

Meijer Development

# Traffic Impact Study

E Aurora Road (SR 82), Northfield Center Township,  
Summit County, Ohio  
December 2020



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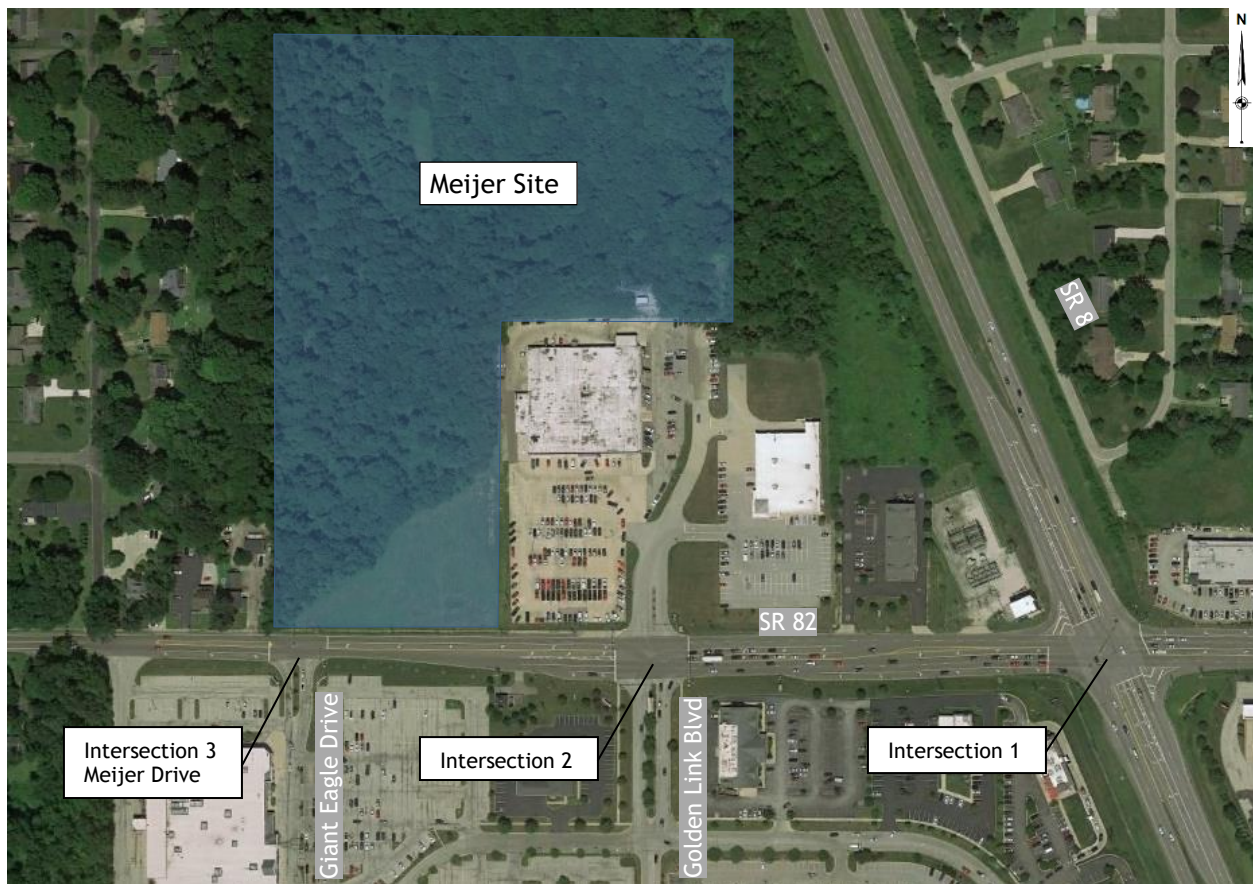
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SECTION 1 - EXECUTIVE SUMMARY

**Overall Summary and Recommendations**

A Traffic Impact Study (TIS) was required by the Ohio Department of Transportation (ODOT) to determine the off-site roadway impacts that the proposed Meijer Development will have on the adjacent roadway network.

The proposed Meijer Development consists of a 159,264 square feet Free-Standing Discount Superstore and 10 fueling position Gasoline/Service Station with Convenience Store. The site area, shown in Figure 1, is located on the north side of E Aurora Road (SR 82) at SR 8 in Northfield Center Township, Summit County, Ohio.



**Figure 1: Site Area, Source: Google Earth, N.T.S.**

The Meijer Development study area includes three (3) existing intersections and one (1) proposed access point (the fourth leg of an existing intersection) along E Aurora Road (SR 82). The intersections are numerically identified throughout this study as:

1. E Aurora Road (SR 82) and SR 8
2. E Aurora Road (SR 82) and Golden Link Boulevard
3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive



Based on the results of the traffic analyses, included in Section 5, the following roadway improvements are recommended. See **Appendix 2** for the preliminary roadway improvement schematic.

### **2023 Opening Year Meijer Build Improvements**

#### Intersection #1 - E Aurora Road (SR 82) and SR 8

1. Extend the southbound right turn lane to 350' (including 50' taper) and add an associated right turn overlap to the signal timing.
2. Construct an additional 300' (including 50' taper) eastbound left turn lane.
3. Extend the northbound dual left turn lanes to provide 550' (including 50' taper) of storage.

#### Intersection #2 - E Aurora Road (SR 82) and Golden Link Boulevard

4. Separate the northbound shared left/through lane into exclusive left and through lanes. Final northbound configuration will be a left turn lane, through lane, and right turn lane.
5. Separate the southbound shared left/through lane into exclusive left and through lanes and remove the side street split phasing. Align the northbound and southbound left turn lanes for the implementation of protected/permissive phasing for the side street turn lanes.
6. Construct a 225' (including 50' taper) westbound right turn lane.

#### Intersection #3 - E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive

7. Construct a 225' (including 50' taper) eastbound left turn lane.
8. Convert the eastbound right turn lane to a shared through/right lane.
9. Construct a 225' (including 50' taper) westbound right turn lane.
10. Construct an access driveway consisting of three (3) lanes: two (2) southbound egress lanes (left and a shared through/right) and one (1) ingress lane.

## SECTION 2 - INTRODUCTION

This Traffic Impact Study (TIS) was prepared for the proposed Meijer on the north side of E Aurora Road (SR 82) at SR 8 in Northfield Center Township, Summit County, Ohio. The Meijer Development study area includes three (3) existing intersections and one (1) proposed access point (the fourth leg of an existing intersection) along E Aurora Road (SR 82).

The study scenarios included within this TIS are the following:

- 2023 Opening Year No-Build (without Meijer traffic)
- 2023 Opening Year Meijer Build 1 (with Meijer traffic)
- 2023 Opening Year Meijer Build 2 (with Meijer traffic and improvements)
- 2043 Horizon Year No-Build (without Meijer traffic)
- 2043 Horizon Year Meijer Build 1 (with Meijer traffic)
- 2043 Opening Year Meijer Build 2 (with Meijer traffic and improvements)

The purpose of this document is to evaluate the current and future traffic conditions along the existing street network based on the anticipated traffic generated from the proposed development. Meijer, Inc. has retained Woolpert, Inc. to prepare this TIS to evaluate the efficiency of the existing roadway network with the addition of the proposed development.

### Scope of Work

A Memorandum of Understanding (MOU), dated September 16, 2019, was prepared to outline the scope for the traffic impact study. A copy of the MOU is included in **Appendix 9 (Correspondence)** for reference.

The scope of work for this study includes:

1. Conducted traffic counts for six (6) hours during the hours of 7-10 AM and 4-7 PM on a weekday (Tuesday through Thursday) and for three (3) hours on a Saturday at the following intersections (unless otherwise noted):
  - SR 8 and E Aurora Road (SR 82)
  - E Aurora Road (SR 82) and Giant Eagle Drive
  - E Aurora Road (SR 82) and Golden Link Boulevard
2. Contacted Akron Metropolitan Area Transportation Study for assistance in determining a growth rate. This growth rate was used to grow the traffic counts to the Opening Year (2023) and Horizon Year (2043).
3. Woolpert submitted a Certified Traffic submittal for volume approval.
4. Prepared trip generation for the Proposed Retail Development using the ITE's Trip Generation Manual, 10<sup>th</sup> edition. The average pass-by trip rates were utilized.
5. The directional distribution was based on the retail development's projected sales distribution.
6. Based on the directional distribution, the generated traffic volumes were assigned to the adjacent street network.
7. Turn lane warrants were not conducted. At signalized locations capacity analysis will determine the need for a turn lane.
8. Performed capacity analysis utilizing Highway Capacity Software (HCS) 7 and Synchro 10 at the three (3) existing intersections, listed in item 1 above. The studied scenarios consisted of the Weekday AM and PM and Saturday peak hours of the Opening Year No-Build (without Meijer traffic), Opening Year Build 1 (with Meijer traffic), Opening Year Build 2 (with Meijer traffic and improvements, Horizon Year No-Build (without Meijer Traffic), Horizon Year Build 1 (with Meijer traffic), and Horizon Year Build 2 (with Meijer traffic and improvements) Traffic Scenarios.
9. Turn lane queuing analysis was completed using ODOT L&D Volume 1 turn lane length methodology. Queuing analysis was performed to determine if projected queues will conflict with existing conditions. HCS and Synchro 95<sup>th</sup> percentile queues were also reported for comparison.
10. Based upon the analysis performed, recommendations were developed (if needed) to mitigate any traffic impacts that the Proposed Retail Development may have on the adjacent street



network. Recommendations will be presented according to the requirements outlined in ODOT's State Highway Access Management Manual (SHAMM) Section 9.46.

## References

1. Highway Capacity Manual, 6th Edition, Updated 2016, Transportation Research Board.
2. Trip Generation Manual, 10<sup>th</sup> Edition, Institute of Transportation Engineers' (ITE).
3. Highway Capacity Software 7.
4. Synchro 10
5. Traffic Access and Impact Studies for Site Development, Institute of Transportation Engineers' (ITE).
6. Ohio Manual on Uniform Traffic Control Devices (OMUTCD), 2012, Ohio Department of Transportation (ODOT).
7. ODOT Location and Design Manuals, 2019, Ohio Department of Transportation (ODOT).
8. State Highway Access Management Manual, Revised January 2020, Ohio Department of Transportation (ODOT).
9. Most recent concept plan prepared by Woolpert.

## SECTION 3 - EXISTING CONDITIONS

### Study Area

The Meijer Development site is located on the north side of E Aurora Road (SR 82) at SR 8 in Northfield Center Township, Summit County, Ohio. The proposed Meijer Development study area includes three (3) existing intersections and one (1) proposed access point (the fourth leg of an existing intersection) along E Aurora Road (SR 82). The land use in the study area consists primarily of commercial and retail development. The existing and proposed intersections are numerically identified throughout this study and shown in Figure 1 as:

1. E Aurora Road (SR 82) and SR 8
2. E Aurora Road (SR 82) and Golden Link Boulevard
3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive

### Roadway Network

Within the study area, E Aurora Road (SR 82) is a two-lane undivided east/west state-maintained roadway that bounds the site to the south. E Aurora Road (SR 82) is an urban minor arterial with a posted speed limit of 45 mph in the study area. Within Northfield Center Township, ODOT maintains SR 82; in the City of Macedonia, the roadway is city-maintained.

SR 8 is a four-lane divided north/south city-maintained roadway that bounds the site to the east. SR 8 is an urban minor arterial with a posted speed limit of 50 mph in the study area. The 2018 Annual Average Daily Traffic (AADT) for SR 8 was found to be 18,758 vehicles per day.

Information for the three existing signals at the study intersections is summarized in Table 1 below. Detailed signal timing is included in **Appendix 10** and was provided by Signal Services, via City of Macedonia.

**Table 1. Existing Signalized Intersection Information**

Intersection	Maintaining Agency	Coordination	Phasing	Timing
1. SR 8 and E Aurora Road (SR 82)	City of Macedonia	Coordinated with signal system east of study area	Protected + Permitted on EB/WB left turns, Protected Only on NB/SB left turns, Overlaps on EB/WB right turns	AM Cycle: 130 sec PM Cycle: 170 sec SAT Cycle: 170 sec
2. E Aurora Road (SR 82) and Golden Link Blvd	City of Macedonia	Coordinated with Int 3	Split phasing on NB/SB approaches. Protected + Permitted on EB left turn, Protected Only on WB left turn, Overlaps on NB/SB right turn and EB right turn	AM Cycle: 100 sec PM Cycle: 120 sec SAT Cycle: 100 sec
3. E Aurora Road (SR 82) and Giant Eagle Drive	City of Macedonia	Coordinated with Int 2	Protected + Permitted on WB left turn	





## Traffic Volumes

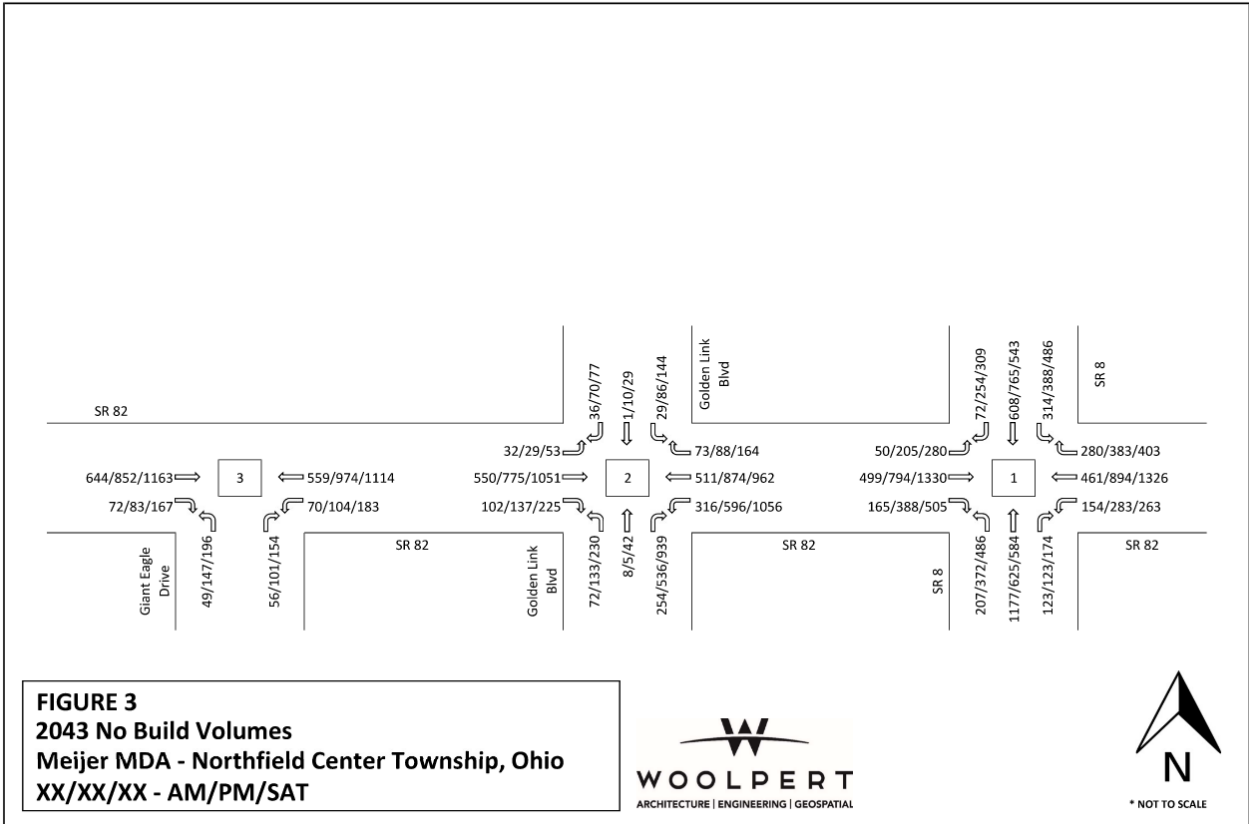
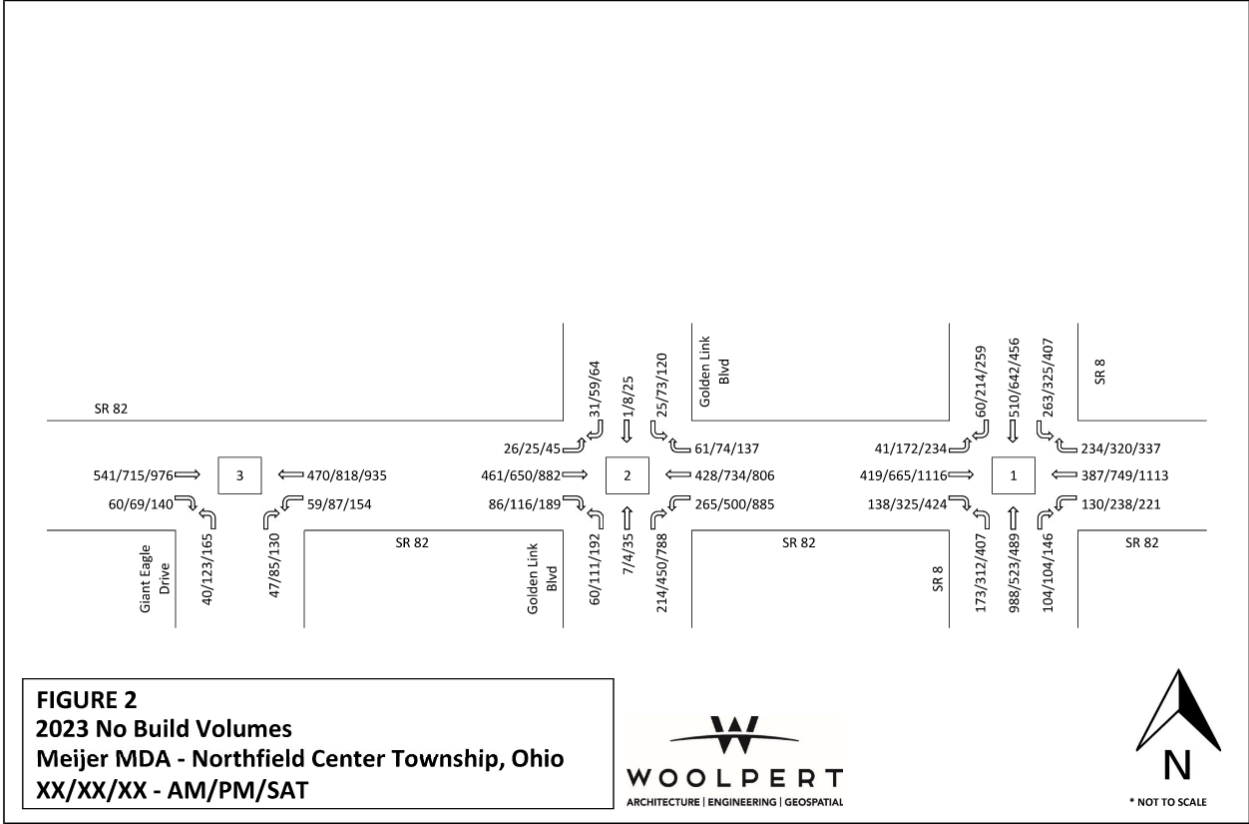
Video turning movement counts were conducted by Cummins Consulting Services on Thursday, September 12, 2019 from 7:00-10:00 AM and 4:00-7:00 PM and on Saturday, September 14, 2019 from 11:00 AM-2:00 PM at the intersections listed in Table 1. The turning movement count summary sheets are contained in **Appendix 1 (Data Collection)**. Video turning movement counts were collected by Cummins Consulting Services. Table 2 details the studied peak period:

**Table 2. Summary of the Studied Peak Hours**

Intersection	Studied Peak Hour Periods
SR 8 and E Aurora Road (SR 82)	AM- 7:00 - 8:00 AM
	PM- 5:00 - 6:00 PM
	Sat- 11:30 AM - 12:30 PM
E Aurora Road (SR 82) and Golden Link Blvd	AM- 9:00 - 10:00 AM
	PM- 5:00 - 6:00 PM
	Sat- 11:30 AM - 12:30 PM
E Aurora Road (SR 82) and Giant Eagle Drive	AM- 8:45 - 9:45 AM
	PM- 5:00 - 6:00 PM
	Sat- 11:15 AM - 12:15 PM

The Akron Metropolitan Area Transportation Study confirmed a growth rate of 1.0% would be acceptable for the study. The growth rate was calculated using historic counts on E Aurora Road (SR 82) in the study area. Per the State Highway Access Management Manual (SHAMM), for studies with site peak-hour trips  $\geq 500$ , the traffic forecast shall follow the procedures in Chapter 8 of Volume 1 of the Ohio Design Traffic Forecasting Manual. This chapter states that background traffic forecasts are converted to DHV per the methods shown in Volume 2. Per Volume 2, conversion of peak hour traffic to DHV uses Statewide Average DHV Factors by Functional Classification. For September traffic counts on an Urban Minor Arterial (SR 82 and SR 8), the DHV factors are 1.09 and 1.40 for Thursday and Saturday, respectively. A linear growth rate of 1.0% was also applied to the 2019 counts to forecast the 2023 and 2043 No-Build (without Meijer traffic) traffic volumes. The projected 2023 and 2043 No-Build (without Meijer traffic) traffic volumes are shown in Figures 2 and 3. Woolpert submitted a Certified Traffic submittal on 6/25/2020 and the volumes were approved on 7/23/2020 and this document is included in **Appendix 9**.





**WOOLPERT**  
**SECTION 4 - PROPOSED DEVELOPMENT**

**Development Description**

The proposed Meijer development, shown in Figure 4, consists of a 159,264 square foot Free-Standing Discount Superstore and a 10 fueling position Gasoline/Service Station with Convenience Store. The Meijer development is estimated to have an opening year of 2023. The proposed access scheme consists of one (1) access point along E Aurora Road (SR 82) lined up with the existing Giant Eagle Drive. A site plan is included in **Appendix 2**.



**Figure 4. Proposed Preliminary Meijer Development Site Plan. N.T.S.**



### Trip Generation

The ITE Trip Generation Manual, 10<sup>th</sup> edition was used to calculate the anticipated trips generated from the Meijer development. The trips and corresponding reduction rates are shown in Table 3. Pass-by trip reduction percentage was considered for the Meijer development.

**Table 3. Proposed Meijer Development Trip Generation**

ITE Trip Generation		Unit	Trip Ends								
ITE Code	Description		AM Peak			PM Peak			SAT Peak		
			IN	OUT	Pass-By %	IN	OUT	Pass-By %	IN	OUT	Pass-By %
813	Free-Standing Discount Superstore	159,264 SF	165	130	0%	238	252	200 29%	322	323	171 21%
945	Gasoline/Service Station with Convenience Market	10 Fueling Positions	18	17	58 62%	32	30	78 56%	32	30	78 56%
<b>Meijer Primary Trips</b>			<b>183</b>	<b>147</b>		<b>270</b>	<b>282</b>		<b>344</b>	<b>354</b>	

### Directional Distribution

Meijer has provided the following traffic distribution they expect for this store. Table 4 below shows the distribution of traffic expected to approach and depart from the Meijer site.

**Table 4. Directional Distribution**

Route	Approach/Departure
	Primary Trip Distribution
From/To the NORTH SR 8	25%
From/To the SOUTH SR 8	25%
From/To the EAST E Aurora Road (SR 82)	20%
From/To the WEST E Aurora Road (SR 82)	30%
<b>Total</b>	<b>100%</b>

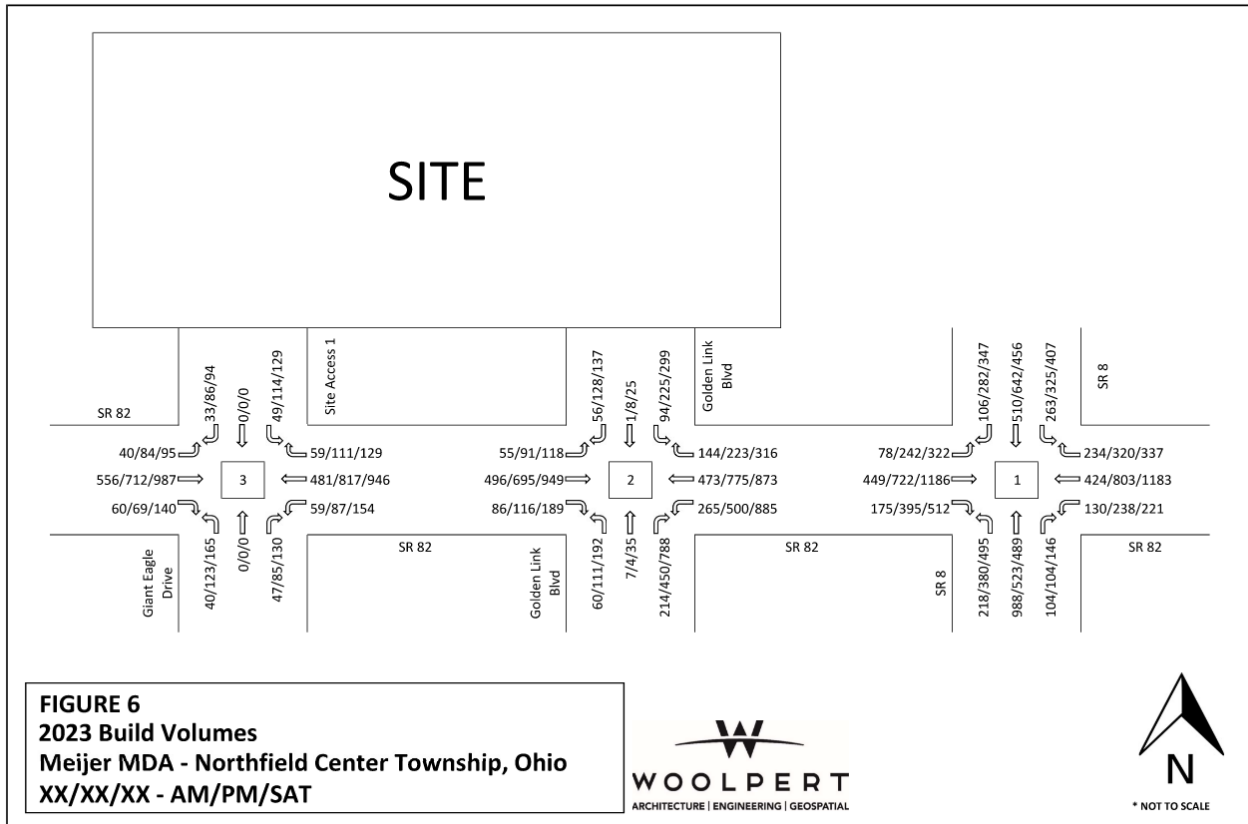
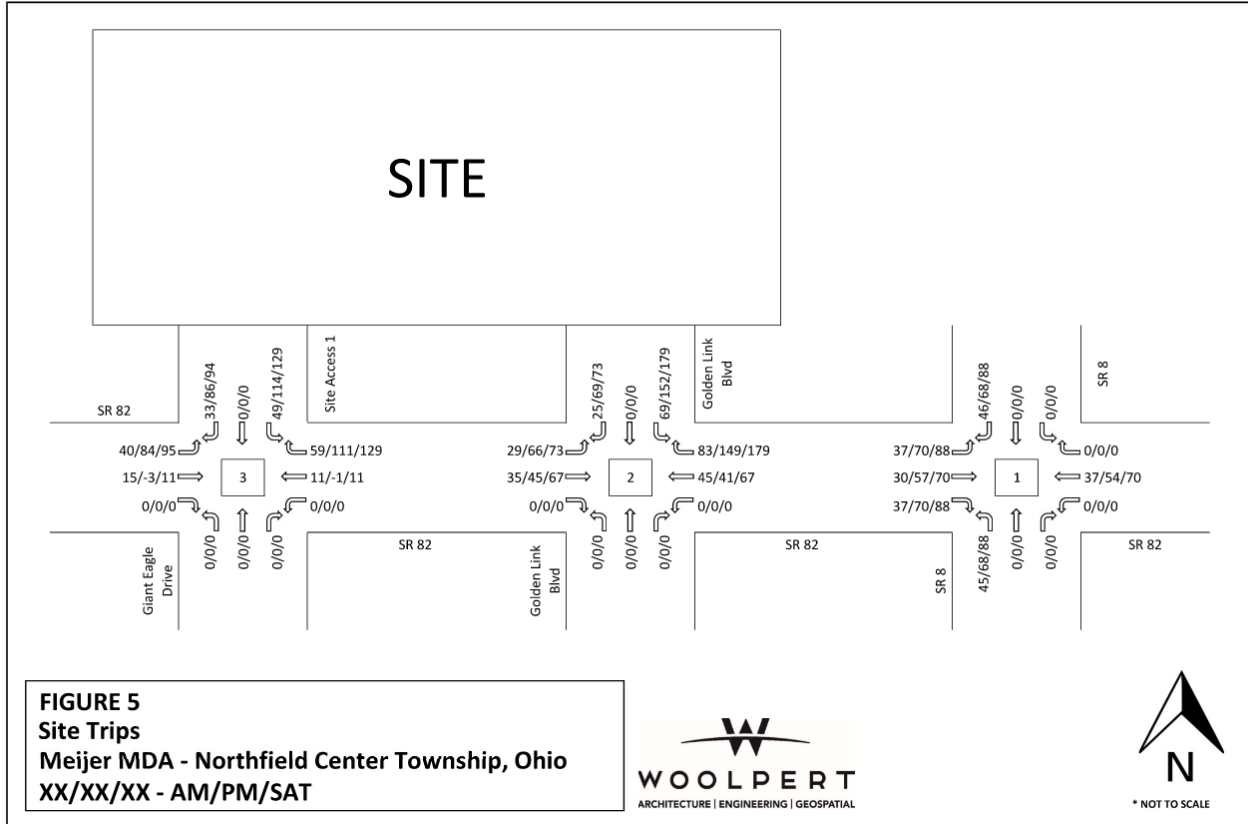
Based on the directional distribution shown in Table 4, the proposed development’s trip generation shown in Table 4 were distributed to the adjacent roadway network. The proposed development’s trip generation are illustrated in Figure 5.

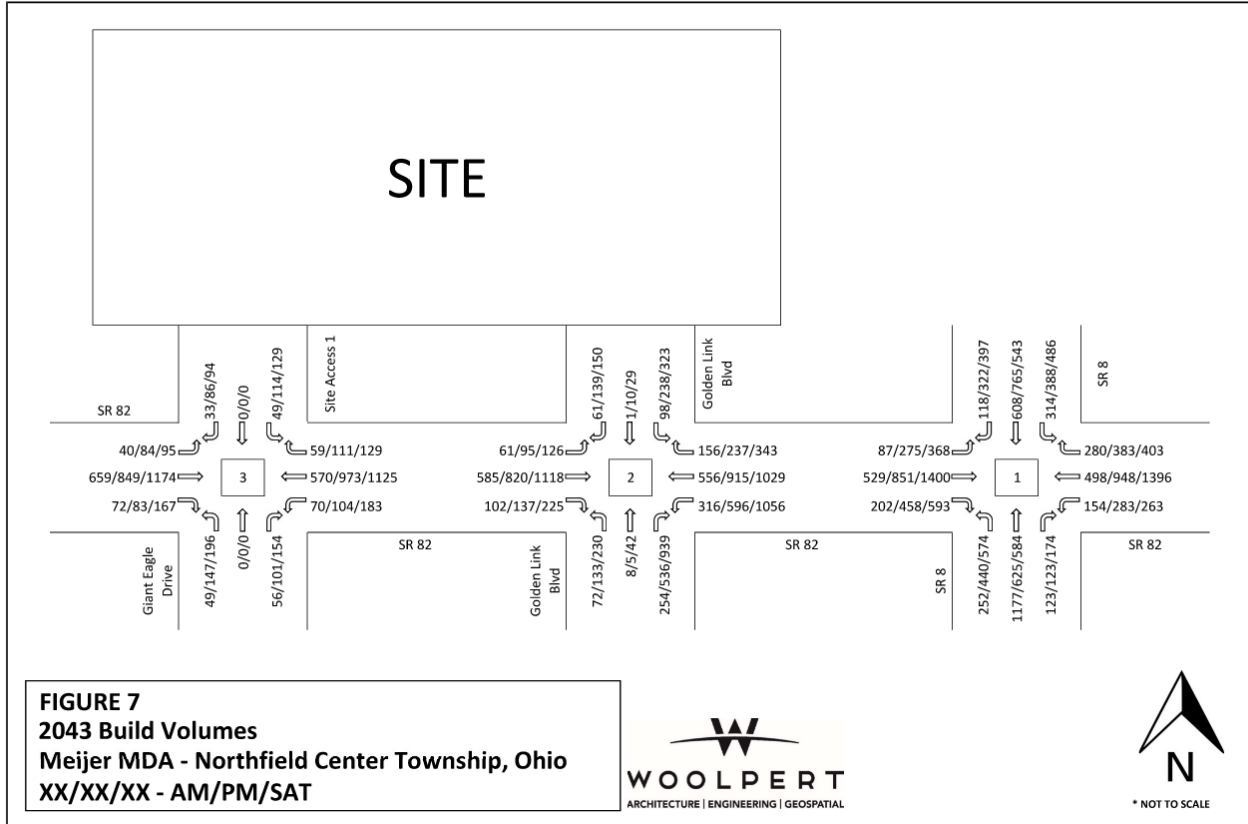
### Opening Year Traffic Volumes

The proposed Meijer Development’s calculated trip generation traffic volumes shown in Figure 5 were added to the 2023 Opening Year No-Build traffic volumes in Figure 2 to develop the 2023 Opening Year Meijer Build traffic volumes shown in Figure 6.

### Horizon Year Traffic Volumes

The proposed Meijer Development calculated trip generation traffic volumes shown in Figure 5 were added to the 2043 Horizon Year No-Build traffic volumes in Figure 3 to develop the 2043 Horizon Year Meijer Build traffic volumes shown in Figure 7. The traffic volume calculations are included in **Appendix 3**.





## SECTION 5 - TRAFFIC ANALYSES

### Analysis Parameters

Capacity and turn lane analysis were conducted for three scenarios for the Opening Year and Horizon Year - No-Build (without Meijer traffic), Build 1 (with Meijer traffic), and Build 2 (with Meijer traffic and improvements). The No-Build scenario consisted of the existing geometric conditions and signal timings without the Meijer development traffic. The Build 1 scenario consisted of the existing geometric conditions and signal timings with the Meijer development traffic. The Build 2 scenario consisted of recommended improvements with the Meijer development traffic.

Capacity analysis for the study followed the guidelines established in ODOT's Location and Design Manual and State Highway Access Management Manual. Section 401.2 of the Location and Design Manual details the procedure for capacity analysis within HCS, specifically the requirements for comparing the no-build (No-Build) scenario to the build scenarios. In order to establish a common basis for comparing the scenarios, ODOT requires that the critical delay of the north/south approach be within three seconds of the critical delay of the east/west approach. Additionally, the highest control delays of the approaches should be within 5 seconds, if possible.

Section 9.46 of the State Highway Access Management Manual outlines the parameters for determining if degradation is occurring at an intersection between the no-build (No-Build) condition and the Build 1 condition. Degradation occurs if any of the following are met:

- The overall intersection delay drops to a letter grade to LOS D or worse, or if a LOS F is made worse
- The control delay drops to LOS E or a LOS F is made worse
- Turn lane queuing exceeds available turn storage or turn lanes are blocked by thru queuing

If any of the conditions for degradation are met, improvements must be recommended to mitigate the condition back to the existing condition.

Following discussion with ODOT during analysis, it was determined that the improvements necessary to mitigate the build condition back to the existing condition would be impractical based on cost and scale. ODOT agreed that minimal degradation would be acceptable for this study. The improvements needed required an additional through lane on SR 82. This was decided to be impractical due to the impact to adjacent properties that the developer does not have ownership of.

In the HCS analysis at E Aurora Rd (SR 82) and Golden Link Blvd (Int 2), the volumes for the westbound through movement were adjusted to reflect heavier lane utilization in the outside through lane. The inside westbound through lane ends in a left turn lane at Intersection 3; therefore, most of the westbound through traffic at Intersection 3 utilizes the outside through lane at Intersection 2.

To account for the unequal lane utilization in the No Build and Build 1 conditions, the two westbound through lanes were coded as a through lane and a right turn lane. Ten (10) percent of the through volume was assigned to the through lane and 90% of the through volume along with the right turn volume were assigned to the right turn lane. The following steps were followed to calibrate the Adjusted Saturation Flow Rate for the right turn lane that includes 90% of the through volume:

- Code approach as single shared through-right lane.
- Code 90% of the through volume plus the right turn volume.
- Observe the Adjusted Saturation Flow Rate for the above lane configuration and volumes.
- Change the shared through-right lane to an exclusive right turn lane
- Adjust Saturation until the Adjusted Saturation Flow Rate equals the observed Adjusted Saturation Flow Rate for the shared through-right lane above.





To account for the unequal lane utilization in the Build 2 condition, the Heaviest Lane Volume was adjusted based on the through volume continuing beyond the downstream intersection.

### Turn Lane Analysis

Turn lane queuing analysis was also completed and is included in **Appendix 8**. Storage turn lane lengths were determined by comparing the HCS and the ODOT Location and Design Manual calculated turn lane length methods. The 95<sup>th</sup> percentile queue is the queue length that has only a 5-percent probability of being exceeded during the analysis time period. SimTraffic 95<sup>th</sup> percentile queue lengths were also recorded for the 2043 PM peak hour in the No-Build and Build 2 scenarios to determine if any queuing issues were present during microsimulation for the worst-case scenario. The findings are shown in Tables 5 - 7 below. Queues longer than the existing turn length are shown in orange in the no-build and build 1 scenarios. Queues longer than the recommended turn length are shown in yellow in the build 2 scenario. The turn lane lengths include a 50-foot taper and are based on design speed.

The southbound right turn lane at the intersection of SR 8 and E Aurora Road (SR 82) (Int 1) is recommended to be extended to 350 feet to meet the reported queues from HCS and SimTraffic and to allow for an overlap on the signal timing. The northbound dual left turn lanes are recommended to be extended to 550 feet to avoid spillback into the through lanes. Many of the queues in the PM and SAT peak hours exceed the available storage but mitigating them would require infeasible recommendations, including triple turn lanes and roadway widening. These would require significant intersection and roadway work with minimal benefit to the intersection operation.

A westbound right turn lane is recommended at the intersection of E Aurora Road (SR 82) and Golden Link Boulevard (Int 2) to reduce queueing on the approach. Many of the queues in the PM and SAT peak hours exceed the available storage but mitigating them would require infeasible recommendations, including triple turn lanes, roadway widening, and turn lane lengthening to adjacent intersections. These would require significant intersection and roadway work with minimal benefit to the intersection operation.

The proposed southbound left turn lane on the Meijer Drive at the intersection of E Aurora Road (SR 82) and Giant Eagle Drive is recommended to be 150 feet. A 225-foot eastbound left turn lane and 225-foot westbound right turn lane is also recommended for the development traffic turning into the Meijer driveway. The recommended length exceeds the HCS and Synchro reported lengths but are shorter than the ODOT calculated length because of thru backup. The westbound left turn lane is recommended to be shortened to 300' to allow for a taper of the westbound through lanes to eliminate the trap lane in the No-Build condition.



**Table 5: Turn Lane Queueing Analysis Results (AM Peak Hour)**

Movement	Existing Turn Lane Length (Ft.)	Opening Year (2023)				
		No-Build		Build 1	Build 2	
		ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)
<b>1. SR 8 and E Aurora Road (SR 82)</b>						
EBL	300	303	49	92	328	59
EBT	680	-	282	303	-	311
EBR	450	303	145	196	328	196
WBL	275	275	170	160	308	159
WBT	400	-	259	283	-	290
WBR	400	386	264	273	386	273
NBL	440/440	621	130	172	621	168
NBT	3300	-	605	605	-	634
NBR	150	621	1	1	621	97
SBL	450/450	507	191	197	507	192
SBT	3800	-	279	279	-	285
SBR	100	355	63	115	355	98
<b>2. E Aurora Road (SR 82) and Golden Link Blvd</b>						
EBL	175	333	20	28	349	39
EBT	530	-	220	207	-	233
EBR	125	333	76	65	349	66
WBL	350/350	414	148	145	414	137
WBT	680	-	334	497	-	208
WBR					339	108
NBL	250	158	68	74	158	53
NBT					-	7
NBR	250	361	192	207	361	168
SBL	75	100	15	63	210	84
SBT	100	-	12	44	-	1
SBR	100	106	29	50	151	47
<b>3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive</b>						
EBL	1400	-	431	550	429	24
EBT					-	260
EBR	225	488	38	40	429	
WBL	540	438	30	30	376	35
WBT	540	-	263	309	-	431
WBR					376	44
NBL	150	100	32	36	100	33
NBTR	150	109	38	47	100	46
SBL				44	101	40
SBTR				33	-	32

Table 5 (cont.): Turn Lane Queueing Analysis Results (AM Peak Hour)

Movement	Existing Turn Lane Length (Ft.)	Horizon Year (2043)					Recommended Length (Ft.) NC = No Change
		No-Build		Build 1	Build 2		
		ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	
<b>1. SR 8 and E Aurora Road (SR 82)</b>							
EBL	300	332	61	108	350	66	300/300
EBT	680	-	359	379	-	406	NC
EBR	450	332	192	231	350	233	NC
WBL	275	307	242	246	333	252	NC
WBT	400	-	322	346	-	364	NC
WBR	400	407	343	343	428	347	NC
NBL	440/440	663	162	206	731	203	550/550
NBT	3300	-	762	762	-	821	NC
NBR	150	663	129	129	731	108	NC
SBL	450/450	530	233	238	562	233	NC
SBT	3800	-	316	316	-	324	NC
SBR	100	377	72	122	399	103	350
<b>2. E Aurora Road (SR 82) and Golden Link Blvd</b>							
EBL	175	353	24	45	373	44	NC
EBT	530	-	262	271	-	271	NC
EBR	125	353	91	88	373	73	NC
WBL	350/350	437	169	169	471	172	NC
WBT	680	-	387	542	-	245	NC
WBR					356	116	225
NBL	250	169	88	89	180	63	NC
NBT					-	8	NC
NBR	250	385	230	235	404	102	NC
SBL	75	100	18	62	102	86	NC
SBT	100	-	14	43	-	1	NC
SBR	100	110	33	59	115	55	NC
<b>3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive</b>							
EBL					393	23	225
EBT	1400	-	517	671	-	291	NC
EBR	225	519	43	45	393		NC
WBL	540	471	33	35	358	41	NC
WBT	540	-	294	358	-	506	NC
WBR					358	41	225
NBL	150	106	42	46	100	42	NC
NBTR	150	114	48	58	100	53	NC
SBL				45	100	41	150
SBTR				34	-	31	150

Table 6: Turn Lane Queueing Analysis Results (PM Peak Hour)

Movement	Existing Turn Lane Length (Ft.)	Opening Year (2023)				
		No-Build		Build 1	Build 2	
		ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)
<b>1. SR 8 and E Aurora Road (SR 82)</b>						
EBL	300	450	292	491	476	236
EBT	680	-	548	559	-	556
EBR	450	487	398	463	557	458
WBL	275	488	370	383	512	378
WBT	400	-	581	680	-	678
WBR	400	488	383	422	512	421
NBL	440/440	558	294	360	638	359
NBT	3300	-	415	419	-	421
NBR	150	361	177	178	361	179
SBL	450/450	582	281	292	582	292
SBT	3800	-	507	531	-	537
SBR	100	456	337	483	525	382
<b>2. E Aurora Road (SR 82) and Golden Link Blvd</b>						
EBL	175	437	24	95	464	87
EBT	530	-	383	436	-	386
EBR	125	437	132	135	464	112
WBL	350/350	676	314	291	676	304
WBT	680	-	779	1449	-	392
WBR					500	187
NBL	250	225	138	141	225	125
NBT					-	6
NBR	250	613	435	404	613	431
SBL	75	182	60	287	378	129
SBT	100	-	52	168	-	9
SBR	100	157	76	187	241	147
<b>3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive</b>						
EBL	1400	-	702	1639	620	58
EBT					-	309
EBR	225	622	49	36	620	
WBL	540	698	51	81	696	52
WBT	540	-	736	560	-	904
WBR					696	68
NBL	150	202	133	58	202	146
NBTR	150	156	90	141	156	107
SBL				172	193	134
SBTR				143	-	109

Table 6 (cont.): Turn Lane Queuing Analysis Results (PM Peak Hour)

Movement	Existing Turn Lane Length (Ft.)	Horizon Year (2043)							Recommended Length (Ft.) NC = No Change
		No-Build			Build 1	Build 2			
		ODOT Calculated Length (Ft.)	SimTraffic 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	ODOT Calculated Length (Ft.)	SimTraffic 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	
<b>1. SR 8 and E Aurora Road (SR 82)</b>									
EBL	300	479	463	356	473	508	437	293	300/300
EBT	680	-	736	696	729	-	736	777	NC
EBR	450	521	573	515	617	550	611	622	NC
WBL	275	410	385	438	466	557	391	582	NC
WBT	400	-	990	709	889	-	1221	773	NC
WBR	400	517	449	495	554	557	580	507	NC
NBL	440/440	603	377	378	497	631	654	460	550/550
NBT	3300	-	400	502	493	-	708	497	NC
NBR	150	384	221	207	204	414	256	159	NC
SBL	450/450	616	491	363	417	645	508	385	NC
SBT	3800	-	741	640	662	-	984	674	NC
SBR	100	480	288	409	570	499	484	460	350
<b>2. E Aurora Road (SR 82) and Golden Link Blvd</b>									
EBL	175	471	90	25	88	500	224	92	NC
EBT	530	-	316	423	462	-	477	481	NC
EBR	125	471	156	144	146	500	189	136	NC
WBL	350/350	719	366	401	340	788	376	353	NC
WBT	680	-	615	953	1460	-	705	489	NC
WBR						545	384	165	225
NBL	250	235	462	179	211	-	150	156	NC
NBT						245	519	6	NC
NBR	250	669	306	668	680	709	317	559	NC
SBL	75	193	108	66	229	203	502	166	NC
SBT	100	-	87	70	200	-	112	12	NC
SBR	100	166	106	93	198	176	114	167	NC
<b>3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive</b>									
EBL					3700	733	97	69	225
EBT	1400	-	572	899		-	-	-	-
EBR	225	664	177	53	44	733	290	334	NC
WBL	540	759	131	82	108	809	112	53	NC
WBT	540	-	174	804	827	-	444	1190	NC
WBR						809	199	57	225
NBL	150	209	172	173	148	217	195	69	NC
NBTR	150	166	167	1	194	176	192	141	NC
SBL					184	193	140	147	150
SBTR					143	-	94	117	150

**Table 7: Turn Lane Queueing Analysis Results (SAT Peak Hour)**

Movement	Existing Turn Lane Length (Ft.)	Opening Year (2023)				
		No-Build		Build 1	Build 2	
		ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)
<b>1. SR 8 and E Aurora Road (SR 82)</b>						
EBL	300	683	329	714	735	311
EBT	680	-	940	909	-	1015
EBR	450	683	487	574	735	559
WBL	275	680	317	440	734	311
WBT	400	-	973	1186	-	1022
WBR	400	680	388	420	734	369
NBL	440/440	662	390	558	767	448
NBT	3300	-	407	394	-	422
NBR	150	359	252	246	359	258
SBL	450/450	662	381	458	662	374
SBT	3800	-	379	379	-	418
SBR	100	504	470	788	608	563
<b>2. E Aurora Road (SR 82) and Golden Link Blvd</b>						
EBL	175	548	37	96	232	114
EBT	530	-	735	647	-	797
EBR	125	548	197	183	603	170
WBL	350/350	1084	835	736	1084	904
WBT	680	-	1089	2332	-	492
WBR					544	226
NBL	250	323	240	305	323	185
NBT					-	32
NBR	250	979	1357	1598	979	1269
SBL	75	233	82	354	445	178
SBT	100	-	83	227	-	23
SBR	100	166	66	152	249	120
<b>3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive</b>						
EBL	1400	-	917	5137	817	55
EBT					-	383
EBR	225	810	66	77	817	
WBL	540	784	143	230	791	73
WBT	540	-	451	890	-	1123
WBR					791	58
NBL	150	228	181	89	228	74
NBTR	150	206	139	218	206	194
SBL				159	206	154
SBTR				120	-	113

Table 7 (cont.): Turn Lane Queueing Analysis Results (SAT Peak Hour)

Movement	Existing Turn Lane Length (Ft.)	Horizon Year (2043)					Recommended Length (Ft.) NC = No Change
		No-Build		Build 1	Build 2		
		ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	ODOT Calculated Length (Ft.)	HCS 7 95th %tile Queue Length (Ft.)	
<b>1. SR 8 and E Aurora Road (SR 82)</b>							
EBL	300	336	631	968	428	422	300/300
EBT	680	-	1272	1354	-	1420	NC
EBR	450	604	583	724	800	703	NC
WBL	275	602	602	711	799	472	NC
WBT	400	-	1313	1647	-	1324	NC
WBR	400	602	452	505	799	437	NC
NBL	440/440	608	522	742	759	627	550/550
NBT	3300	-	554	483	-	527	NC
NBR	150	332	313	291	402	306	NC
SBL	450/450	608	493	629	759	535	NC
SBT	3800	-	488	465	-	532	NC
SBR	100	469	728	1070	553	733	350
<b>2. E Aurora Road (SR 82) and Golden Link Blvd</b>							
EBL	175	489	41	105	649	129	NC
EBT	530	-	876	1119	-	1270	NC
EBR	125	489	219	223	649	205	NC
WBL	350/350	942	1507	1245	1253	1171	NC
WBT	680	-	1725	2918	-	706	NC
WBR					609	237	225
NBL	250	296	315	373	383	81	NC
NBT					-	40	NC
NBR	250	856	2402	2311	1142	1981	NC
SBL	75	218	91	348	260	240	NC
SBT	100	-	111	332	-	27	NC
SBR	100	149	80	171	189	138	NC
<b>3. E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive</b>							
EBL				6618	947	56	225
EBT	1400	-	1450		-	480	NC
EBR	225	714	73	93	947		NC
WBL	540	673	257	328	911	133	NC
WBT	540	-	523	1572	-	1896	NC
WBR					911	56	225
NBL	150	213	293	204	248	204	NC
NBTR	150	188	216	307	221	307	NC
SBL				159	206	159	150
SBTR				120	-	120	150

## Capacity Analysis

Capacity of an intersection is quantified by the Level of Service (LOS), which is based upon the amount of delay a vehicle experiences while at a particular intersection. The criterion for both signalized and unsignalized intersections is shown in Tables 8 and 9, respectively, and described within the Highway Capacity Manual (HCM 6).

**Table 8. Signalized Intersection LOS Criteria**

Level of Service	Control Delay (seconds/vehicle)
A	0-10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

**Table 9. Unsignalized Intersection LOS Criteria**

Level of Service	Control Delay (seconds/vehicle)
A	<10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Capacity analyses were performed for three (3) studied intersections within the study area during the AM, PM, and Saturday peak hours for all studied traffic scenarios utilizing the corresponding traffic volumes shown in Figures 2, 3, 5, 6, and 7. The AM, PM, and Saturday peak hour HCS capacity analyses findings are shown in Tables 10-12. The Synchro capacity analysis summary sheets are contained in the following appendices: 2023 No-Build Capacity Analysis Sheets (**Appendix 4**), 2023 Meijer Opening Year Capacity Analysis Sheets (**Appendix 5**), 2043 No-Build Capacity Analysis Sheets (**Appendix 6**), 2043 Meijer Horizon Year Capacity Analysis Sheets (**Appendix 7**).

The results of the capacity analysis are shown for all intersections throughout the development scenarios with the proposed recommendations.

At the intersection of SR 8 and E Aurora Road (SR 82), an additional eastbound left turn lane is recommended for the 2023 Opening Year. This was recommended to maintain the delay and QSR's reported in HCS.

At the intersection of E Aurora Road (SR 82) and Golden Link Blvd, the northbound approach is recommended to be reconfigured to separate left-through-right lanes in the 2023 Opening year. The southbound approach is recommended to be reconfigured to a left-through-right and to line up the northbound and southbound left turn lanes to allow for protected/permissive left turn phasing. This allows for additional green time to be allocated to SR 82. A westbound right turn lane is also recommended.

At the intersection of E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive, a westbound right turn lane is recommended to meet the demand of the westbound traffic in the 2023 Opening Year. Additionally, converting the eastbound right turn lane to a shared through/right lane is recommended. This also requires the extending of the existing eastbound through lane at intersection 2 to intersection 3.



Table 10. Summary of AM Peak Hour Capacity Analysis

Street	Approach	Opening Year (2023)			Horizon Year (2043)		
		No-Build	Build 1	Build 2	No-Build	Build 1	Build 2
<b>1. SR 8 and E Aurora Rd (SR 82)</b>							
E Aurora Rd (SR 82)	EB	42.2-D	42.7-D	46.7-D	50.8-D	50.2-D	58.4-E
	WB	40.6-D	41.5-D	42.8-D	49.4-D	49.9-D	52.1-D
SR 8	NB	44.5-D	45.2-D	48.3-D	50.4-D	51.0-D	57.9-E
	SB	37.3-D	38.0-D	37.3-D	37.9-D	38.2-D	37.6-D
<b>Intersection Total</b>		<b>41.5-D</b>	<b>42.2-D</b>	<b>44.2-D</b>	<b>47.2-D</b>	<b>47.5-D</b>	<b>51.9-D</b>
<b>2. E Aurora Rd (SR 82) and Golden Link Blvd</b>							
E Aurora Rd (SR 82)	EB	29.6-C	22.2-C	28.0-C	30.9-C	29.2-C	28.2-C
	WB	31.7-C	37.3-D	26.9-C	29.8-C	34.3-C	28.4-C
Golden Link Blvd	NB	28.6-C	33.2-C	22.9-C	31.3-C	32.4-C	24.0-C
	SB	33.5-C	36.1-D	27.3-C	32.8-C	35.3-D	28.1-C
<b>Intersection Total</b>		<b>30.5-C</b>	<b>31.7-C</b>	<b>26.7-C</b>	<b>30.5-C</b>	<b>32.4-C</b>	<b>27.7-C</b>
<b>3. E Aurora Rd (SR 82) and Giant Eagle Drive</b>							
E Aurora Rd (SR 82)	EB	24.7-C	33.3-C	24.5-C	25.6-C	36.7-D	22.9-C
	WB	13.2-B	14.1-B	29.9-C	12.3-B	14.6-B	30.1-C
Giant Eagle Drive	NB	24.2-C	32.1-C	29.5-C	26.9-C	34.0-C	29.1-C
Meijer Drive	SB		31.3-C	28.4-C		32.9-C	28.2-C
<b>Intersection Total</b>		<b>19.7-B</b>	<b>25.0-C</b>	<b>27.3-C</b>	<b>19.9-B</b>	<b>27.0-C</b>	<b>26.6-C</b>

Per the SHAMM’s parameters, degradation in the AM Peak Hour is expected for the following movements and intersections:

1. SR 8 and E Aurora Rd (SR 82)
  - a. EB approach in 2043 Build 2
  - b. NB approach in 2043 Build 2

**Table 11. Summary of PM Peak Hour Capacity Analysis**

Street	Approach	Opening Year (2023)			Horizon Year (2043)		
		No-Build	Build 1	Build 2	No-Build	Build 1	Build 2
<b>1. SR 8 and E Aurora Rd (SR 82)</b>							
E Aurora Rd (SR 82)	EB	55.0-E	50.2-D	50.3-D	65.5-E	68.9-E	72.4-E
	WB	51.1-D	61.3-E	60.7-E	57.8-E	81.3-F	62.2-E
SR 8	NB	56.9-E	59.7-E	59.9-E	63.8-E	73.5-E	65.6-E
	SB	57.3-E	64.7-E	59.7-E	67.6-E	81.3-F	72.2-E
<b>Intersection Total</b>		<b>54.9-D</b>	<b>58.8-E</b>	<b>57.5-E</b>	<b>63.5-E</b>	<b>76.4-E</b>	<b>68.2-E</b>
<b>2. E Aurora Rd (SR 82) and Golden Link Blvd</b>							
E Aurora Rd (SR 82)	EB	41.7-D	47.0-D	36.0-D	36.5-D	38.4-D	41.5-D
	WB	47.7-D	85.2-F	33.2-C	53.5-D	68.4-E	35.1-D
Golden Link Blvd	NB	32.3-C	29.0-C	30.9-C	53.1-D	58.3-E	37.0-D
	SB	47.7-D	81.0-F	37.7-D	50.0-D	64.4-E	41.1-D
<b>Intersection Total</b>		<b>42.9-D</b>	<b>64.8-E</b>	<b>34.1-C</b>	<b>48.4-D</b>	<b>58.1-E</b>	<b>37.8-D</b>
<b>3. E Aurora Rd (SR 82) and Giant Eagle Drive</b>							
E Aurora Rd (SR 82)	EB	31.7-C	141.5-F	20.1-C	37.4-D	555.6-F	17.5-B
	WB	27.6-C	15.3-B	38.7-D	24.8-C	24.1-C	49.1-D
Giant Eagle Drive	NB	31.6-C	64.5-E	40.0-D	36.0-C	87.4-F	50.8-D
Meijer Drive	SB		61.0-E	39.8-D		64.8-E	46.4-D
<b>Intersection Total</b>		<b>29.7-C</b>	<b>71.5-E</b>	<b>31.9-C</b>	<b>31.3-C</b>	<b>236.7-F</b>	<b>36.9-D</b>

Per the SHAMM’s parameters, degradation in the PM Peak Hour is expected for the following movements and intersections:

1. SR 8 and E Aurora Rd (SR 82) - Intersection Total in 2023 Build 1 and 2023 Build 2
  - a. WB approach in 2023 Build 1 and 2023 Build 2 and 2043 Build 1
  - b. SB approach in 2043 Build 1
2. E Aurora Rd (SR 82) and Golden Link Blvd - Intersection Total in 2023 Build 1 and 2043 Build 1
  - a. WB approach in 2023 Build 1 and 2043 Build 1
  - b. NB approach in 2043 Build 1
  - c. SB approach in 2023 Build 1 and 2043 Build 1
3. E Aurora Rd (SR 82) and Giant Eagle Drive - Intersection Total in 2023 Build 1 and 2043 Build 1 and 2043 Build 2
  - a. EB approach in 2023 Build 1 and 2043 Build 1
  - b. NB approach in 2023 Build 1 and 2043 Build 1

**Table 12. Summary of SAT Peak Hour Capacity Analysis**

Street	Approach	Opening Year (2023)			Horizon Year (2043)		
		No-Build	Build 1	Build 2	No-Build	Build 1	Build 2
<b>1. SR 8 and E Aurora Rd (SR 82)</b>							
E Aurora Rd (SR 82)	EB	64.5-E	62.5-E	64.9-E	90.1-F	105.0-F	100.5-F
	WB	70.6-E	104.5-F	69.2-E	98.9-F	151.6-F	91.6-F
SR 8	NB	69.3-E	88.7-F	70.2-E	94.3-F	118.1-F	96.1-F
	SB	71.4-E	104.8-F	72.5-E	102.3-F	152.7-F	102.1-F
<b>Intersection Total</b>		<b>68.6-E</b>	<b>87.7-F</b>	<b>68.6-E</b>	<b>95.9-F</b>	<b>130.3-F</b>	<b>97.5-F</b>
<b>2. E Aurora Rd (SR 82) and Golden Link Blvd</b>							
E Aurora Rd (SR 82)	EB	105.2-F	70.4-E	103.7-F	107.4-F	144.9-F	182.3-F
	WB	123.2-F	177.1-F	103.9-F	255.5-F	253.8-F	134.0-F
Golden Link Blvd	NB	123.1-F	173.2-F	106.5-F	258.8-F	249.2-F	177.4-F
	SB	40.9-D	87.3-F	32.4-C	41.9-D	100.9-F	38.6-D
<b>Intersection Total</b>		<b>114.3-F</b>	<b>139.8-F</b>	<b>97.5-F</b>	<b>206.0-F</b>	<b>210.6-F</b>	<b>147.5-F</b>
<b>3. E Aurora Rd (SR 82) and Giant Eagle Drive</b>							
E Aurora Rd (SR 82)	EB	38.7-D	1571.7-F	19.2-B	72.2-E	3243.4-F	21.8-C
	WB	16.2-B	36.9-D	56.9-E	19.3-B	85.8-F	112.9-F
Giant Eagle Drive	NB	38.0-D	68.2-E	56.7-E	69.5-E	105.2-F	105.2-F
Meijer Drive	SB		48.1-D	45.0-D		48.1-D	48.1-D
<b>Intersection Total</b>		<b>28.8-C</b>	<b>672.5-F</b>	<b>40.5-D</b>	<b>48.8-D</b>	<b>1401.1-F</b>	<b>70.0-E</b>

Per the SHAMM’s parameters, degradation in the PM Peak Hour is expected for the following movements and intersections:

1. SR 8 and E Aurora Rd (SR 82) - Intersection Total in 2023 Build 1 and 2043 Build 1 and 2043 Build 2
  - a. EB approach in 2043 Build 1 and 2043 Build 2
  - b. WB approach in 2023 Build 1 and 2043 Build 1
  - c. NB approach in 2023 Build 1 and 2043 Build 1 and 2043 Build 2
  - d. SB approach in 2023 Build 1 and 2043 Build 1
2. E Aurora Rd (SR 82) and Golden Link Blvd - Intersection Total in 2023 Build 1 and 2043 Build 1
  - a. EB approach in 2043 Build 1 and 2043 Build 2
  - b. WB approach in 2023 Build 1
  - c. NB approach in 2023 Build 1
  - d. SB approach in 2023 Build 1 and 2043 Build 1
3. E Aurora Rd (SR 82) and Giant Eagle Drive - Intersection Total all build scenarios
  - a. EB approach in 2023 Build 1 and 2043 Build 1
  - b. WB approach in all build scenarios
  - c. NB approach in all build scenarios

### Operational Analysis

ODOT provided supplementary SimTraffic analysis for the 2043 PM peak hour in the No-Build and Build 2 scenarios to evaluate traffic operations and queueing results. The average queueing results of 10 simulations were included in the queue section of the report. The delay per vehicle by lane from the simulations is summarized in Table 13. The simulations show that with the addition of Meijer traffic and recommended improvements, the degradation from the no-build condition is kept to an acceptable level. The performance reports with synchro timings are included in **Appendix 8**.

Table 13. Summary of PM Peak Hour SimTraffic Analysis

Street	Lane	Horizon Year (2043)	
		No-Build (delay/veh/ln)	Build 2 (delay/veh/ln)
<b>1. SR 8 and E Aurora Rd (SR 82)</b>			
E Aurora Rd (SR 82)	EBL	140.1	96.4
	EBL		120.0
	EBT	88.9	84.7
	EBT	96.8	97.6
	EBR	21.5	22.4
	WBL	88.2	98.9
	WBT	87.8	98.8
	WBT	66.5	97.7
	WBR	16.8	14.0
SR 8	NBL	115.9	159.6
	NBL	115.6	207.0
	NBT	50.7	53.2
	NBT	44.8	49.0
	NBR	0.6	0.4
	SBL	62.7	53.4
	SBL	101.0	75.3
	SBT	81.0	111.7
	SBT	82.2	105.1
SBR	1.3	46.0	
<b>Intersection Total</b>		<b>70.6</b>	<b>82.9</b>
<b>2. E Aurora Rd (SR 82) and Golden Link Blvd</b>			
E Aurora Rd (SR 82)	EBL	27.1	36.2
	EBT	26.4	34.5
	EBT	26.5	36.0
	EBR	4.8	5.1
	WBL	33.8	36.8
	WBL	42.4	46.9
	WBT	18.8	34.0
	WBT	20.8	29.9
	WBR		1.4
Golden Link Blvd	NBL	74.7	30.7
	NBT		603.5
	NBR	28.3	39.3
	SBL	61.0	108.8
	SBT	51.1	62.7
	SBR	42.7	24.9
<b>Intersection Total</b>		<b>29.5</b>	<b>38.0</b>
<b>3. E Aurora Rd (SR 82) and Giant Eagle Drive</b>			
E Aurora Rd (SR 82)	EBL		32.0
	EBT	11.3	8.7
	EBR	1.1	7.9
	WBL	32.7	22.7
	WBT	1.9	11.6
	WBR		1.5
Giant Eagle Drive	NBL	49.2	55.5
	NBR	47.2	25.4
Meijer Drive	SBL		43.1
	SBR		30.4
<b>Intersection Total</b>		<b>12.0</b>	<b>16.1</b>

## SECTION 6 - CONCLUSIONS

### Recommendations

Based on the results of the traffic analyses, included in Section 5, the following roadway improvements are recommended. See **Appendix 2** for the preliminary roadway improvement schematic.

#### **2023 Opening Year Meijer Build Improvements**

##### Intersection #1 - E Aurora Road (SR 82) and SR 8

1. Extend the southbound right turn lane to 350' (including 50' taper) and add an associated right turn overlap to the signal timing.
2. Construct an additional 300' (including 50' taper) eastbound left turn lane.
3. Extend the northbound dual left turn lanes to provide 550' (including 50' taper) of storage.

##### Intersection #2 - E Aurora Road (SR 82) and Golden Link Boulevard


4. Separate the northbound shared left/through lane into exclusive left and through lanes. Final northbound configuration will be a left turn lane, through lane, and right turn lane.
5. Separate the southbound shared left/through lane into exclusive left and through lanes and remove the side street split phasing. Align the northbound and southbound left turn lanes for the implementation of protected/permissive phasing for the side street turn lanes.
6. Construct a 225' (including 50' taper) westbound right turn lane.

##### Intersection #3 - E Aurora Road (SR 82) and Giant Eagle Drive/Meijer Drive

7. Construct a 225' (including 50' taper) eastbound left turn lane.
8. Convert the eastbound right turn lane to a shared through/right lane.
9. Construct a 225' (including 50' taper) westbound right turn lane.
10. Construct an access driveway consisting of three (3) lanes: two (2) southbound egress lanes (left and a shared through/right) and one (1) ingress lane.

SECTION 7 - STATEMENT OF CERTIFICATION

I certify that this TRAFFIC IMPACT STUDY has been prepared by myself or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

X   
\_\_\_\_\_

Lindsey Kieres, PE, PTOE  
Ohio PE #79568  
Woolpert Inc

