Delaware Development

Traffic Impact Study
City of Delaware, Ohio

June 20, 2016

ms consultants, inc.
engineers, architects, planners

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EXECUTIVE SUMMARY

This document serves as a Traffic Impact Study (TIS) for the Delaware Development site located in the City of Delaware, north of US 23 and Meeker Way. The development includes approximately 300,000 square-feet of retail, 40,000 square-feet of office, 18 single-family homes, 55 multi-family units, and event center. The development will have five access points:

- US 23/Delaware Plaza South (signalized, left-in/right-out only)
- US 23/Hawthorn Boulevard (signalized, full access)
- Meeker Way (unsignalized)
- Stratford Road south access point (unsignalized)
- Stratford Road north access point (unsignalized)

The proposed development, in conjunction with the recommended roadway improvements, would provide the similar Design Year traffic operations as the No-Build condition. The improvements recommended in this TIS will successfully mitigate the impact of the development on the study area roadway network.

The following is a list of recommended improvements for the study area:

US 23/Meeker Way (new intersection currently under construction by ODOT/City of Delaware)

- Lengthen northbound right turn lane as long as possible (104') without impacting the culvert
- Lengthen southbound left turn lane by 35'
- Lengthen westbound double left turn lane storage length by 93'

US 23/Hawthorn Boulevard

- Install traffic signal
    - Implement protected-permissive left turn phases for northbound and westbound movements only
- Lengthen northbound left turn lane by 64'
- Construct 414' northbound right turn lane
- Construct 285' southbound left turn lane
- Remove median on eastbound approach and construct 150' left turn lane, through lane, and 125' right turn lane
- Construct westbound approach with 325' left turn lane, through lane, and 250' right turn lane
    - Provide 400' between stop bar and first interior site intersection

US 23/Delaware Plaza South

- Construct double southbound left turn lanes with combined 500' of storage length
- Construct 314' northbound right turn lane
- Construct westbound right turn lane with 300' of storage prior to first site driveway

- Modify signal to allow for southbound left turn/westbound right turn phase to overlap with existing northbound left turn/eastbound right turn phase

US 23/Cottswold Drive

- Align northbound and southbound left turn lanes
- Modify signal to provide protected-permissive northbound/southbound left turn phases

Meeker Way/Site Access

- Construct 138' eastbound left turn lane

Meeker Way/Stratford Road (new intersection currently under construction by others)

- Contribution toward future extension of southbound right turn lane ($5,625)
- Construct 150' eastbound left turn lane

Stratford Road/S. Site Access

- Construct 175' northbound left turn lane
- Construct 225' southbound right turn lane

Stratford Road/N. Site Access

- Construct 175' northbound left turn lane

US 23

- Close four median breaks between Meeker Way and Delaware Plaza South

Stratford Road

- Widen to provide three-lane section between north and south site drives
- Modify substandard curve for 45-mph design speed.

INTRODUCTION

The purpose of this document is to evaluate the traffic impacts of the proposed Delaware Development mixed-use development on the surrounding road network on the south side of the City of Delaware, Ohio. A map of the site location is provided as **Figure 1**. This study will document the impacts that the proposed new land uses would have on the surrounding roadway system and will identify the mitigative improvements, if any, that the developer should be responsible for providing.

STUDY AREA

The study area for this TIS includes numerous roadways in the southern portion of the City of Delaware. The study area includes the following intersections:

- US 23/SR 315
- US 23/Stratford Road
- US 23/Meeker Way (under construction; planned to open 2016)
- US 23/Hawthorn Boulevard
- US 23/Delaware Plaza South
- US 23/Delaware Plaza North
- US 23/Hull Drive
- US 23/Cottswold Drive
- Stratford Road/Meeker Way (under construction; planned to open 2016)

A summary of the existing conditions at these locations is provided below:

US 23/SR 315

This intersection is signalized and is currently operating as one signal with the Stratford Road intersection. However, there is currently a project (DEL-23-8.77, PID 79366) underway which will remove the Stratford Road signal and allow the US 23/SR 315 intersection to operate without the double clearance interval. The intersection will have a northbound left turn lane, a southbound right turn lane, a double eastbound left turn lane and an eastbound right turn lane. US 23 has a speed limit of 55 miles per hour and SR 315 has a speed limit of 45 miles per hour.

US 23/Stratford Road

This intersection will be converted to unsignalized operation with project DEL-23-8.77. In the future condition, there will be a northbound right turn lane, a southbound left turn lane, and a westbound right turn lane. Only right turns will be allowed from Stratford Road. US 23 has a speed limit of 55 miles per hour and Stratford Road has a speed limit of 45 miles per hour.

US 23/Meeker Way

At this future signalized intersection, there will be a northbound right turn lane, a southbound left turn lane, dual westbound left turn lanes, and a westbound right turn lane. Meeker Way is a two-lane facility, with a speed limit of 35 miles per hour.

FIGURE 1: STUDY AREA MAP
DELAWARE DEVELOPMENT AT
US 23/SR 315/STRATFORD ROAD
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COTTSWOLD DRIVE
23
HULL DRIVE
DELAWARE PLAZA SOUTH
DELAWARE PLAZA NORTH
DELAWARE
DEVELOPMENT
SITE
HAWTHORN BOULEVARD
23
STRATFORD ROAD
FUTURE
MEEKER
WAY
Existing signal
Future signal
Future signal removal
N
315
23

US 23/Hawthorn Boulevard

This intersection is unsignalized and is the entrance to the Stratford Woods residential subdivision. There is a northbound left turn lane, a southbound right turn lane, an eastbound left turn lane, and an eastbound right turn lane. Hawthorn Boulevard has a speed limit of 25 miles per hour.

US 23/Delaware Plaza South

This intersection provides one of two access points to the Delaware Plaza shopping center on the west side of US 23. Stratford Drive, a residential cul-de-sac on the east side of US 23, is also served by this signal. This signal functions as one signal with the Delaware Plaza North intersection, providing a double clearance interval to prevent queuing between intersections. At this intersection, there are two northbound left turn lanes, a southbound right turn lane, and two eastbound left turn lanes. Northbound left turns operate under protected-only signal phasing. Left turns exiting the Delaware Plaza shopping center are prohibited at this location – vehicles wishing to travel north on US 23 must exit at the Delaware Plaza North driveway.

US 23/Delaware Plaza North

This intersection provides one of two access points to the Delaware Plaza development. This signal functions as one signal with the Delaware Plaza South intersection, with a double clearance interval provided to prevent queuing between intersections. At this intersection, there is a southbound right turn lane, two eastbound left turn lanes, and an eastbound right turn lane. Northbound left turns are prohibited at this location. This signal is a two-phase operation, with the minor street phase concurrent with the minor street phase at the Delaware Plaza South intersection.

US 23/Hull Drive

The US 23/Hull Drive intersection is an unsignalized intersection. The west leg provides access to a strip mall, hotel, and single-family homes. The east leg provides access to a car dealership and a few single-family homes. The intersection has a left turn lane and a right turn lane on both the northbound and southbound approaches. A westbound left turn lane is also provided.

US 23/Cottswold Drive

The US 23/Cottswold Drive intersection is signalized with protected-only northbound and southbound left turns. The west leg leads into a residential neighborhood, while the east leg serves retail land uses. The intersection has northbound and southbound left and right turn lanes. The eastbound and westbound approaches have a left turn lane and a through-right lane.

Stratford Road/Meeker Way

At this future unsignalized intersection, there are no turn lanes. The Meeker Way approach will stop for Stratford Road traffic. The speed limit on Meeker Way is 35 miles per hour, while the speed limit on Stratford Road is 45 miles per hour.

PROPOSED BUILD CONDITION

The development will consist of retail, office, single-family, and multi-family land uses. A City roadway will be built in the site, and serve north-south traffic. This street will connect the Delaware Plaza South and Meeker Way. A second public street will be built from Hawthorn Boulevard to the main site road. The Delaware Plaza South will allow left-in/right-in/right-out traffic only. The Hawthorn Boulevard access will allow full movement access. Two additional full movement access drives will be located on Stratford Road, for a total of five access points into the site. A conceptual site layout is shown as **Figure 2**. The Opening Year for this developed is 2017, making the Design Year for this study to be 2037.

BACKGROUND TRAFFIC VOLUMES

Turning movement count data for AM and PM weekday peak hours was collected at the study area intersections on weekdays in December 2015 and February 2016. All counts were performed on days when Delaware City Schools were in regular session and on days without inclement weather. A copy of the traffic count data can be found in **Appendix A**.

Growth rates for each of the roadways in the study area were obtained from the Mid-Ohio Regional Planning Commission (MORPC). These linear annual growth rates are shown in **Table 1**.

Table 1: Growth Rates

Location	Linear Annual Growth Rate
US 23, north of Cottswold Drive	1.00%
US 23, south of Cottswold Drive	1.00%
Cottswold Drive, east of US 23	0.50%
Cottswold Drive, west of US 23	0.50%
US 23, north of Hull Drive	1.00%
US 23, south of Hull Drive	1.00%
Hull Drive, east of US 23	0.50%
Hull Drive, west of US 23	0.50%
US 23, north of Hawthorn Boulevard	1.00%
US 23, south of Hawthorn Boulevard	1.00%
Hawthorn Boulevard, west of US 23	0.50%
US 23, north of SR 315	1.00%
US 23, south of SR 315	1.30%
SR 315, west of US 23	2.40%

The background traffic also took into account the traffic that will be diverted to the future Meeker Way, which will be open by the Opening Year.

think. create. do.

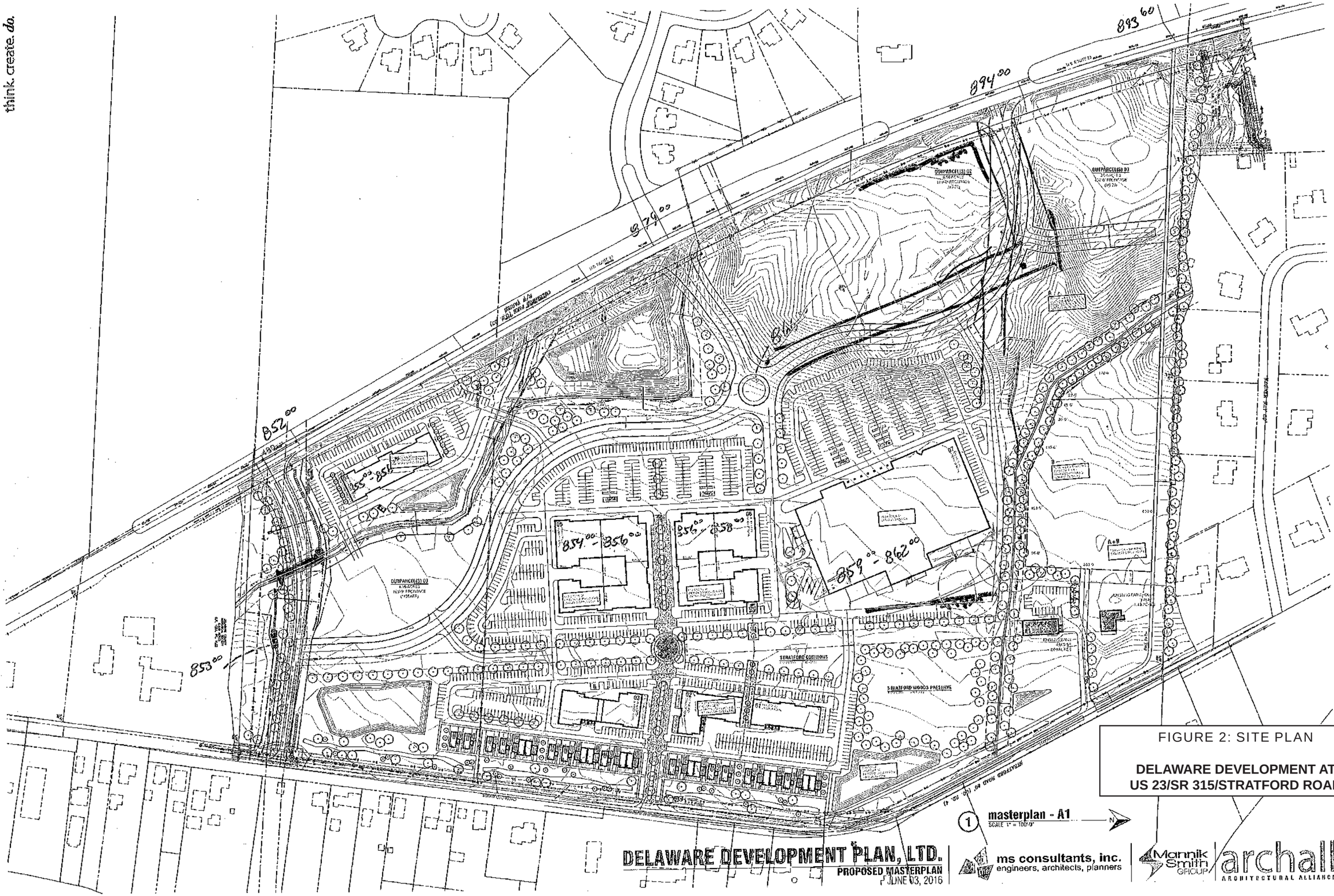

FIGURE 2: SITE PLAN

DELAWARE DEVELOPMENT AT US 23/SR 315/STRATFORD ROAD

TRIP GENERATION

Trip generation was performed using the ITE *Trip Generation Manual*, 9th Edition. Pass-by trips and internal capture trips were calculated using the ITE *Trip Generation Handbook* (3rd Edition). **Table 2** summarizes the assumed land uses.

Table 2: Land Uses and Pass-By Percentages

	ITE Code	Land Use	Variable	Units	AM Pass-By %	PM Pass-By %
Anchor Store	850	Supermarket	120,000	SF	36%*	36%
Buildings 01-07	710	General Office	40,800	SF	--	--
	826	Specialty Retail Center	40,800	SF	--	34%*
Buildings 08-12	820	Shopping Center	90,750	SF	50%*	34%
Outparcels	841	Automobile Sales	30,000	SF	--	--
	881	Pharmacy/Drugstore with Drive-Through Window	13,000	SF	--	33%**
	912	Drive-In Bank	4,000	SF	29%	35%
	931	Quality Restaurant	9,000	SF	--	33%**
	933	Fast-Food Restaurant without Drive-Through Window	3,000	SF	49%*	50%*
	934	Fast-Food Restaurant with Drive-Through Window	3,000	SF	49%	50%
	937	Coffee/Donut Shop with Drive-Through Window	2,000	SF	49%*	50%*
	946	Gasoline/Service Station with Convenience Market and Car Wash	11	pumps	62%	56%
Event Center	***	***	54	spaces	--	--
Single-Family	210	Single-Family Detached Housing	18	DU	--	--
Multi-Family	230	Residential Condominium/Townhouse	55	units	--	--

*This pass-by rate is not in the ITE *Trip Generation Handbook*. The assumptions can be found in the text below.
**The pass-by rate in the ITE *Trip Generation Handbook* was too high and a smaller percentage was assumed.
***There is no ITE land use category that corresponds well with the proposed 7,600 SF Event Center. Therefore, its parking lot capacity was used to estimate peak hour trips for this building.

For the anchor store, supermarket (ITE 850) was chosen as it is more conservative (larger generator) than other potential 100,000+ SF stores such as free-standing discount store, hardware superstore, etc.).

As no users for the outparcels have been identified by the developer, a variety of retail land uses have been estimated/assumed for these outparcels. The average sized store from the ITE Trip Generation data was used for each outparcel land use.

The pass-by rates for several of the uses were estimated due to no data in the ITE *Trip Generation Handbook*. For the Supermarket, the AM pass-by rate was assumed to be the same as the PM pass-by rate. For the Specialty Retail Center, the PM pass-by rate (since there are no AM peak trips) is assumed to be the same as Shopping Center since it will attract similar users. For AM pass-by trips at the Shopping Center, a 50% rate was assumed since in the AM peak hours, it is likely that many users will be on their way to work/school. For the Fast-Food Restaurant without Drive-Through Window and Coffee/Donut Shop with Drive-Through Window, the AM and PM pass-by rates for Fast-Food with Drive-Through Window were used as they are very similar uses. For the Gasoline/Service Station with Convenience Market and Car Wash (Land Use Code 946), pass-by rates for Gasoline/Service Station with Convenience Market (Land Use Code 945) were used as Land Use Code 946 does not provide pass-by rates and the rates will be similar.

The peak traffic at the Event Center was assumed to occur in off-peak hours (used for events and gatherings, midday, evenings, and weekends). A conservative estimate of 54 total trips was assumed in both the AM and PM peak hours (27 entering and 27 exiting).

The internal capture percentage was calculated using the NCHRP 684 Internal Trip Capture Estimation Tool. The calculation sheets can be found in **Appendix B**. The internal capture rates are in the table below.

Table 3: Internal Capture Percentages

	AM Peak		PM Peak	
	Entering	**Exiting**	**Entering**	**Exiting**
Office	18%	91%	67%	26%
Retail	9%	14%	11%	8%
Restaurant	21%	19%	33%	47%
Residential	9%	23%	67%	65%
Other	0%	0%	0%	0%

The trip calculations can be found in **Table 4**. A summary of the calculations can be found in Appendix B.

Table 4: Trip Calculations Summary

Building	ITE Code	Land Use	Variable	Units	Time of Day	Rate	Pass-By %	Total Trips	Entering							Exiting						
									%	Total Trips	Internal Capture %	Internal Capture	Sub Total	Pass-By Trips	Primary Trips	%	Total Trips	Internal Capture %	Internal Capture	Sub Total	Pass-By Trips	Primary Trips
Anchor Store	850	Supermarket	120,000	SF	AM Peak	3.40	36%	408	56%	228	9%	20	208	75	133	44%	180	14%	16	164	59	105
					PM Peak	9.48	36%	1,138	49%	558	10%	56	502	181	321	51%	580	7%	58	522	188	334
Buildings 01-04	710	General Office	54,600	SF	AM Peak	Eqn	NA	118	88%	104	19%	20	84	0	84	12%	14	93%	3	11	0	11
					PM Peak	Eqn	NA	140	17%	24	54%	13	11	0	11	83%	116	25%	63	53	0	53
	826	Specialty Retail Center	54,600	SF	AM Peak	NA	NA	0	--	--	9%	--	--	0	0	--	--	14%	--	--	0	0
					PM Peak	Eqn	34%	153	44%	67	10%	7	60	20	40	56%	86	7%	9	77	26	51
Buildings 05-07	820	Shopping Center	103,100	SF	AM Peak	0.96	50%	99	62%	61	9%	5	56	28	28	38%	38	14%	3	35	18	17
					PM Peak	Eqn	34%	612	48%	294	10%	30	264	90	174	52%	318	7%	32	286	97	189
Outparcels	841	Automobile Sales	30,000	SF	AM Peak	1.92	NA	58	75%	44	9%	4	40	0	40	25%	14	14%	1	13	0	13
					PM Peak	2.62	NA	79	40%	32	10%	3	29	0	29	60%	47	7%	5	42	0	42
	881	Pharmacy/Drugstore with Drive-Through Window	13,000	SF	AM Peak	3.45	NA	45	52%	23	9%	2	21	0	21	48%	22	14%	2	20	0	20
					PM Peak	9.91	33%	129	50%	65	10%	7	58	19	39	50%	64	7%	6	58	19	39
	912	Drive-In Bank	4,000	SF	AM Peak	12.08	29%	48	57%	27	20%	5	22	6	16	43%	21	20%	4	17	5	12
					PM Peak	24.30	35%	97	50%	49	33%	16	33	12	21	50%	48	46%	16	32	11	21
	931	Quality Restaurant	9,000	SF	AM Peak	NA	NA	0	--	--	20%	--	--	0	0	--	--	20%	--	--	0	0
					PM Peak	7.49	33%	67	67%	45	33%	15	30	10	20	33%	22	46%	7	15	5	10
	933	Fast-Food Restaurant without Drive-Through Window	3,000	SF	AM Peak	43.87	49%	132	60%	79	20%	16	63	31	32	40%	53	20%	10	43	21	22
					PM Peak	26.15	50%	78	51%	40	33%	13	27	14	13	49%	38	46%	12	26	13	13
	934	Fast-Food Restaurant with Drive-Through Window	3,000	SF	AM Peak	45.42	49%	136	51%	69	20%	14	55	27	28	49%	67	20%	13	54	26	28
					PM Peak	32.65	50%	98	51%	50	33%	16	34	17	17	49%	48	46%	16	32	16	16
	937	Coffee/Donut Shop with Drive-Through Window	2,000	SF	AM Peak	100.60	49%	201	51%	103	20%	20	83	41	42	49%	98	20%	19	79	39	40
					PM Peak	42.80	50%	86	50%	43	33%	14	29	15	14	50%	43	46%	14	29	15	14
	946	Gasoline/Service Station with Convenience Market and Car Wash	11	pumps	AM Peak	11.84	62%	130	51%	66	9%	6	60	37	23	49%	64	14%	6	58	36	22
					PM Peak	13.86	56%	152	51%	78	10%	8	70	39	31	49%	74	7%	7	67	38	29
Event Center		*	43	spaces	AM Peak	2.00	NA	86	50%	43	0%	0	43	0	43	50%	43	0%	0	43	0	43
					PM Peak	2.00	NA	86	50%	43	0%	0	43	0	43	50%	43	0%	0	43	0	43
Multi-Family	230	Residential Condominium/Townhouse	55	units	AM Peak	Eqn	NA	32	17%	5	0%	0	5	0	5	83%	27	22%	0	27	0	27
					PM Peak	Eqn	NA	37	67%	25	68%	17	8	0	8	33%	12	67%	8	4	0	4
TOTALS					AM Peak			1,493		852		112	740	245	495		641		77	564	204	360
					PM Peak			2,952		1,413		215	1,198	417	781		1,539		253	1,286	428	858

TRIP DISTRIBUTION

Separate trip distributions were developed for the retail, office, and residential land uses based on locations of nearby residential land uses and regional population.

The residential trip distribution was primarily based on turning movement count data at Hawthorn Boulevard, Hull Drive, and Cottswold Drive (existing residential subdivision).

Table 5: Primary Trip Distributions

	Retail	Office	Residential
To/from south on US 23 (incl. Pollock, Braumiller, etc.)	25%	50%	40%
To/from south on SR 315	10%	10%	10%
To/from north on US 23	35%	25%	30%
To/from north on Stratford Road	12%	5%	10%
To/from Hawthorne Boulevard	10%	4%	-
To/from Delaware Plaza	-	3%	5%
To/from Hull Drive (west leg)	2%	1%	-
To/from Cottswold Drive (west leg)	5%	2%	-

Pass-by trips were based on existing traffic volumes at the US 23/Delaware Plaza intersections and on Stratford Road. This included trips to/from Delaware Plaza to the new development.

Table 6: Pass-By Trip Distributions

	AM Peak	PM Peak
US 23 northbound	28%	41%
Northbound left turns into Delaware Plaza	1%	2%
US 23 southbound	55%	35%
Southbound right turns into Delaware Plaza	2%	5%
Eastbound left turns from Delaware Plaza	1%	6%
Eastbound right turns from Delaware Plaza	1%	3%
Stratford Road northbound	5%	5%
Stratford Road southbound	7%	3%

Using the background traffic and trip generation and distribution, turning movement volumes were developed and can be seen as **Figures 3-4**. Draft certified traffic for this proposed development, pending approval by ODOT Office of Statewide Planning & Research, can be found in Appendix A. It should be noted that the volumes in Appendix A were developed for an earlier iteration of the site plan containing a different access configuration on US 23. The volumes shown on Figures 3-4 represent the most current site layout.

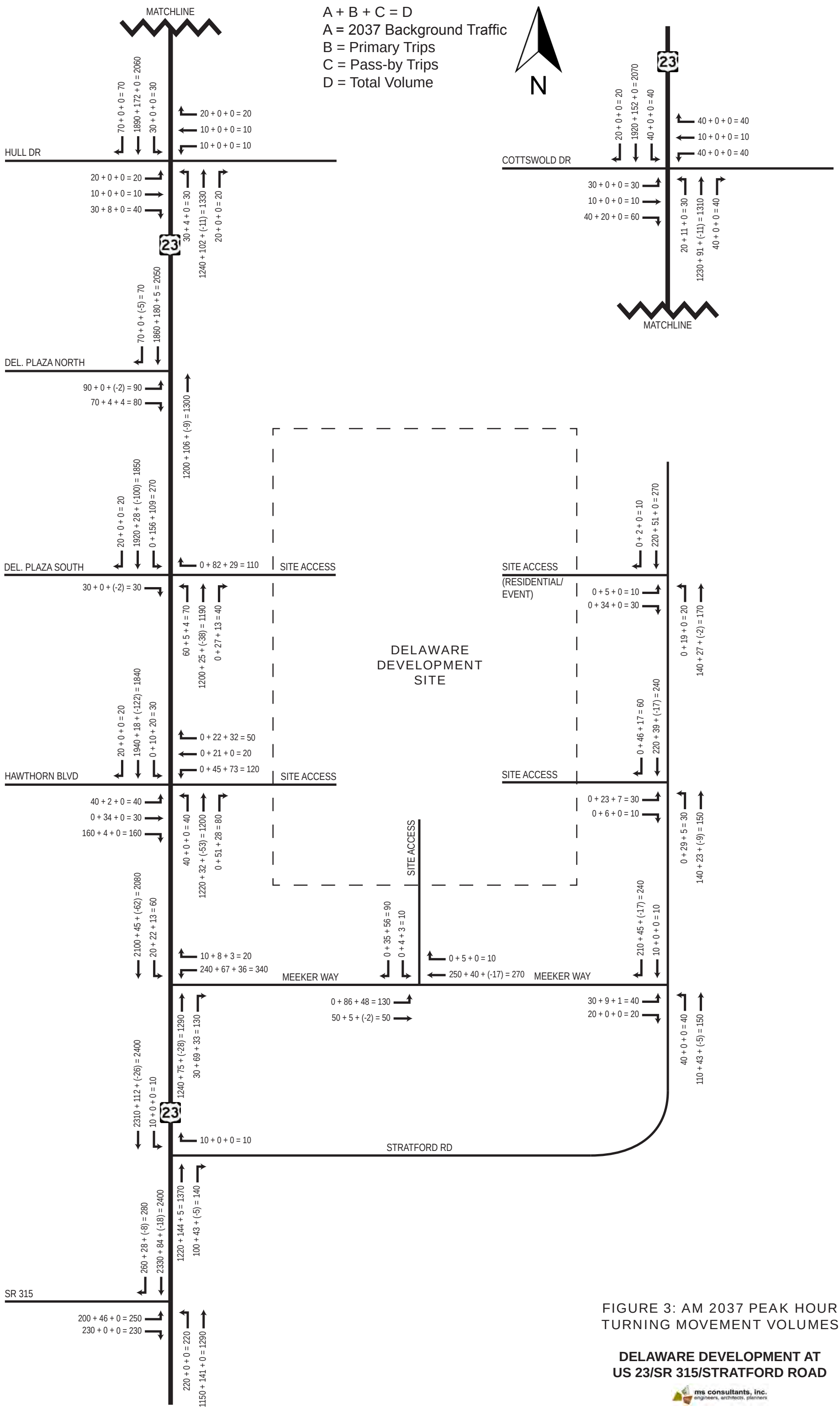

FIGURE 3: AM 2037 PEAK HOUR TURNING MOVEMENT VOLUMES

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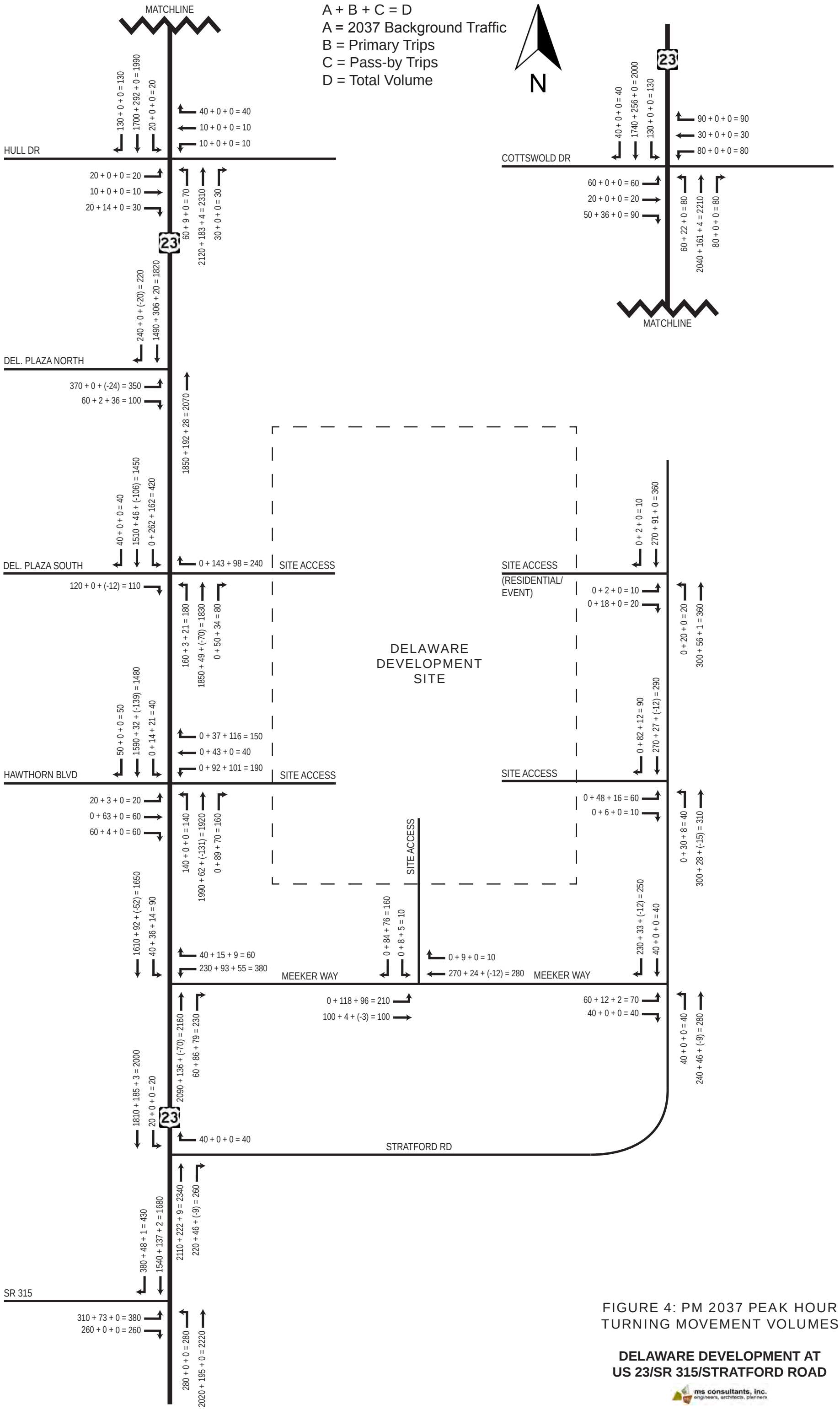

FIGURE 4: PM 2037 PEAK HOUR
TURNING MOVEMENT VOLUMES

DELAWARE DEVELOPMENT AT
US 23/SR 315/STRATFORD ROAD

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TRAFFIC ANALYSES

This section provides a summary of the traffic analyses. First, the site access configurations were analyzed to determine the configuration that resulted in the least amount of delay along US 23. Then, analyses were performed at each of the study area intersections to determine if a signal is warranted, the turn lanes needs, and capacity requirements.

US 23 Alternatives Analysis

Synchro/SimTraffic was used to analyze various site access configurations on US 23 between Meeker Way and the Delaware Plaza Drive North. Due to the close spacing of the signals, modeling software was utilized to confirm that the new site access points would allow this section of th US 23 signal system to operate efficiently. Four access alternatives between SR 315 and Cottswold Drive in addition to the No-Build condition were compared to determine the site drive configuration that would result in the fewest delays to through US 23 traffic. The four alternatives analyzed are listed below:

- Alternative A: Full site access at Delaware Plaza (DP) South
- Alternative B: Partial site access at DP North & DP South
- Alternative C: Full site access at Hawthorn Boulevard
- Alternative D: Inbound site access at DP South; Outbound site access at DP North

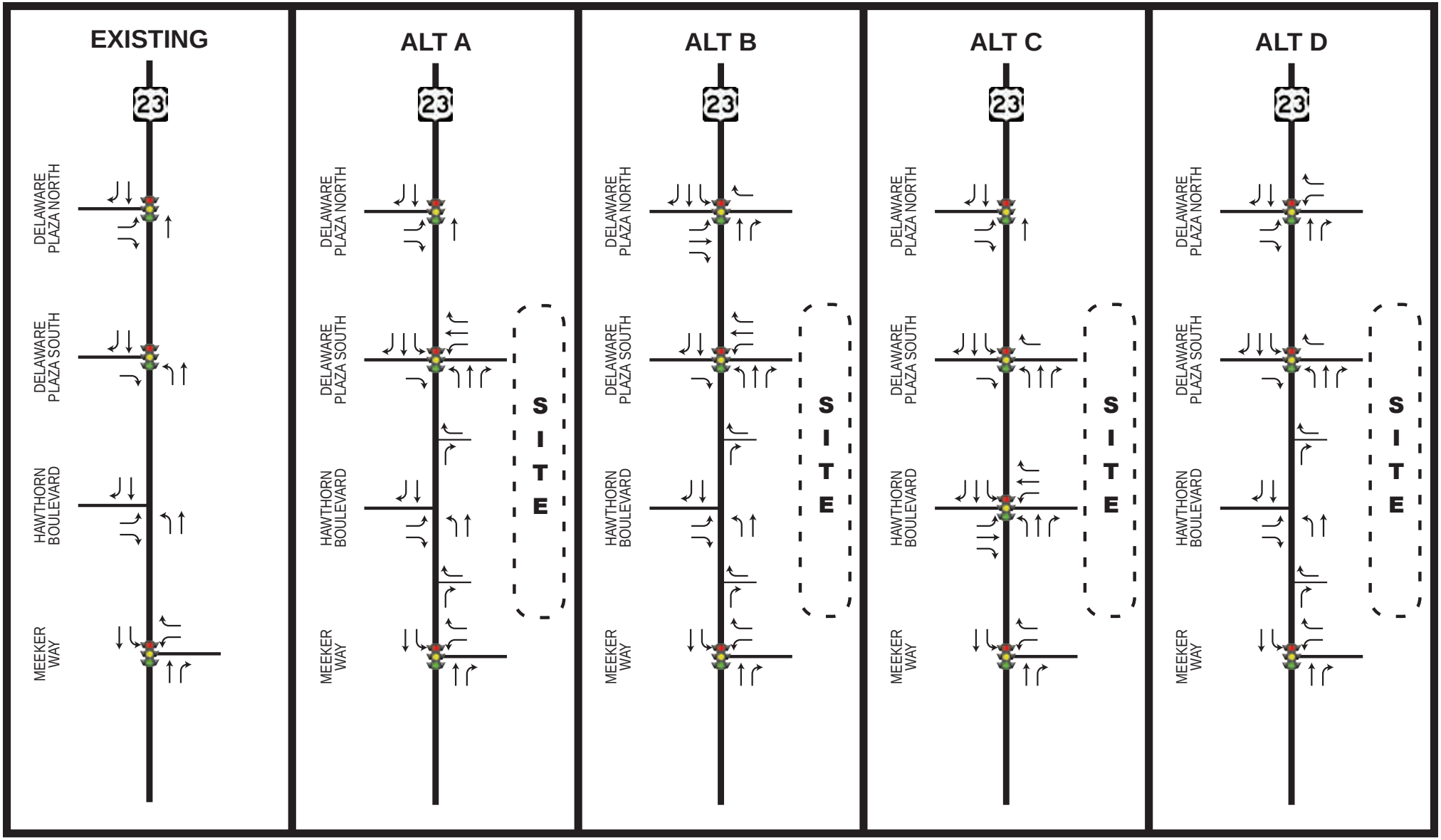
Figure 5 shows a brief summary of each alternative. A summary of the analyses, including SimTraffic simulations can be found in **Appendix C**.

Based on these results, Alternative C was selected as the preferred access configuration for US 23 as it has the lowest overall delays on US 23 and does not have any predicted queues that would spill into adjacent intersections. A summary of the improvements made with Alternative C can be found below:

- No changes to DP North signal
- Left-in/right-out site access at DP South signal
    - Signal remains 2-phase (NB-SB through phase, NBLT/SBLT/EBRT/WBRT phase)
    - No east/west through movements permitted
- Full movement driveway opposite Hawthorn Boulevard
    - 3 approach lanes (L, T, R on east & west legs)
    - Westbound protected-permissive left turn phase
    - Southbound left turns permitted, but no protected southbound left turn signal phase
- No right-in/right-outs (or any unsignalized access points) on US 23

Recommended Alternative Traffic Analyses

Traffic analyses were performed for the recommended alternative and other site access drives. Analyses included signal warrants, turn lane warrant, and capacity analyses. These are summarized for each intersection. The signal warrant analyses followed the procedure outlined in the Ohio Manual of Uniform Traffic Control Devices (OMUCD). The turn lane warrant analyses for unsignalized intersection followed the procedure outline in the Delaware County and City of Delaware *Traffic Impact Study (TIS) Standards*



Allowable movements shown

Signalized intersection

N

FIGURE 5: SITE ACCESS ALTERNATIVES

DELAWARE DEVELOPMENT AT US 23/SR 315/STRATFORD ROAD

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manual. For signalized intersections, turn lane requirements were determined by capacity needs using Highway Capacity Software (HCS 2010).

HCS 2010 was used to analyze all the study intersections of the recommended alternative. The intersections were analyzed in the Design Year (2037) for both the No-Build and Build conditions. The analysis reports are included in **Appendix D**. The following criteria were used in determining whether an intersection would be degraded by the proposed development:

- LOS D or better is acceptable for intersections and for approaches
- LOS E is acceptable for individual movements

US 23/SR 315

This intersection is predicted to operate at LOS E in the No-Build condition AM peak hour. This includes several LOS F movements, such as the northbound left turn and southbound through movements. The Build condition is predicted to increase delay by 1.4 seconds per vehicle in the AM peak hour. In the safety study (DEL-23-8.77) that recommended the upgrades at the intersection, LOS E operation was predicted even with the improvements currently under construction. Therefore, it is not unexpected that this project results in LOS E in both the No-Build and Build conditions. The only improvements that could be made to improve operations would be to add a third lane in both directions on US 23. However, due to the close proximity of the bridge to the south, this improvement is out of scope for this development. Therefore, no improvements are recommended at this intersection.

Table 7: Lane Configuration and LOS for US 23/SR 315

	Lane Configuration				**LOS & Average Delays** (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	L,T,T	T,T,R	L,L,R	--	E* 70.5	C 31.5
2037 Build	L,T,T	T,T,R	L,L,R	--	E** 71.9	D*** 39.3

*LOS F – NBLT and SB approach, LOS E – EB approach
**LOS F – NBLT, SB approach and EB approach
***LOS F – SBT, LOS E – EBLT

US 23/Stratford Road

At this unsignalized intersection, the No-Build LOS is predicted to operate at LOS D for the stopped Stratford Road approach. In the Build condition, the stopped approach is predicted to operate at LOS E. For an unsignalized, stopped approach, LOS E is not unexpected. Also, if the delays become too long, drivers could divert to the US 23/Meeker Way signal.

Table 8: Lane Configuration and LOS for US 23/Stratford Road

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	T,T,R	L,T,T,T	--	R	B* 14.2	D* 28.9
2037 Build	T,T,R	L,T,T,T	--	R	C* 15.4	E* 35.9

*Unsignalized intersection – delays shown are for worst approach

US 23/Meeker Way

In the No-Build condition, the US 23/Meeker Way signal is predicted to operate with an acceptable level of service, however the northbound through movement operates at LOS F due to a v/c of 1.028. In the Build condition, both peak hours operate with an acceptable level of service, except the northbound through movement in the PM peak with a v/c of 1.083. The DEL-23-8.77 Safety Study predicted that the 2035 level-of-service for the intersection would be LOS E in both peak hours. The Build condition is not causing the northbound US 23 movement to degrade to LOS F. Furthermore, there are no practical turn lane additions that could improve operations. A northbound through lane could improve the operation. However, adding a third northbound through lane would only cause confusion and geometric issues at the downstream intersection. Therefore, no capacity improvements are recommended.

Table 9: Lane Configuration and LOS for US 23/Meeker Way

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	T,T,R	L,T,T	--	L,L,R	C 29.5	C* 31.4
2037 Build	T,T,R	L,T,T	--	L,L,R	C 31.4	D** 42.5

*LOS F – NBT
**LOS F – NBT, LOS E – WB approach

US 23/Hawthorn Boulevard

In the No-Build condition, this intersection is unsignalized and a three-legged intersection. In the recommended Build condition, a fourth leg will be added to the intersection to allow access to the proposed site. A signal warrant analysis was performed to determine if the site traffic would trigger the need for signalized access.

Projected traffic volumes were compared to the signal warrant criteria in the Ohio Manual of Uniform Traffic Control Devices (OMUTCD). US 23 volumes were taken from the most recent ODOT 24-hour count (May 21, 2015). A copy of this count can be found in **Appendix E**. For the minor street approach, traffic from the site drive had the higher volume than the Hawthorn Boulevard volumes and was therefore used in the signal warrant analysis. The hourly shopping center distribution (Land Use 820) from the ITE *Trip*

Generation Manual, 9th Edition was used to distribute the exiting trips from the proposed development to determine if a signal warrant was met. Twelve hours of the eight hour warrant were met for Warrant 1, Condition B. Therefore, it is recommended that a signal be installed at this location. A copy of the signal warrant can be found in Appendix E.

Based on the warranted signal, turn lane requirements were determined using HCS. In the Build condition, a northbound right turn lane and a southbound left turn lane will be added. Additionally, the eastbound and westbound approaches will be configured to have left, through, and right turn lanes. The southbound left turn lane will not have a protected phase, as southbound vehicles will have other opportunities to turn left into the site (Delaware Plaza South and Meeker Way). The eastbound and westbound left turn lanes will be aligned so that the left turns can run without protected-only phasing. This lane configuration will require the removal of the existing median on Hawthorn Boulevard to allow for the eastbound and westbound left turn lanes to align directly opposite of each other.

Table 10: Lane Configuration and LOS for US 23/Hawthorn Boulevard

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	L,T,T	T,T,R	L,R	--	F* 88.6	F* 96.2
2037 Build	L,T,T,R	L,T,T,R	L,T,R	L,T,R	D** 40.3	D*** 44.1

*Unsignalized intersection – delays shown are for worst approach
**LOS F – SBT, LOS E – EB approach
***LOS F – SBLT

US 23/Delaware Plaza South

The intersection is predicted to operate at LOS C in the No-Build condition and is predicted to operate at LOS C in the Build condition. In the Build condition, a fourth leg will be added to the intersection on the east side of US 23 to provide access to the proposed site. This new east leg will be a City collector road through the site connecting to Meeker Way to the south (see Figure 2). The new public road intersection will function as a left-in/right-out (LIRO). Two southbound left turn lanes will be provided, along with a northbound right turn lane and a westbound right turn lane. With this lane configuration, it will allow the signal to continue to function as a two-phase signal as it functions in the No-Build condition.

Table 11: Lane Configuration and LOS for US 23/Delaware Plaza South

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	L,L,T,T	T,T,R	R,R	--	C 29.2	C 27.5
2037 Build	L,L,T,T,R	L,L,T,T,R	R,R	R	C 27.4	C 29.4

US 23/Delaware Plaza North

There are no changes recommended for this intersection. This intersection currently operates as a left-out/right-in/right-out. The predicted LOS is acceptable in both the No-Build and Build conditions for the AM and PM peak hours.

Table 12: Lane Configuration and LOS for US 23/Delaware Plaza North

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	L,L,R	T,T	L,L,R	--	C 25.1	C 27.1
2037 Build	L,L,R	T,T	L,L,R	--	C 27.9	C 30.5

US 23/Hull Drive

A signal warrant analysis was performed at the Hull Drive intersection to determine if the site traffic would trigger the need for signalized access. Two 2-hour peak period turning movement counts were performed at this intersection and the additional projected site traffic was added to the counts. The Hull Drive volumes were at least 12 vehicles short of meeting the minor street criteria in all four peak hours. Because the four peak hours do not meet warrant criteria, it is unlikely that any other hours would the 8-hour warrant. Therefore, it is not recommended that a signal be installed at this location. A copy of the signal warrant can be found in Appendix E.

The No-Build and Build conditions were analyzed as an unsignalized intersection since a signal warrant was not met. The intersection is predicted to operate at LOS F in both the No-Build and Build conditions. The addition of the site traffic results in a 225-second increase in delay in the PM peak hour. Site traffic is predicted to only make eastbound right turns and northbound left turns, in addition to northbound and southbound through traffic. There are no recommended improvements to this intersection. It should be noted that, although not a public roadway, motorists on Hull Drive can access the signal at Delaware Plaza North to make inbound and outbound left turns from US 23.

Table 13: Lane Configuration and LOS for US 23/Hull Drive

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	L,T,T,R	L,T,T,R	LTR	L,TR	F* 192.6	F* 470.4
2037 Build	L,T,T,R	L,T,T,R	LTR	L,TR	F* 311.9	F* 694.8

*Unsignalized intersection – delays shown are for worst approach

US 23/Cottswold Drive

This intersection is predicted to operate at an acceptable LOS in the No-Build condition, except for the southbound through movement in the AM peak and the northbound through movement in the PM peak. In the Build condition, the PM peak degrades to an LOS E. In order to mitigate this degradation, it is recommended to align the northbound and southbound left turn lanes and allow for protected/permissive operation. This improvement would mitigate the intersection delay back to a LOS D. This mitigation would not eliminate the LOS F on the US 23 through movements.

Table 14: Lane Configuration and LOS for US 23/Cottswold Drive

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	L,T,T,R	L,T,T,R	L,TR	L,TR	C* 35.3	D** 44.1
2037 Build	L,T,T,R	L,T,T,R	L,TR	L,TR	D* 37.3	E*** 63.7
2037 Build w/Impr.	L,T,T,R	L,T,T,R	L,TR	L,TR	D* 35.2	D** 50.9

*LOS F – SBT
**LOS F – NBT, LOS E – EB and WB approaches and SBLT
***LOS F – NBT, SBLT, SBT and WBLT, LOS E – EB and WB approaches

Meeker Way/Site Access

This intersection is a full movement access to the City collector road running north-south through the development on Meeker Way, east of US 23. The southbound approach is stopped, while Meeker Way is free-flow. Turn lane warrant analysis was performed for this unsignalized intersection. Copies of the turn lane warrant graphs can be found in **Appendix F**. As shown in **Table 15**, an eastbound left turn lane is warranted and therefore will be included in the Build condition analyses.

Table 15: Turn Lane Warrant Summary for Meeker Way/Site Access

		No-Build	Build
Meeker Way/Site Access	EBLT	--	YES
	WBRT	--	NO

The predicted LOS at this intersection is acceptable with two lanes on the spine road, one inbound and one outbound.

Table 16: Lane Configuration and LOS for Meeker Way/Site Access

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	--	--	--	--	--	--
2037 Build	--	LR	L,T	TR	B* 11.3	B* 12.6

*Unsignalized intersection – delays shown are for worst approach

Meeker Way/Stratford Road

Turn lane warrant analysis was performed for this unsignalized intersection. Copies of the turn lane warrant graphs can be found in Appendix F. As shown in **Table 17**, a northbound left turn lane and a southbound right turn lane are warranted based on the No-Build volumes. Therefore, the developer will not be responsible for constructing them. The developer will be responsible for any difference in turn lane length based on ODOT L&D turn lane sizing. The developer will construct an eastbound left turn lane. This is due to the taper from the eastbound left turn lane onto the site access point. This turn lane will maintain a three-lane section of Meeker Way from Stratford Road to US 23.

Table 17: Turn Lane Warrant Summary for Meeker Way/Stratford Road

		No-Build	Build
Meeker Way/Stratford Road	NBLT	YES	YES
	SBRT	YES	YES

This intersection was analyzed with a northbound left-through lane, a southbound through-right lane, an eastbound left turn lane, and an eastbound right turn lane in the Build condition. With the addition of site traffic and the eastbound left turn lane, the Build condition will add 1 second of delay to the intersection. The intersection is predicted to operate at LOS B in both the AM and PM peak hours in both conditions.

Table 18: Lane Configuration and LOS for Meeker Way/Stratford Road

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	LT	TR	LR	--	B* 10.3	B* 12.2
2037 Build	LT	TR	L,R	--	B* 10.7	B* 12.5

*Unsignalized intersection – delays shown are for worst approach

Stratford Road/South Site Access

Two access locations are planned for Stratford Road. The south site access from the Stratford Road will be a private drive into the development, providing access to the City collector road through the center of

the site. This access drive will have two lanes, one inbound and one outbound. Turn lane warrant analysis was performed for this unsignalized intersection. Copies of the turn lane warrant graphs can be found in Appendix F. As shown in **Table 19,** a northbound left turn lane and a southbound right turn lane are warranted based on the No-Build volumes.

Table 19: Turn Lane Warrant Summary for Stratford Road/South Site Access

		No-Build	Build
Stratford Road/South Site Access	NBLT	--	YES
	SBRT	--	YES

The south site access point is predicted to operate acceptably in the Design Year with the northbound left turn lane, southbound right turn lane, and single outbound lane.

Table 20: Lane Configuration and LOS for Stratford Road/S. Site Access

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	--	--	--	--	--	--
2037 Build	L,T	T,R	LR	--	B* 11.9	C* 16.2

*Unsignalized intersection – delays shown are for worst approach

Stratford Road/North Site Access

The north site drive will provide access to the event center and multi-family residences. This drive will also access the City collector road through the center of the site. This access drive will have two lanes, one inbound and one outbound. Turn lane warrant analysis was performed for this unsignalized intersection. Copies of the turn lane warrant graphs can be found in Appendix F. As shown in **Table 21**, a northbound left turn lane is warranted based on the No-Build volumes.

Table 21: Turn Lane Warrant Summary for Stratford Road/North Site Access

		No-Build	Build
Stratford Road/North Site Access	NBLT	--	YES
	SBRT	--	NO

The north site access point is predicted to operate acceptably in the Design Year with the northbound left turn lane and single outbound lane.

Table 22: Lane Configuration and LOS for Stratford Road/N. Site Access

	Lane Configuration				LOS & Average Delays (in sec/veh)	
	NB	SB	EB	WB	AM	PM
2037 No-Build	--	--	--	--	--	--
2037 Build	L,T	T,R	LR	--	B* 10.8	B* 12.8

*Unsignalized intersection – delays shown are for worst approach

TURN LANE SIZING

Turn lane sizing was calculated for the warranted turn lanes for stop-controlled intersections (No-Build and Build conditions), as well as turn lanes recommended for the signal-controller intersections identified in the HCS analysis. Turn lane length was also calculated for all existing turn lanes where the proposed development would increase traffic. Calculations to size turn lanes were performed according to the procedures in the ODOT Location & Design (L&D) Manual. SimTraffic 95th percentile queue lengths are also shown for the US 23 intersections. The results of these calculations, along with recommended turn lane lengths, are shown in **Table 23**. Copies of the turn lane sizing calculation worksheets are located in Appendix F. A summary of the turn lane length requirements at each intersections is below.

US 23/SR 315

At the US 23/SR 315 intersection, the required turn lane storage lengths for the No-Build volumes exceed the No-Build condition turn lane lengths. This is due to geometry on SR 315 and proximity of the southbound left turn lane onto Pollock Road south of the intersection. Therefore, no improvements are recommended for this intersection.

US 23/Stratford Road

The proposed Build condition volumes at the US 23/Stratford Road intersection do not require lengthening of either of the existing turn lanes.

US 23/Meeker Way

The US 23/Meeker Way intersection Build condition turning movement volumes will require lengthening of several turn lanes at this intersection. The northbound right turn lane should be lengthened approximately 104' or as long as possible without impacting the culvert south of the turn lane. This work would be completed within the existing right-of-way. The southbound left turn lane should be lengthened by 35'. This can be done within the existing median. The westbound left turn lane should be lengthened to include a combined 475' of storage. Lengthening the westbound left turn lane is not expected to impact the recently constructed culvert on Meeker Way east of US 23.

US 23/Hawthorn Boulevard

At the US 23/Hawthorn Boulevard intersection, several turn lanes will need to be constructed and lengthened due to the Build condition volumes and the addition of the east leg of the intersection. The

Table 23: Turn Lane Sizing Summary

		No-Build		Build		SimTraffic 95th Percentile	Existing Length	**Recommended Length**
		L&D	No-Block	L&D	No-Block			
US 23/ SR 315	NBLT	539’	1095’	539’	1175’	323’	250’	**Existing**
	SBRT	639’	1225’	689’	1250’	443’	821’	**Existing**
	EBLT	400’*	350’	475’*	350’	374’	321’*	**Existing**
	EBRT	514’	250’	514’	275’	217’	145’	**Existing**
US 23/ Stratford Rd	NBRT	285’	N/A	285’	N/A	--	265’	**Existing**
	SBLT	285’	N/A	285’	N/A	--	285’	**Existing**
US 23/ Meeker Way	NBRT	285’	1125’	489’	1150’	401’	385’	**489’**
	SBLT	285’	1125’	314’	1125’	219’	279’	**314’**
	WBLT	325’*	100’	475’*	100’	302’	382’*	**382’***
	WBRT	150’	175’	150’	275’	110’	241’	**Existing**
US 23/ Hawthorn Blvd	NBLT	285’	N/A	364’	1035’	189’	300’	**364’**
	NBRT	N/A	N/A	414’	1035’	72’	--	**414’**
	SBLT	N/A	N/A	285’	1005’	124’	--	**285’**
	SBRT	285’	N/A	285’	1005’	209’	325’	**Existing**
	EBLT	100’	N/A	150’	100’	51’	--	**150’**
	EBRT	200’	N/A	300’	100’	68’	125’	**Existing**
	WBLT	N/A	N/A	325’	100’	209’	--	**325’**
	WBRT	N/A	N/A	250’	100’	189’	--	**250’**
US 23/ Delaware Plaza South	NBLT	250’*	1005’	250’*	1005’	118’	430’*	**Existing**
	NBRT	N/A	N/A	314’	1005’	36’	--	**314’**
	SBLT	N/A	N/A	500’*	1005’	224’	--	**500’***
	SBRT	285’	1035’	285’	1005’	22’	320’	**Existing**
	EBRT	175’*	N/A	175’*	N/A	112’	280’*	**Existing**
	WBRT	N/A	N/A	489’	N/A	256’	--	**300’**

Unless otherwise stated, all turn lane lengths include 50’ drop taper.
*Double left turn lane; combined storage length of both turn lanes shown

Table 23 continued

		No-Build		Build		SimTraffic 95th Percentile	Existing Length	**Recommended Length**
		L&D	No-Block	L&D	No-Block			
US 23/ Delaware Plaza North	SBRT	489’	1005’	489’	1125’	233’	315’	**Existing**
	EBLT	475’*	150’	450’*	175’	229’	400’*	**Existing**
	EBRT	314’	275’	339’	250’	101’	200’	**Existing**
US 23/ Hull Dr	NBLT	285’	N/A	285’	N/A	--	315’	**Existing**
	NBRT	285’	N/A	285’	N/A	--	150’	**Existing**
	SBLT	285’	N/A	285’	N/A	--	160’	**Existing**
	SBRT	285’	N/A	285’	N/A	--	310’	**Existing**
	WBLT	100’	N/A	100’	N/A	--	140’	**Existing**
US 23/ Cottswold Dr	NBLT	285’	1095’	314’	1175’	191’	375’	**Existing**
	NBRT	314’	1095’	314’	1175’	203’	375’	**Existing**
	SBLT	364’	1035’	364’	1125’	226’	475’	**Existing**
	SBRT	285’	1035’	285’	1125’	52’	215’	**Existing**
	EBLT	150’	150’	150’	175’	101’	225’	**Existing**
	WBLT	200’	175’	200’	175’	113’	150’	**Existing**
Meeker Way/ Site Access	EBLT	N/A	N/A	225’	N/A	--	--	**138’**
Stratford Rd/ Meeker Way	NBLT	175’	N/A	175’	N/A	--	--	**175’**
	SBRT	300’	N/A	325’	N/A	--	--	**325’**
	EBLT	--	--	150’	N/A	--	--	**150’**
Stratford Rd/ Site Access South	NBLT	N/A	N/A	175’	N/A	--	--	**175’**
	SBRT	N/A	N/A	225’	N/A	--	--	**225’**
Stratford Rd/ Site Access North	NBLT	N/A	N/A	175’	N/A	--	--	**175’**

Unless otherwise stated, all turn lane lengths include 50’ drop taper.
*Double left turn lane; combined storage length of both turn lanes shown

northbound left turn lane should be extended by 64' to meet the 364' ODOT L&D left turn length recommendations. A 414' northbound right turn lane and a 285' southbound left turn lane should be constructed on US 23 to access the new site drive. The eastbound approach on Hawthorn Boulevard is recommended to be reconfigured to add a 150' left turn lane and a 125' right turn lane, in addition to a dedicated through lane. This lane configuration will require the removal of the existing median on Hawthorne Boulevard to allow the eastbound and westbound left turn lanes to align directly opposite of each other. Although the ODOT L&D requires an eastbound right turn lane length of 300', the predicted SimTraffic 95th-percentile queue lengths on this approach are less than 100'. Thus, the shorter length will operate effectively and will fit within the existing pavement, avoiding impacts to the existing subdivision. The westbound approach, which will be a new City roadway through the planned development, should have a 325' left turn lane and a 250' right turn lane, in addition to a dedicated through lane. This road should be designed with at least 400' between the westbound stop bar at US 23 and the first interior site intersection.

US 23/Delaware Plaza South

The US 23/Delaware Plaza South intersection is proposed to have a City road into the site added as the east leg of the intersection. Double southbound left turn lanes should be constructed into the site with a combined 500' of storage length. A 314' northbound right turn lane into the site should be constructed. The westbound approach will only allow right turns for vehicles exiting the development, and the turn lane should provide at least 300' of uninterrupted storage length. This is shorter than the L&D sizing which recommends 489', however SimTraffic queues are less than 300' which indicates that this turn lane will operate acceptably. This approach only allows right turns and will allow right-turn-on-red, which will also reduce the storage length requirements.

US 23/Delaware Plaza North

At the US 23/Delaware Plaza North intersection, the Build condition volumes are not predicted to cause a need for increased turn lane lengths, except at the eastbound right turn lane. However, SimTraffic 95th percentile queues show that the queues do not exceed 100', which is less than the existing turn lane length. Therefore, no improvements recommended.

US 23/Hull Drive

The Build condition volumes at the US 23/Hull Drive intersection are not predicted to increase the turn lane lengths at the intersection. Therefore, no improvements recommended.

US 23/Cottswold Drive

At the US 23/Cottswold Drive intersection, the Build condition volumes trigger an increase in the ODOT L&D turn lane size for the northbound left turn lane. However, the existing turn lane length is longer than the proposed Build condition length. Therefore, no improvement is necessary to the northbound left turn lane length.

Meeker Way/Site Access
The Build condition volumes warrant an eastbound left turn lane at the City road intersection on Meeker Way. ODOT L&D recommends the turn lane to be 225'. However, it is recommended that the developer only build it for 138' (including tapers) in order to provide the full westbound left turn lane storage length at the US 23/Meeker Way intersection.

Meeker Way/Stratford Road
At the Meeker Way/Stratford Road intersection, a northbound left turn lane and a southbound right turn lane are warranted in both the No-Build and Build conditions. ODOT L&D turn lane sizing shows that the increase in traffic in the Build condition would require the southbound right turn lane to be extended by 25'. An estimate of $225 per lane-foot has been assumed for the developer to contribute towards a future extension of the southbound right turn lane. The developer will pay $5625 towards this turn lane. The developer will construct a 150' eastbound left turn lane.

Stratford Road/South Site Access
The Build condition traffic volumes at the Stratford Road/South Site Access trigger a need for a 175' northbound left turn lane and a 225' southbound right turn lane to access the south site driveway.

Stratford Road/North Site Access
Build condition traffic volumes trigger a need for a 175' northbound left turn lane to access the south site driveway.

US 23
The section of US 23 between Meeker Way and Hawthorne Boulevard and Hawthorn Boulevard and Delaware Plaza South has four existing median breaks that should be closed with the construction of this project. The developer should remove these four existing median break during construction.

Stratford Road
The section of Stratford Road between the north site access and the south site access will be widened to three lanes, due to the turn lane lengths and tapers between them. The substandard curve that is located between the two driveways will also be rebuilt to meet 45-mph design criteria.

RECOMMENDATIONS

This document evaluated the impacts of the proposed Delaware Development mixed-use development located north of the US 23/SR 315/Stratford Road intersection. The development includes retail, office, single-family, and multi-family uses. The development will have five access points, at US 23/Delaware Plaza South, at US 23/Hawthorn Boulevard, Meeker Way, and two accesses on Stratford Road.

The proposed development, in conjunction with the recommended roadway improvements, would provide the similar Design Year traffic operations as the No-Build condition. The improvements recommended in this TIS will successfully mitigate the impact of the development on the study area roadway network.

The following is a list of recommended improvements at each intersection within the study area:

US 23/SR 315

- No improvements recommended

US 23/Stratford Road

- No improvements recommended

US 23/Meeker Way

- Lengthen northbound right turn lane as long as possible (104') without impacting the culvert
- Lengthen southbound left turn lane by 35'
- Lengthen westbound double left turn lane storage length by 93'

US 23/Hawthorn Boulevard

- Install traffic signal
    - Signal phasing should include protected-permissive left turn movements for northbound and westbound movements only
- Lengthen northbound left turn lane by 64'
- Construct 414' northbound right turn lane
- Construct 285' southbound left turn lane
- Remove median on eastbound approach and construct 150' left turn lane, through lane, and 125' right turn lane
- Construct westbound approach with 325' left turn lane, through lane, and 250' right turn lane
    - Provide 400' between stop bar and first interior site intersection

US 23/Delaware Plaza South

- Construct double southbound left turn lanes with combined 500' of storage length
- Construct 314' northbound right turn lane
- Construct westbound right turn lane with 300' of storage prior to first site driveway
- Modify signal to allow for southbound left turn/westbound right turn phase to overlap with existing northbound left turn/eastbound right turn phase

US 23/Delaware Plaza North

- No improvements recommended

US 23/Hull Drive

- No improvements recommended

US 23/Cottswold Drive

- Align northbound and southbound left turn lanes
- Modify signal to allow for protected-permissive northbound-southbound left turn phases

Meeker Way/Site Access

- Construct 138' eastbound left turn lane

Meeker Way/Stratford Road

- Contribution towards future extension of southbound right turn lane ($5625)
- Construct 150' eastbound left turn lane

Stratford Road/S. Site Access

- Construct 175' northbound left turn lane
- Construct 225' southbound right turn lane

Stratford Road/N. Site Access

- Construct 175' northbound left turn lane

US 23

- Close four median breaks between Meeker Way and Delaware Plaza South

Stratford Road

- Widen to accommodate three-lane section between north and south site drives
- Modify substandard curve for 45-mph design speed.

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