	1	1	0	0	26*
845	0	6	0	0	0	0	0	6	0	0	0	0	12*
1600	1	14	0	0	0	0	0	11	0	0	0	0	26
1615	1	15	0	0	0	0	0	7	0	0	0	0	23
1630	1	14	0	0	0	0	0	7	0	0	0	1	23
1645	0	11	0	0	0	0	0	9	0	0	0	1	21
1700	0	6	0	0	0	0	0	13	0	0	0	1	20
1715	0	3	0	0	0	0	0	13	0	0	0	1	17*
1730	0	2	0	0	0	0	0	11	0	0	0	0	13*
1745	0	0	0	0	0	0	0	4	0	0	0	0	4*

TEAPAC[Ver 9.50.02] - 60-Minute Volumes: Appr/Exit Totals

Int# 3 eola/waterstone/multi

Begin Time	Approach Totals N	Approach Totals E	Approach Totals S	Approach Totals W	Exit Totals N	Exit Totals E	Exit Totals S	Exit Totals W	Int Total
700	7	0	18	0	18	0	7	0	25
715	7	0	27	0	27	0	7	0	34
730	7	0	27	0	27	0	7	0	34
745	12	0	31	1	30	0	13	1	44
800	15	0	27	1	26	0	16	1	43
815	13	0	17	1	16	0	14	1	31*
830	11	0	14	1	13	0	12	1	26*
845	6	0	6	0	6	0	6	0	12*
1600	15	0	11	0	11	0	14	1	26
1615	16	0	7	0	7	0	15	1	23
1630	15	0	7	1	8	0	14	1	23
1645	11	0	9	1	10	0	11	0	21
1700	6	0	13	1	14	0	6	0	20
1715	3	0	13	1	14	0	3	0	17*
1730	2	0	11	0	11	0	2	0	13*
1745	0	0	4	0	4	0	0	0	4*

Aurora, IL Weather: Cold and Dry 12/21/23
Eola Rd and Waterstone Drive 11:23:34
Wednesday December 20, 2023 Single Unit Trucks Only

TEAPAC[Ver 9.50.02] - 60-Minute Volumes: by Movement

Int# 2 eola/waterstone/single

Begin Time	N-Approach RT	N-Approach TH	N-Approach LT	E-Approach RT	E-Approach TH	E-Approach LT	S-Approach RT	S-Approach TH	S-Approach LT	W-Approach RT	W-Approach TH	W-Approach LT	Int Total
700	0	18	0	0	0	0	0	9	0	1	0	1	29
715	1	23	0	0	0	0	0	13	0	0	0	1	38
730	1	29	0	0	0	0	0	15	0	0	0	0	45
745	1	34	0	0	0	0	0	18	0	0	0	0	53
800	1	42	0	0	0	0	0	22	0	0	0	0	65
815	0	34	0	0	0	0	0	15	0	0	0	0	49*
830	0	23	0	0	0	0	0	10	0	0	0	0	33*
845	0	10	0	0	0	0	0	5	0	0	0	0	15*
1600	0	16	0	0	0	0	0	18	1	0	0	0	35
1615	0	19	0	0	0	0	0	17	1	0	0	0	37
1630	0	26	0	0	0	0	0	15	1	0	0	0	42
1645	0	23	0	0	0	0	0	16	1	0	0	0	40
1700	0	19	0	0	0	0	0	18	0	0	0	0	37
1715	0	16	0	0	0	0	0	12	0	0	0	0	28*
1730	0	7	0	0	0	0	0	10	0	0	0	0	17*
1745	0	3	0	0	0	0	0	6	0	0	0	0	9*

TEAPAC[Ver 9.50.02] - 60-Minute Volumes: Appr/Exit Totals

Int# 2 eola/waterstone/single

Begin Time	Approach Totals N	Approach Totals E	Approach Totals S	Approach Totals W	Exit Totals N	Exit Totals E	Exit Totals S	Exit Totals W	Int Total
700	18	0	9	2	10	0	19	0	29
715	24	0	13	1	14	0	23	1	38
730	30	0	15	0	15	0	29	1	45
745	35	0	18	0	18	0	34	1	53
800	43	0	22	0	22	0	42	1	65
815	34	0	15	0	15	0	34	0	49*
830	23	0	10	0	10	0	23	0	33*
845	10	0	5	0	5	0	10	0	15*
1600	16	0	19	0	18	0	16	1	35
1615	19	0	18	0	17	0	19	1	37
1630	26	0	16	0	15	0	26	1	42
1645	23	0	17	0	16	0	23	1	40
1700	19	0	18	0	18	0	19	0	37
1715	16	0	12	0	12	0	16	0	28*
1730	7	0	10	0	10	0	7	0	17*
1745	3	0	6	0	6	0	3	0	9*

Aurora, IL Weather: Cold and Dry 12/21/23
Eola Rd and Waterstone Drive 11:21:17
Wednesday December 20, 2023 Passenger Vehicles Only

TEAPAC[Ver 9.50.02] - 60-Minute Volumes: by Movement

Int# 1 eola/waterstone/cars

Begin Time	N-Approach RT	N-Approach TH	N-Approach LT	E-Approach RT	E-Approach TH	E-Approach LT	S-Approach RT	S-Approach TH	S-Approach LT	W-Approach RT	W-Approach TH	W-Approach LT	Int Total
700	3	1114	0	0	0	0	0	1679	0	2	0	8	2806
715	2	1139	0	0	0	0	0	1733	0	2	0	6	2882
730	2	1122	0	0	0	0	0	1767	1	1	0	6	2899
745	1	1088	0	0	0	0	0	1627	2	2	0	6	2726
800	3	1081	0	0	0	0	0	1479	2	5	0	6	2576
815	3	825	0	0	0	0	0	1065	2	5	0	6	1906*
830	2	582	0	0	0	0	0	691	1	5	0	4	1285*
845	2	298	0	0	0	0	0	346	0	4	0	2	652*
1600	4	2208	0	0	0	0	0	1591	7	6	0	4	3820
1615	5	2159	0	0	0	0	0	1551	5	6	0	3	3729
1630	3	2141	0	0	0	0	0	1489	3	4	0	5	3645
1645	5	2129	0	0	0	0	0	1540	2	4	0	4	3684
1700	5	2084	0	0	0	0	0	1453	3	7	0	3	3555
1715	3	1542	0	0	0	0	0	1074	3	4	0	3	2629*
1730	3	1015	0	0	0	0	0	709	2	4	0	1	1734*
1745	0	499	0	0	0	0	0	319	2	3	0	1	824*

TEAPAC[Ver 9.50.02] - 60-Minute Volumes: Appr/Exit Totals

Int# 1 eola/waterstone/cars

Begin Time	Approach Totals N	Approach Totals E	Approach Totals S	Approach Totals W	Exit Totals N	Exit Totals E	Exit Totals S	Exit Totals W	Int Total
700	1117	0	1679	10	1687	0	1116	3	2806
715	1141	0	1733	8	1739	0	1141	2	2882
730	1124	0	1768	7	1773	0	1123	3	2899
745	1089	0	1629	8	1633	0	1090	3	2726
800	1084	0	1481	11	1485	0	1086	5	2576
815	828	0	1067	11	1071	0	830	5	1906*
830	584	0	692	9	695	0	587	3	1285*
845	300	0	346	6	348	0	302	2	652*
1600	2212	0	1598	10	1595	0	2214	11	3820
1615	2164	0	1556	9	1554	0	2165	10	3729
1630	2144	0	1492	9	1494	0	2145	6	3645
1645	2134	0	1542	8	1544	0	2133	7	3684
1700	2089	0	1456	10	1456	0	2091	8	3555
1715	1545	0	1077	7	1077	0	1546	6	2629*
1730	1018	0	711	5	710	0	1019	5	1734*
1745	499	0	321	4	320	0	502	2	824*

Hourly Distribution of Entering and Exiting Vehicle Trips by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	220			220		
Land Use	Multifamily Housing (Low-Rise)			Multifamily Housing (Low-Rise)		
Subcategory	Not Close to Rail Transit			Close to Rail Transit		
Setting	General Urban/Suburban			General Urban/Suburban		
Time Period	Weekday			Weekday		
# Data Sites	6			1		
	% of 24-Hour Vehicle Trips			% of 24-Hour Vehicle Trips		
Time	Total	Entering	Exiting	Total	Entering	Exiting
12:00 - 1:00 AM	0.7%	0.9%	0.4%	0.4%	0.4%	0.3%
1:00 - 2:00 AM	0.4%	0.5%	0.3%	0.2%	0.1%	0.2%
2:00 - 3:00 AM	0.4%	0.4%	0.4%	0.1%	0.2%	0.0%
3:00 - 4:00 AM	0.4%	0.4%	0.3%	0.2%	0.1%	0.2%
4:00 - 5:00 AM	0.9%	0.3%	1.4%	0.2%	0.2%	0.1%
5:00 - 6:00 AM	1.6%	0.5%	2.6%	2.4%	0.9%	4.0%
6:00 - 7:00 AM	4.2%	1.4%	6.9%	4.4%	2.0%	6.7%
7:00 - 8:00 AM	6.5%	2.0%	10.8%	7.2%	4.2%	10.3%
8:00 - 9:00 AM	5.8%	3.1%	8.5%	5.2%	3.4%	6.9%
9:00 - 10:00 AM	3.9%	2.9%	4.9%	4.4%	3.1%	5.7%
10:00 - 11:00 AM	3.6%	2.4%	4.8%	3.9%	3.4%	4.4%
11:00 - 12:00 PM	4.3%	3.8%	4.7%	5.4%	6.4%	4.4%
12:00 - 1:00 PM	4.3%	4.5%	4.1%	6.1%	5.8%	6.5%
1:00 - 2:00 PM	4.2%	4.0%	4.4%	4.7%	4.1%	5.4%
2:00 - 3:00 PM	5.2%	5.6%	4.9%	6.8%	7.5%	6.1%
3:00 - 4:00 PM	6.1%	6.9%	5.3%	6.5%	7.6%	5.4%
4:00 - 5:00 PM	7.9%	10.1%	5.6%	9.5%	11.6%	7.5%
5:00 - 6:00 PM	9.5%	11.4%	7.6%	11.2%	13.5%	8.9%
6:00 - 7:00 PM	8.2%	9.7%	6.7%	7.2%	7.7%	6.6%
7:00 - 8:00 PM	6.4%	8.1%	4.7%	6.1%	7.5%	4.7%
8:00 - 9:00 PM	5.9%	7.7%	4.2%	3.2%	4.2%	2.2%
9:00 - 10:00 PM	4.4%	6.0%	2.7%	2.4%	3.3%	1.5%
10:00 - 11:00 PM	3.5%	4.7%	2.4%	1.3%	1.5%	1.0%
11:00 - 12:00 AM	1.9%	2.5%	1.4%	1.1%	1.2%	1.0%

Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

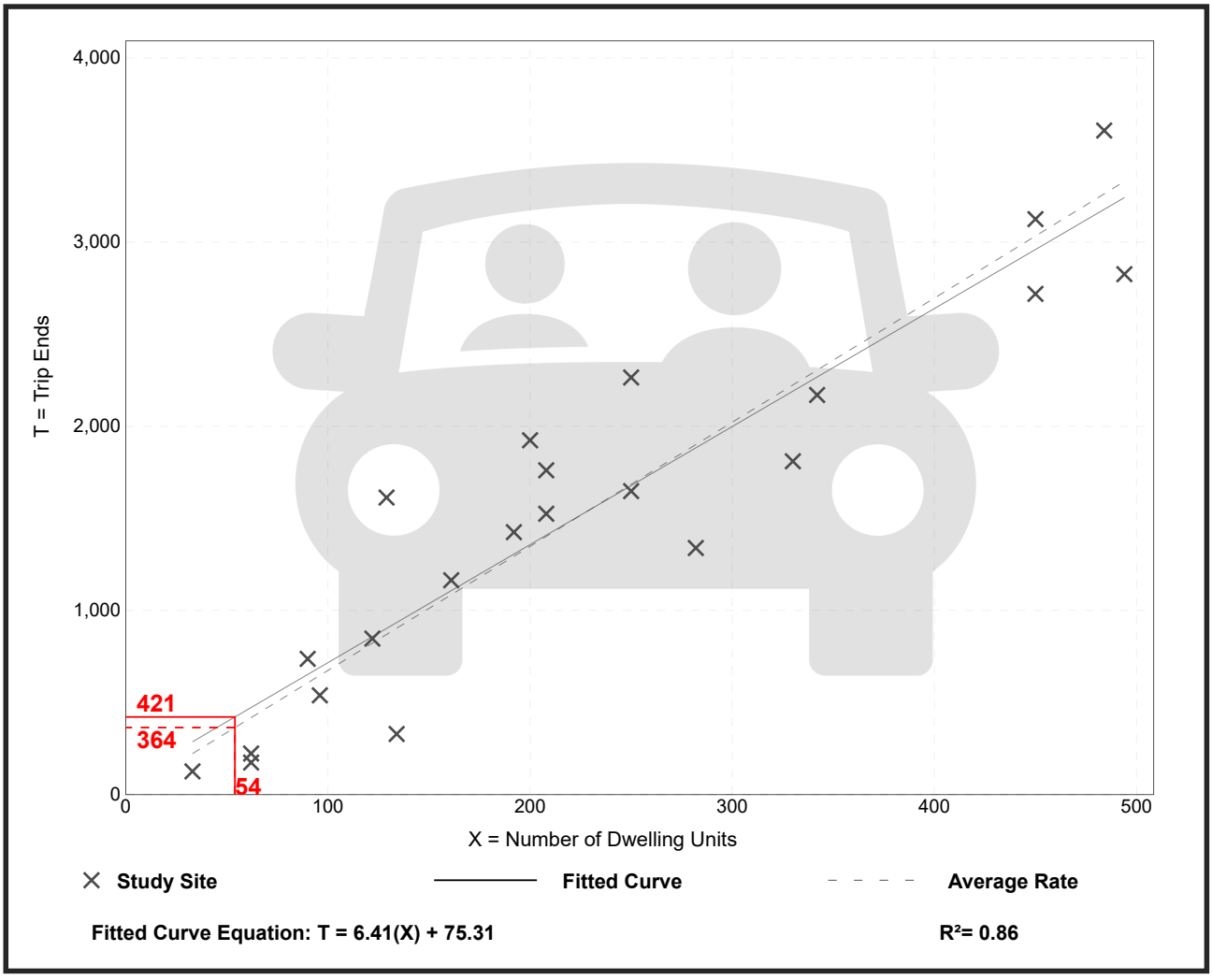
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 22
Avg. Num. of Dwelling Units: 229
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.74	2.46 - 12.50	1.79

Data Plot and Equation



Trip Gen Manual, 11th Edition ● Institute of Transportation Engineers