CIVIL ENGINEERING / SURVEYING / UTILITIES

Traffic Impact Study

OCTOBER 24, 2025

East Village

Lee's Summit, Missouri

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1.0 INTRODUCTION

This traffic impact study has been prepared for the East Village development, located in the southeast quadrant of the US-50 Highway (US-50) and M-291 Highway (M-291) interchange in Lee's Summit, Missouri. The site is bounded by M-291 to the west, a railroad to the east, and 16th Street to the south. The location of the development is shown in **Figure 1** in the Appendix.

The purpose of this study is to identify and address the impacts of the proposed development on the surrounding street network and intersections. The study was prepared in accordance with the City of Lee's Summit Access Management Code and the Missouri Department of Transportation (MoDOT) Engineering Policy Guide.

The study includes the following components:

- Existing Conditions: Review of existing roadway characteristics and traffic volumes from July 2025.
- Base Conditions: Incorporation of the full development traffic approved for the Oldham Village "West" Traffic Impact Study (dated August 2024) prepared by Kimley-Horn.
- Trip Generation: Estimation of trip generation rates based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, by development phase. A supplemental trip generation recommendation from Kittelson & Associates was incorporated for the Warehouse Retailer land use. Kittelson evaluated more than 40 comparable Warehouse Retailer sites to provide a more accurate estimate than the standard ITE rates.
- Trip Distribution and Assignment: Determination of trip distribution and assignment by project phase, including:
    - *Phase 1:* Oldham Parkway North
    - *Phase 2:* Bailey Road North
    - *Phase 3:* 16th Street North = Full Development
- Traffic Operations Analysis: Evaluation of traffic impacts from the proposed development on the surrounding street network, including peak-hour levels of service (LOS), delay times, and 95th-percentile queue lengths.
- Site Access Review: Assessment of proposed access points relative to the City's Access Management Guidelines.
- Mitigation Measures: Identification of potential roadway or traffic control improvements to address operational concerns.
- Signal Warrant Analysis: Evaluation of signal warrants for the intersections of Oldham Parkway & Intersection Node 6 and Bailey Road & Drive 8.
- Future Year Projections: Development of 2045 traffic volume projections.

A summary of the final recommendations and their phasing can be viewed in **Figure 33**.

2.0 EXISTING CONDITIONS

2.1 STUDY AREA

The East Village development is located in the southeast quadrant of the US-50 Highway (US-50) and M-291 Highway (M-291) interchange in Lee's Summit, Missouri. The site encompasses approximately 108 acres and is primarily greenfield, with the existing Zoetis Inc. building situated along Bailey Road at Pfizer Way. The parcels located along the north side of SE 16th Street are not included in the proposed development.

The site is bounded by US-50 to the north, a railroad to the east, SE 16th Street to the south, and M-291 to the west. The study area is shown in **Figure 1** in the Appendix.

In coordination with City of Lee's Summit and Missouri Department of Transportation (MoDOT) staff, the following intersections were included in the study for traffic analysis:

- M-291 & Oldham Parkway (Signalized) Node #1
- M-291 & Persels Road / Bailey Road (Signalized) Node #2
- M-291 & SE 16th Street (Right-Out) Node #3
- M-291 & Scherer Road (Signalized) Node #4
- Bailey Road & Hamblen Road (Signalized) Node #5

MoDOT previously analyzed the US-50 & M-291 interchange in 2015. That analysis included the M-291 corridor, incorporating assumptions for major commercial developments along Oldham Parkway to both the east and west of the highway.

2.2 SURROUNDING STREET NETWORK

The existing street network within the study area includes US-50, M-291, Oldham Parkway, Bailey Road, 16th Street, and a new north-south collector street through the development. The following provides a summary of the existing street network within the study area.

US-50 is a four-lane divided east-west freeway with a posted speed limit of 60mph. The US-50 and M-291 interchange was reconstructed in 2018 as a diverging diamond. The crossover on the north side of US-50 is a roundabout intersection with the crossover on the south side being signalized.

M-291 is a north-south expressway that connects Lee's Summit to Harrisonville to the south with a posted speed of 45mph. M-291 is a six-lane divided roadway north of Persels/Bailey Road and a four-lane divided highway south of Persels/Bailey Road. M-291 has 12-foot travel lanes and 10-foot paved shoulders. Access is controlled along M-291 adjacent to the study area. There is a shared use path along the west side of M-291 extending south of the interchange to Oldham Parkway.

Oldham Parkway is a 35mph commercial collector that runs northwest-southeast that functions as a frontage road along the south side of US-50. Oldham Parkway is a two-lane undivided roadway with paved shoulders. At Jefferson Street, Oldham Parkway follows an east-west alignment to M-291 with two lanes in the westbound direction, a raised median, and four lanes in the eastbound direction with curbs and gutters and a shared use path along the south side.

Bailey Road is generally a two-lane east-west minor arterial street with a posted speed of 35mph that widens to three-lanes approximately 700' east of Pfizer Way. As Bailey Road approaches the signalized intersection of M-291, it widens to four-lanes. Bailey Road east of M-291 has an existing sidewalk along the south side of the road that continues over the railroad overpass to Hamblen Road.

16th Street is a two-lane east-west local street with a posted speed of 25mph. Within the study area, 16th Street has stop-controlled right-in right-out (RIRO) access control to northbound M-291.There are no existing sidewalks along 16th Street.

The new **north-south collector** between Oldham Parkway and Bailey Road is proposed as a median divided two-lane roadway with additional left-turn lanes at intersection approaches and sidewalks on each side. Between Bailey Road and 16th Street it is proposed with a 3-lane section with a center two-way left turn lane with sidewalks on each side.

2.3 DATA COLLECTION

Peak hour traffic counts were collected at the study intersections on Thursday July 10th, Saturday July 19th, and Tuesday July 22nd of 2025. The data collected is included in the **Appendix**. The AM peak hour occurred between 7:45 AM and 8:45 AM, the PM peak hour occurred between 4:30 PM and 5:30 PM, and the Saturday peak hour occurred between 12:00 PM and 1:00 PM. The existing conditions peak hour volumes are shown in **Figure 2**.

3.0 BASE CONDITIONS

The base condition for this study were established using the preceding Oldham Village "West" Traffic Impact Study prepared by Kimley Horn in August 2024. That study included traffic counts collected in October 2022. The existing and projected peak hour traffic volumes entering and exiting Oldham Parkway and Persels Road, along with the Full Development peak hour volumes shown in Exhibit 16 of that study (Existing + Full Development Peak Hour Traffic Volumes), were utilized in this study.

This study also includes two additional M-291 intersections at 16th Street and at Scherer Road/Thompson Drive. To maintain consistency with existing M-291 traffic volumes, the northbound and southbound through volumes collected in 2025 were used.

3.1 OLDHAM VILLAGE "WEST" SITE PLAN

The Oldham Village "West" Traffic Impact Study included approximately 45 acres of development area in the southwest corner of US-50 and M-291. The Oldham Village "West" study area can be seen in **Figure 3**.

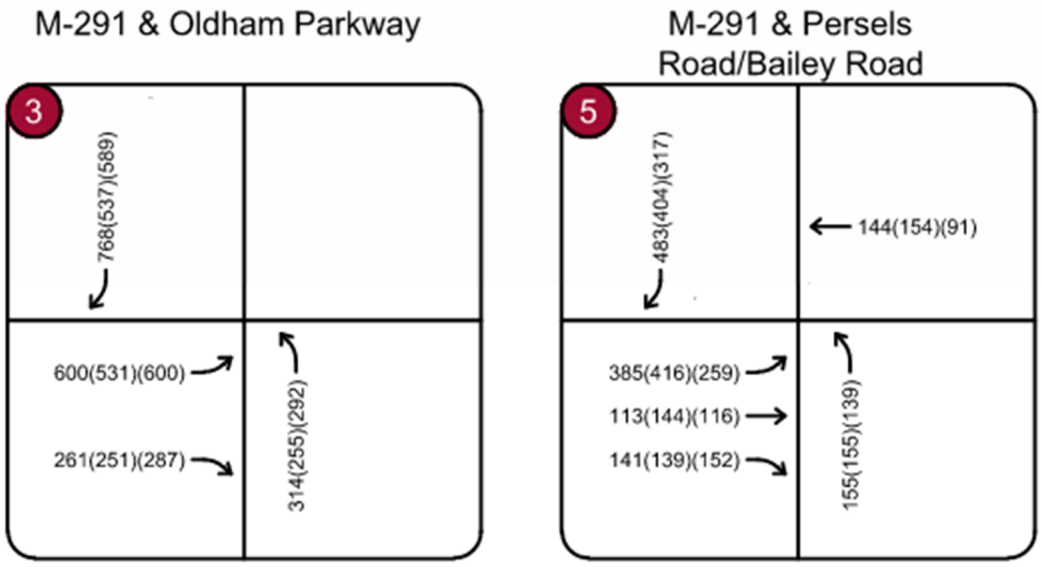
The estimated trips generated by that development were assigned to the street network based on the trip distribution summarized in **Table 1**. That distribution was based on existing traffic patterns, the surrounding street network, population density, and engineering judgement. The distributions were reported to generally follow what was used for MoDOT's analysis for the US-50 & M-291 interchange.

TABLE 1: OLDHAM VILLAGE "WEST" TRIP DISTRIBUTION

Direction To/From	Percentage
North on M-291	50%
South on M-291	20%
East on Bailey Road	5%
West on Persels Road	10%
South on Ward Road	5%
South on Jefferson Street	5%
North on Ward Road	5%
Total	**100%**

3.2 OLDHAM VILLAGE "WEST" TRIP ASSIGNMENT

The Existing + Full Development Peak Hour Traffic Volumes from Exhibit 16, from the Oldham Village "West" study were used for all entering and exiting trips to and from Oldham Parkway and Persels. These values are provided below.



The existing M-291 through volume peak hour traffic counts, collected in 2025 were, added to these volumes to establish the Base Condition Peak Hour Volumes in **Figure 4**.

3.3 BASE CONDITIONS

For this traffic study, the base conditions include the existing peak hour traffic volumes entering and exiting Oldham Parkway and Persels Road, the proposed Full Development peak hour volumes from Exhibit 16 of that study, and the M-291 through volumes collected in July 2025.

The resulting base condition peak hour volumes are shown in **Figure 4**. All subsequent traffic volume exhibits and analyses are based on these volumes.

Figure 5 illustrates the base condition geometry, lane use, and intersection control, while **Figure 6** presents the base condition 95th percentile queue lengths.

4.0 PROPOSED CONDITIONS

4.1 EAST VILLAGE: OVERALL SITE PLAN

The proposed East Village development is planned to include 22 individual lots, as shown in **Figure 7**. The project will be developed in three phases, illustrated in **Figure 8**.

Phase 1 provides access to Lot 1 which consists of a Warehouse Retailer with fueling stations. Phase 1 includes the extension of a median-divided, curbed Oldham Parkway east of M-291, with a sidewalk along the south side. Three intersections are proposed along the Oldham Parkway extension:

1. The first is an westbound right-out (RO) located approximately 300 feet east of M-291.

2. The second intersection will provide signalized access for Oldham Parkway and a new north–south collector street (Node 6) to service the development area. With Phase 1, the intersection will be constructed to its final configuration and signalized, while the south leg of the intersection will be constructed in Phase 2. Lane configurations for the second intersection are as follows:
    - West leg: 4 lanes (2 EBL, 1 EBT, 1 EBR)
    - East leg: 3 lanes (1 WBL, 1 WBT, 1 WBR)
    - North leg: 3 lanes (1 SBL, 1 SBT, 1 SBR)

3. The third intersection, located approximately 330 feet east of the second intersection, will provide access to the fueling stations for the warehouse retailer.

Phase 2 provides access to Lots 2–13, which include two multifamily housing units totaling 570 units, eight restaurants, one 14,500-square-foot strip retail plaza, and a 3.4-acre public park with a coffee kiosk. Phase 2 proposes a new north–south collector street between Oldham Parkway and Bailey Road. This street will be median-divided with curb and sidewalks on both sides, providing one lane in each direction with additional dedicated left-turn lanes at each intersection. Three intersections are proposed along this collector for internal circulation to the various lots.

Phase 2 also includes two new east–west median-divided internal streets with curb and sidewalks on both sides. These streets provide internal access from the new north–south collector to Lots 2–3 and Lots 12–13.

The new north–south collector will form a T-intersection with Bailey Road approximately 560 feet east of M-291. This intersection will be designed as a westbound RIRO, with median improvements along Bailey Road to allow an eastbound left turn. No southbound through or left-turn movements will be provided.

A second intersection with Bailey Road is also planned in Phase 2, approximately 420 feet east of the new north–south collector. This intersection will initially be constructed as a T-intersection with the south leg built in Phase 3. It will become signalized in Phase 3.

Bailey Road will be improved with Phase 2 from M-291 to the eastern project limit, including an additional eastbound through lane between M-291 and the north–south collector. The existing sidewalk on the south side of Bailey Road will be maintained.

Phase 3 provides access to Lots 14–22, which include two multifamily housing units totaling 350 units, six restaurants, and an open space area.

Phase 3 also constructs a new north–south collector street between Bailey Road and 16th Street. Five intersections are proposed along this collector for internal circulation to the various lots. The collector will be a three-lane section with a center two-way left-turn lane. The new north–south collector will form a T-intersection with 16th Street approximately 290 feet east of M-291.

In addition to the north–south collector, a second collector street with a two-way left-turn lane will connect to a signalized intersection at Bailey Road. This new traffic signal allows vehicles in Phase 3 to make a northbound left turn onto westbound Bailey Road. The signal also provides a protected U-turn movement for vehicles accessing Bailey from the western north–south collector to return to M-291.

4.2 PHASE 1: OLDHAM PARKWAY NORTH

4.2.1 PHASE 1 SITE ACCESS

Phase 1 of the site will be accessed from 3-intersections on Oldham Parkway, see **Figure 9.** Three intersection nodes, summarized below, are included with Phase 1. All access spacing distances are measured between the centerline of streets or driveways.

- Node 9: Oldham Parkway & Westbound right-out (RO)
  This access is approximately 300’ east of M-291.
- Node 6: Oldham Parkway & North/South Collector
  This access is proposed to be signalized as it functions as the primary entrance to the Warehouse Retailer to the north and to the future Oldham Village East development to the south. This access point is approximately 560’ east of M-291.
- Node 10: Oldham Parkway & Fueling Stations
  This access is approximately 330’ east of Node 6.

4.2.2 PHASE 1 TRIP GENERATION

Table 2 represents the trip generation estimate for Phase 1: Oldham Parkway North which consists of a single lot for a warehouse retailer.

As opposed to using the Institute of Transportation Engineers (ITE) land use code of 857 – Discount Club for the trip generation, the warehouse retailer provided a Trip Generation Technical Memorandum prepared by Kittelson Associates dated July 9, 2025. Kittelson maintains a transportation database for the warehouse retailer which is continually updated and was asked to provide a trip generation estimate for this proposed site. Their estimate, based on data from more than 40 similar sites, is included in **Table 2**.

TABLE 2: PHASE 1 PROPOSED TRIP GENERATION (OLDHAM PARKWAY NORTH)

#	ITE Land Use	ITE Code	Value/ Variable	Daily	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
					Total	In	Out	Total	In	Out	Total	In	Out
	Phase 1 – Oldham Parkway North												
1	Warehouse Retailer	***	161k SF	11,074	322	179	143	1094	526	568	1527	758	769
	Phase 1 Trips (unreduced)			11,704	322	179	143	1094	526	568	1527	758	769
	Phase 1 Internal Capture			0	0	0	0	0	0	0	0	0	0
	Phase 1 Pass-By Trips			0	0	0	0	318	153	165	320	159	161
	Phase 1 Primary Trips			**11,704**	**322**	**179**	**143**	**776**	**373**	**404**	**1207**	**599**	**608**

***Note: Trip generation provided from Kittelson Associates. Their technical memorandum may be found in the Appendix.

ITE provided internal capture and pass-by rates were applied to the values in **Table 2**.

For trip generation comparison to ITE values, ITE Land Use 857 – Discount Club is provided below.

#	ITE Land Use	ITE Code	Value/ Variable	Daily	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
					Total	In	Out	Total	In	Out	Total	In	Out
	Phase 1 – Oldham Parkway North												
1	Discount Club	857	161k SF	6,836	129	79	50	675	337	338	1026	503	523

The values in **Table 2** generate 4,868 more daily trips, 193 more AM peak hour trips, 101 more PM peak hour trips, and 181 more Saturday peak hour trips than estimated by ITE. The ITE values were not used for this Trip Generation.

4.2.3 PHASE 1 TRIP DISTRIBUTION AND ASSIGNMENT

For Phase 1, the estimated trips generated by the warehouse retailer were assigned to the street network based on the trip distribution summarized in **Table 3**. This distribution was developed through a review of existing traffic patterns, the available surrounding street network, the previous study, and warehouse retailer market data.

TABLE 3: PHASE 1 TRIP DISTRIBUTION

Direction To/From	Percentage
North on M-291	70%
South on M-291 south of Persels/Bailey	15%
South on M-291 and west on Persels	5%
South on M-291 and east on Bailey	10%
Total	**100%**

The Phase 1 street network, study intersections, and primary trip distribution are shown in **Figure 9**. Pass-by trip volumes from **Table 2** were applied to the Phase 1 intersections in **Figure 10**. **Figure 11** presents the total site trips generated and distributed with pass-by trips for Phase 1.

Figure 12 illustrates the Base Conditions plus Phase 1 peak hour traffic volumes, representing the addition of **Figure 4** to **Figure 11**. These peak hour volumes were used for all Base + Phase 1 analyses.

4.2.4 PHASE 1 LANE GEOMETRY AND QUEUES

The lane geometry and intersection controls for the Base + Phase 1 condition are shown in **Figure 13**. The 95th percentile queue lengths by lane group, based on analyses conducted in this study, are shown for the Base + Phase 1 condition in **Figure 14**.

4.2.5 PHASE 1 SIGNAL WARRANT ANALYSIS

A peak hour traffic signal warrant analysis was performed for the new intersection of Oldham Parkway & N/S Collector (Node 6). The peak hour volumes for Node 6 for the Base + Phase 1 condition are shown in **Figure 12**. These volumes were plotted on *Figure 4C-3, Warrant 3, Peak Hour* from the *Manual of Uniform Traffic Control Devices* (MUTCD) for the AM, PM, and Saturday peak hours. The plotted results may be seen on **Figure 15**.

Figure 15 indicates that the Peak Hour Traffic Signal Warrant is met at Node 6 during the Base + Phase 1 condition.

4.3 PHASE 2 BAILEY ROAD NORTH

4.3.1 PHASE 2 SITE ACCESS

Phase 2 of the site will be accessed from Node 6 on Oldham Parkway, as well as Nodes 7 and 20 on Bailey Road, see **Figure 16**.

- Node 7: Bailey Road & North/South Collector
  This access is approximately 540’ east of M-291.
- Node 20: Bailey Road & Drive 8
  This access is approximately 430’ east of Node 7.
- Node 11: North/South Collector & Drive 1
  This access is approximately 340’ south of Node 6.
- Node 12: North/South Collector & North E/W Drive
  This access is approximately 310’ south of Node 11.
- Node 13: North E/W Drive & Drive 2
  This access is approximately 335’ east of Node 12.
- Node 14: North E/W Drive & Drive 3
  This access is approximately 300’ east of Node 13.
- Node 15: North E/W Drive & Drive 4
  This access is approximately 90’ east of Node 14 and is only access to parking lots.
- Node 16: North/South Collector & South E/W Drive
  This access is approximately 460’ south of Node 12.
- Node 17: South E/W Drive & Drive 5
  This access is approximately 240’ east of Node 16.
- Node 18: South E/W Drive & Drive 6
  This access is approximately 220’ east of Node 17.
- Node 19: Drive 7
  This access is approximately 320’ south of Node 18.

4.3.2 PHASE 2 TRIP GENERATION

Table 4 represents the trip generation estimate for Phase 2: Bailey Road North which consists of twelve lots. Appropriate ITE land use codes, average trip generation rates, internal capture, and pass-by rates were utilized.

TABLE 4: PHASE 2 PROPOSED TRIP GENERATION (BAILEY ROAD NORTH)

#	ITE Land Use	ITE #	Units	Daily	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
					Total	In	Out	Total	In	Out	Total	In	Out
	Phase 2 – Bailey Road North												
2	Multifamily Housing (Low-Rise)	220	320 Units	2157	128	31	97	163	103	60	131	66	65
3	Multifamily Housing (Low-Rise)	220	250 Units	1685	100	24	76	125	80	45	103	52	51
4	Fine Dining Restaurant	931	7020 SF	589	5	3	2	55	37	18	75	44	31
5	Fine Dining Restaurant	931	7020 SF	589	5	3	2	55	37	18	75	44	31
6	High-Turnover (Sit-Down) Restaurant	932	8380 SF	898	80	44	36	76	46	30	94	48	46
7	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
8	Fine Dining Restaurant	931	7020 SF	589	5	3	2	55	37	18	75	44	31
9	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
10	Fast Casual Restaurant	934	7020 SF	682	10	5	5	88	48	40	229	126	103
11	Strip Retail Plaza (<40k)	822	14500 SF	790	34	21	13	96	48	48	65	49	46
12-a	Coffee/Donut Shop w/o DTW	936	250 SF	0	23	12	11	8	4	4	14	7	7
12-b	Public Park	411	3.42 Acres	3	0	0	0	0	0	0	1	1	0
13	Fine Dining Restaurant	931	7640 SF	641	6	3	3	60	40	20	82	48	34
	Phase 2 Trips (unreduced)			11,147	636	271	365	959	572	387	1272	681	591
	Phase 2 Internal Capture Reduce			0	66	34	32	115	71	44	0	0	0
	Phase 2 Pass-By Trips Reduce			0	122	62	60	230	136	94	0	0	0
	Phase 2 Primary Trips			**11,147**	448	175	273	614	365	249	1272	681	591

4.3.3 PHASE 2 TRIP DISTRIBUTION AND ASSIGNEMENT

For Phase 2, the trips generated were assigned to the street network based on the trip distribution summarized in **Table 5**. This distribution was developed through a review of existing traffic patterns, previous studies, City and State comments, and the additional site access provided by the construction of a new north–south collector street between Oldham Parkway and Bailey Road. Generally, lots in the northern half of the site are assigned more trips to Oldham Parkway, while the southern half is assigned more trips to Persels/Bailey. Pass-by trips were generally directed back along the path from which they originated, with some exceptions.

The new north–south collector provides access to Phase 2 from both Oldham Parkway and Bailey Road, which justifies reducing the proportion of traffic coming to and from M-291 from the north—from 70% in Phase 1 to 55% in Phases 2 and 3

TABLE 5: PHASE 2 TRIP DISTRIBUTION

Direction To/From	Percentage
North on M-291	55%
South on M-291 south of Persels/Bailey	30%
South on M-291 and west on Persels	5%
South on M-291 and east on Bailey	10%
Total	**100%**

The Phase 2 street network, study intersections, and primary trip distribution are shown in **Figure 16**. Pass-by trip volumes from Table 4 were applied to the study intersections in **Figure 17**. **Figure 18** presents the total site trips generated and distributed with pass-by trips for Phase 2.

Figure 19 illustrates the Base Conditions plus Phase 1 and Phase 2 peak hour traffic volumes, representing the addition of **Figure 11** to **Figure 18**. These peak hour volumes were used for all Base + Phase 2 analyses.

4.3.4 PHASE 2 LANE GEOMETRY AND QUEUES

The lane geometry and intersection controls for the Base + Phase 2 condition are shown in **Figure 20**. The 95th percentile queue lengths by lane group, based on analyses conducted in this study, are shown for the Base + Phase 2 condition in **Figure 21**.

4.4 PHASE 3 16TH STREET NORTH

4.4.1 PHASE 3 SITE ACCESS

Phase 3 of the site will be accessed from Nodes 7 and 20 on Bailey Road, and Node 8 on 16th Street, see **Figure 22**.

- Node 21: North/South Collector & Drive 9
  This access is approximately 240’ south of Node 7.
- Node 22: North/South Collector & Drive 10
  This access is approximately 270’ south of Node 21.
- Node 26: North/South Collector & Drive 13
  This access is approximately 220’ south of Node 22.
- Node 23: North/South Collector & Drive 11
  This access is approximately 370’ south of Node 26.
- Node 8: North/South Collector & 16th Street
  This access is approximately 380’ south of Node 23.
- Node 24: 16th Street and Park Driveway
  This access is approximately 1170’ east of Node 8.
- Node 25: Drive 12
  This access is approximately 380 south of Node 20.

4.4.2 PHASE 3 TRIP GENERATION

Table 6 represents the trip generation estimate for Phase 3: 16th Street North which consists of nine lots. Appropriate ITE land use codes, average trip generation rates, internal capture, and pass-by rates were utilized.

TABLE 6: PHASE 3 PROPOSED TRIP GENERATION (16th STREET NORTH)

#	ITE Land Use	ITE #	Units	Daily	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
					Total	In	Out	Total	In	Out	Total	In	Out
	Phase 3 – 16th Street North												
14	Fast-Food with DTW	934	3000 SF	1402	134	68	66	99	52	47	166	85	81
15	Fast-Food with DTW	934	3000 SF	1402	134	68	66	99	52	47	166	85	81
16	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
17	Fast Casual Restaurant	930	7020 SF	682	10	5	5	88	48	40	229	126	103
18	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	43	43	149	79	73
19	Fast-Food with DTW	934	3000 SF	1402	134	68	66	99	52	47	166	85	81
20	Multifamily Housing (Low-Rise)	220	250 Units	1685	100	24	76	125	80	45	103	52	51
21	Single-Family Attached Housing	215	100 Units	720	48	12	36	57	34	23	57	27	30
22	Public Park	411	1.05 Acres	1	0	0	0	0	0	0	0	0	0
	Phase 3 Trips (unreduced)			9,818	800	367	433	745	410	335	1185	612	573
	Phase 3 Internal Capture Reduce			0	177	91	86	91	48	43	0	0	0
	Phase 3 Pass-By Trips Reduce			0	323	164	159	263	137	126	0	0	0
	Phase 3 Primary Trips			**9,818**	**300**	**112**	**188**	**391**	**225**	**166**	**1185**	**612**	**573**

4.4.3 PHASE 3 TRIP DISTRIBUTION AND ASSIGNMENT

For Phase 3, the trips generated were assigned to the street network using the same trip distribution as Phase 2, summarized in **Table 5**.

The extension of the new north–south collector from Phase 2 continues from Bailey Road, where it currently has RIRO access, to 16th Street. Within Phase 3, traffic is generally routed into the site via Persels/Bailey, with northbound M-291 vehicles arriving at 16th Street. Exiting vehicles from Lots 14 and 15 are routed eastbound on Bailey Road to the traffic signal, where they make a U-turn to return to M-291. Most other Phase 3 lots route their traffic to this signalized intersection.

The Phase 3 street network, study intersections, and primary trip distribution are shown in **Figure 22**. Pass-by trip volumes from **Table 6** were applied to the study intersections in **Figure 23**. **Figure 24** presents the total site trips generated and distributed with pass-by trips for Phase 3.

Figure 25 illustrates the Base Conditions plus Phase 1–3 peak hour traffic volumes, representing the East Village full development traffic. This figure results from adding **Figure 19** to **Figure 24**. The peak hour volumes in Figure 25 were used for all Base + Full Development analyses.

4.4.4 PHASE 3 LANE GEOMETRY AND QUEUES

The lane geometry and intersection controls for the Base + East Village Full Development condition can be viewed in **Figure 26**.

The 95th percentile queue lengths by lane group, from the analyses performed later in this study, can be viewed for the Base + East Village Full Development condition in **Figure 27**.

4.5 VILLAGE EAST: FULL DEVELOPMENT

4.5.1 TRIP GENERATION

TABLE 7: VILLAGE EAST: FULL DEVELOPMENT TRIP GENERATION

#	ITE Land Use	ITE #	Units	Daily	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
					Total	In	Out	Total	In	Out	Total	In	Out
	Phase 1-3 Full Development												
1	Warehouse Retailer	***	155k SF	11,074	322	179	143	1094	526	568	1527	758	769
2	Multifamily Housing (Low-Rise)	220	320 Units	2157	128	31	97	163	103	60	131	66	65
3	Multifamily Housing (Low-Rise)	220	250 Units	1685	100	24	76	125	80	45	103	52	51
4	Fine Dining Restaurant	931	7020 SF	589	5	3	2	55	37	18	75	44	31
5	Fine Dining Restaurant	931	7020 SF	589	5	3	2	55	37	18	75	44	31
6	High-Turnover (Sit-Down) Restaurant	932	8380 SF	898	80	44	36	76	46	30	94	48	46
7	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
8	Fine Dining Restaurant	931	7020 SF	589	5	3	2	55	37	18	75	44	31
9	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
10	Fast Casual Restaurant	930	7020 SF	682	10	5	5	88	48	40	229	126	103
11	Strip Retail Plaza (<40k)	822	14500 SF	790	34	21	13	96	48	48	95	49	46
12-a	Coffee/Donut Shop w/o DTW	936	250 SF	0	23	12	11	8	4	4	14	7	7
12-b	Public Park	411	3.42 Acres	3	0	0	0	0	0	0	1	1	0
13	Fine Dining Restaurant	931	7640 SF	641	6	3	3	60	40	20	82	48	34
14	Fast-Food with DTW	934	3000 SF	1402	134	68	66	99	52	47	166	85	81
15	Fast-Food with DTW	934	3000 SF	1402	134	68	66	99	52	47	166	85	81
16	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
17	Fast Casual Restaurant	930	7020 SF	682	10	5	5	88	48	40	229	126	103
18	Fast-Food with DTW	934	2700 SF	1262	120	61	59	89	46	43	149	76	73
19	Fast-Food with DTW	934	3000 SF	1402	134	68	66	99	52	47	166	85	81
20	Multifamily Housing (Low-Rise)	220	250 Units	1685	100	24	76	125	80	45	103	52	51

21	Single-Family Attached Housing	215	100 Units	720	48	12	36	57	34	23	57	27	30
22	Public Park	411	1.05 Acres	1	0	0	0	0	0	0	0	0	0
	Phase 1-3 Trips (unreduced)			32,669	1758	817	941	2798	1508	1290	3984	2051	1933
	Phase 1-3 Internal Capture Reduce			0	243	125	118	206	119	87	0	0	0
	Phase 1-3 Pass-By Trips Reduce			0	445	226	219	811	426	385	320	159	161
	Phase 1-3 Primary Trips			**32,669**	**1070**	**466**	**604**	**1781**	**963**	**818**	**3664**	**1892**	**1772**

Table 7 represents the Village East Full Development trip generation. It is the compilation of **Tables 2,4, and 6**. With all ITE land use codes, average trip generation rates, internal capture, and pass-by rates applied.

5.0 ACCESS MANAGEMENT

5.1 ACCESS SPACING

The City of Lee's Summit Access Management Code (AMC) establishes minimum spacing requirements between intersections based on street classification and type of access. Along commercial collector streets such as Oldham Parkway and the new north–south (N/S) Collector, the minimum spacing for full access is 300 feet, measured between centerlines.

The spacing criteria are met along Oldham Parkway from M-291 eastward and along the N/S Collector from Oldham Parkway to Bailey Road.

The Oldham Parkway & RO driveway (Node 9) is located approximately 350 feet east of M-291, placing it within the functional area of the intersection.

Along the N/S Collector from Bailey Road (Node 7) to 16th Street (Node 8), several access points do not meet the 300-foot spacing requirement. Efforts have been made to provide shared access between the small lots within the proposed development wherever possible. These lots do not have alternative access opportunities. The City and the Developer may wish to consider classifying this segment as a private collector street.

Figure 29 illustrates intersection spacing distances along the collector streets.

For driveways along Bailey Road, a minor arterial, the minimum required spacing is 400 feet. The spacing between Bailey Road and Drive 8 (Node 20) and the intersection of Bailey Road and the N/S Collector (Node 7) is approximately 420 feet, which meets this criterion.

5.2 THROAT LENGTHS

The throat length requirements in the AMC are based on the number of trips generated by a development and the amount of stacking that will occur at the access drive. The provided and required throat lengths at each access point for the Full Development condition are shown in **Table 8**.

TABLE 8: DRIVEWAY THROAT LENGTHS

Site Driveway		Approach	Peak Hour Trips			Provided Throat Length	Required Throat Length
			AM	PM	Sat		
9	Oldham Parkway & RO	SB	43	216	279	200’	100’
10	Oldham Parkway & Fuel Sta	NB	34	20	22	40’	50’
		SB	29	145	186	125’	100’
11	N/S Collector & Drive 1	EB	110	102	119	75’	100’
		WB	4	52	56	50’	75’
12	N/S Collector & North EW Drive	EB	76	90	127	100’	100’
13	North EW Drive & Drive 2	NB	6	2	4	50’	50’
		SB	4	2	3	70’	50’
14	North EW Drive & Drive 3	WB	69	42	46	80’	75’
16	N/S Collector & South EW Drive	EB	19	88	149	100’	100’
17	South EW Drive & Drive 5	NB	3	34	34	130’	50’
		SB	5	1	3	50’	50’
18	South EW Drive & Drive 6	WB	32	20	22	50’	50’
21	N/S Collector & Drive 9	EB	164	134	162	50’	100’
		WB	31	26	0	70’	60’
22	N/S Collector & Drive 10	EB	80	101	176	70’	100’
23	N/S Collector & Drive 11	EB	74	61	73	60’	75’
		WB	2	1	2	160’	75’
25	Drive 12	EB	51	41	81	130’	75’
		WB	76	45	51	70’	75’

Table 8 identifies six intersection approaches where the proposed site plan does not currently meet the AMC throat distance requirements. It is recommended that the development revisit their site plan to see what accommodations can be made for throat lengths at these locations.

5.3 TURN LANE ANALYSIS

Left-Turn Lanes

Per the City AMC, left-turn lanes are to be provided on collector streets at intersections where the left-turn volume reaches at least 30 vehicles per hour.

The proposed plan provides median-divided left-turn lanes of at least 150 feet in length at all locations along the north–south (N/S) collector between Oldham Parkway (Node 6) and Bailey Road (Node 7). South of Bailey Road (Node 7), the N/S collector transitions to a two-way left-turn (TWLT) lane extending to 16th Street (Node 8).

Right Turn Lanes

Per the AMC, right-turn lanes are required on collector streets where the right-turn volume is at least 100 vehicles an hour, with a minimum length of 100 feet plus taper.

There are four intersections along the N/S collector that meet this volume criterion (all occur during the Saturday peak hour only):

1. Southbound right-turn at N/S Collector & Drive 1 = 124 vph (Node 11)
2. Southbound right-turn at N/S Collector & N EW Drive = 108 vph (Node 12)
3. Southbound right-turn at N/S Collector & Drive 9 = 154 vph (Node 21)
4. Southbound right-turn at N/S Collector & Drive 10 = 122 vph (Node 22)

The proposed site plan does not currently provide right-turn lanes at these intersections. It is recommended that the development revisit the site plan to accommodate the AMC requirements based on the assigned traffic volumes.

For minor arterial streets, the AMC requires right-turn lanes where volumes reach at least 60 vehicles per hour. The minimum lane length for an arterial is 150 feet plus taper at intersections with a collector or other streets.

There are two intersections along Bailey Road that meet this criterion:

1. Eastbound right-turn at Bailey Road & N/S Collector = 329 vph (Node 7)
2. Westbound right-turn at Bailey Road & N/S Collector = 114 vph (Node 7)

The proposed site plan accommodates right-turn lanes for both eastbound and westbound movements at Bailey Road & N/S Collector.

6.0 INTERSECTION CAPACITY ANALYSIS

6.1 LEVEL OF SERVICE OVERVIEW

Intersection capacity analyses were performed using the Highway Capacity Manual (HCM) 10th Edition Methodology provided in Synchro v11. The amount of delay is equated to a Level of Service (LOS) based on defined thresholds. A grade of A through F is assigned, with LOS A representing the best intersection operation. Error! Reference source not found. shows the LOS associated with intersection approach delays, in seconds per vehicle (sec/veh), for signalized and unsignalized intersection cases.

TABLE 9: LEVEL OF SERVICE

Level of Service (LOS)	Stop Control Approach Delay (sec/veh)	Signal Control Approach Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

Existing traffic signal timings were provided by MoDOT and the City of Lee's Summit. The timings were entered into the Synchro v11 program for the signalized intersection analyses.

Intersection capacity analyses were performed at the study intersections for the following scenarios:

- Base Conditions (existing traffic volumes + Oldham Village "West" assignment)
- Base + Phase 1 Conditions
- Base + Phase 1-2 Conditions
- Base + Full Development Conditions
- Future Year 2045 Conditions

The City of Lee's Summit has adopted LOS C as the minimum desirable LOS. However, LOS D and E may be considered acceptable for low to moderate traffic volumes, the availability of alternate routes, and the duration of activity resulting in lower LOS.

Traffic 95th percentile queues were also evaluated with the analyses and have been presented graphically within Figures throughout the study. These queues have been reviewed to ensure the analyses are reflective of the physical constraints of the study intersections and to identify if additional storage is needed for turn lanes.

6.2 BASE CONDITIONS ANALYSIS

Capacity analyses were conducted for existing traffic volumes plus the trip assignments from the full build out of the Oldham Village "West" study. The combination of these volumes represents the Base Condition. The analysis was performed for the weekday AM, PM, and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown on **Figures 4** and **5**. The 95th percentile queues for each movement are shown in **Figure 6**. The Synchro reports are provided in **Appendix D**.

Table 10 provides a summary of the analysis at the study intersections applicable to this condition.

TABLE 10: BASE CONDITION (LOS)

Intersection		Movement	Operational Analysis Results					
			AM Peak Hour		PM Peak Hour		Sat Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	M-291 & Oldham Parkway	Signalized	43.6	D	20.6	C	28.0	C
2	M-291 & Persels/Bailey	Signalized	31.3	C	57.2	E	33.4	C
3	M-291 & 16th Street	WB	21.8	C	20.9	C	16.7	C
4	M-291 & Scherer	Signalized	27.8	C	38.2	D	16.5	C
5	Bailey Road & Hamblen Road	Signalized	13.3	B	14.3	B	14.6	B

The Base Condition delays and levels of service (LOS) for the M-291 intersections with Oldham Parkway and Persels/Bailey Road shown in **Table 10** differ slightly from the Existing + Full Development Peak Hour Conditions reported in the previous study. This is due to two primary factors:

1. The existing M-291 through-traffic volumes were collected three years apart.
2. The long-term car storage land use west of Jefferson Street is now vacant.

Some signal timing adjustments were made to optimize intersection operations, the primary adjustment being an increase in the Saturday cycle length along M-291 from 100 seconds to 120 seconds, and to 130 seconds at M-291 & Scherer.

The results in **Table 10** indicate that the study intersections are projected to operate at acceptable levels of service (LOS D or better) during the AM and Saturday peak hours. During the PM peak hour, the intersections of M-291 & Persels and M-291 & Scherer are projected to operate at LOS E. This is primarily due to the projected M-291 southbound through movement on the two existing southbound lanes.

Intersections of interest:

M-291 & Oldham Parkway (Node 1)

This intersection is expected to operate at LOS D or better for all peak hours under Base Conditions.

M-291 & Persels/Bailey (Node 2)

During the PM peak hour, the intersection of M-291 & Persels/Bailey is projected to operate at LOS E. It is not uncommon for intersections on high volume roadways to operate at LOS D or worse during peak periods. At this intersection, the eastbound left-turn movement has a 95th percentile queue length of 291 feet, which exceeds the newly constructed eastbound left-turn storage provided with the Oldham Village improvements. The southbound through movement has a 95th percentile queue length of 952 feet. While long, storage is available.

M-291 & Scherer (Node 4)

During the PM peak hour, the intersection of M-291 & Scherer is projected to operate at LOS D. The southbound thru movement has a 95% queue length of 1230', which is long, but storage is available.

6.3 BASE + PHASE 1 CONDITIONS ANALYSIS

Capacity analyses were conducted for Base plus Phase 1 development conditions at the study intersections to determine the impact of the site generated traffic from Phase 1 of the proposed development. The cycle lengths were optimized for the study intersections for the analysis. The analysis was performed for the weekday AM, PM, and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown on **Figures 12** and **13**. The 95th percentile queues for each movement are shown in **Figure 14**. The Synchro reports are provided in **Appendix D**.

Table 11 provides a summary of the analyses at the study intersections applicable to this condition.

TABLE 11: BASE + PHASE 1 (LOS)

Intersection		Movement	Operational Analysis Results					
			AM Peak Hour		PM Peak Hour		Sat Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	M-291 & Oldham Parkway	Signalized	42.8	D	49.0	D	46.5	D
2	M-291 & Persels/Bailey	Signalized	33.2	C	64.9	E	35.7	D
3	M-291 & 16th Street	WB	22.3	C	23.5	C	17.7	C
4	M-291 & Scherer	Signalized	29.5	C	44.3	D	17.9	B
5	Bailey Road & Hamblen Road	Signalized	13.4	B	25.7	C	16.3	B
6	Oldham Pkwy & N/S Collector	Signalized	10.1	B	15.1	B	18.8	B
9	Oldham Pkwy & RO	SB	8.8	A	12.4	B	15.5	C
10	Oldham Pkwy & Fuel Station	SB	0.0	A	0.0	A	0.0	A

The results in **Table 11** indicate that the intersections are projected to operate at acceptable levels of service (LOS D or better) during the AM and Saturday peak hours. During the PM peak hour, the intersection of M-291 & Persels is projected to operate at LOS E, primarily due to the projected M-291 southbound through movement on the two existing southbound lanes.

Intersections of interest:

M-291 & Oldham Parkway (Node 1)

With Phase 1 added, the intersection is projected to operate at LOS D during the PM peak hour. The longest 95th percentile queues identified in **Figure 14** for critical movements are as follows:

Movement	Queue Length	Peak Hour	Storage Available
Northbound Left	170’	SAT peak	250’
Northbound Thru	434’	AM peak	1500’
Southbound Left	326’	SAT peak	310’
Southbound Thru	438’	PM peak	500’
Eastbound Left	364’	SAT peak	300’
Westbound Left	187’	SAT peak	250’
Westbound Right	811’	SAT Peak	720’ (290’ WB stop bar to RO + 255’ RO to east signal + 175’ storage in RO)

- The southbound left queue is projected to exceed its storage by 16’. As a result, the existing southbound M-291 left-turn lanes will be lengthened prior to the opening of the warehouse retailer.
- The eastbound left queue is projected to exceed its storage by 64’. This lane has been approved and is being constructed as part of the Oldham West development.
- The westbound right queue is projected to exceed its total potential capacity by 91’. This occurs in all peak hour scenarios and is primarily due to heavy exiting traffic from the warehouse retailer returning to northbound M-291. The distance from the westbound stop bar to the eastern signalized intersection is 545’, and the right-out lane measures 175’ and can function as storage during peak hours.

To mitigate the westbound right-turn expectations, the retailer could consider internally signing the right-out as “Exit for Northbound M-291 Patrons Only.” This would encourage patrons traveling east or south on M-291 to use the eastern exit.

M-291 & Persels/Bailey (Node 2)

As in the Base Conditions scenario, the intersection of M-291 & Persels/Bailey is projected to operate at LOS E during the PM peak hour. The eastbound left-turn movement has a projected 95th percentile queue length of 309 feet, exceeding the newly constructed eastbound left-turn storage provided with the Oldham Village improvements. The southbound through movement has a 95th percentile queue length of 993 feet. While long, storage is available. Improvements to this intersection, primarily the addition of a third southbound M-291 through lane, will be necessary if all traffic projections are realized.

M-291 & Scherer (Node 4)

During the PM peak hour, the intersection of M-291 & Scherer is projected to operate at LOS D. The southbound through movement has a projected 95th percentile queue length of 1,281 feet, which would extend up to the RO intersection at 16th Street.

Oldham Parkway and N/S Collector (Node 6)

The new proposed signalized intersection of Oldham Parkway and N/S Collector met the MUTCD Peak Hour Warrant and is expected to operate at LOS B or better. A review of 95% queues for the T-intersection connected with this phase identifies that all approaches fit within the proposed storage lengths with the longest queue being eastbound left in the Saturday peak at 71 feet.

6.4 BASE + PHASE 1-2 CONDITIONS ANALYSIS

Capacity analyses were conducted for Base plus Phase 1-2 development conditions at study intersections to determine the impact of the site generated traffic from Phase 2 of the proposed development. The cycle lengths were optimized for the study intersections for the analysis. The analysis was performed for the weekday AM, PM, and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown on **Figures 19** and **20**. The 95th percentile queues for each movement are shown in **Figure 21**. The Synchro reports are provided in **Appendix D**.

Table 12 provides a summary of the analyses at the study intersections applicable to this condition.

TABLE 12: BASE + PHASE 1-2 (LOS)

Intersection		Movement	Operational Analysis Results					
			AM Peak Hour		PM Peak Hour		Sat Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	M-291 & Oldham Parkway	Signalized	45.3	D	51.3	D	50.2	D
2	M-291 & Persels/Bailey	Signalized	40.9	D	34.0	C	43.5	D
3	M-291 & 16th Street	WB	23.7	C	24.7	C	21.4	C
4	M-291 & Scherer	Signalized	34.7	C	28.1	C	21.9	C
5	Bailey Road & Hamblen Road	Signalized	13.5	B	31.5	C	19.1	B
6	Oldham Pkwy & N/S Collector	Signalized	15.3	B	19.0	B	23.2	C
7	Bailey Road & N/S Collector	SB	11.0	B	17.4	C	13.8	B
9	Oldham Pkwy & RO	SB	9.6	A	14.4	B	20.5	C
10	Oldham Pkwy & Fuel Station	NB	9.9	A	13.2	B	15.7	C
		SB	8.6	A	9.0	A	9.2	A
11	N/S Collector & Drive 1	EB	10.9	B	15.4	C	25.3	D
		WB	8.8	A	9.6	B	10.4	B
12	N/S Collector & North EW Drive	EB	9.6	A	11.2	B	14.3	B
		WB	8.5	A	8.7	A	8.8	A
13	North EW Drive & Drive 2	SB	8.8	A	9.1	A	9.3	A
14	North EW Drive & Drive 3	NB	8.6	A	8.8	A	8.9	A
15	North EW Drive & Drive 4	SB	0.0	A	0.0	A	0.0	A
16	N/S Collector & South EW Drive	EB	8.6	A	9.3	A	9.8	A
		WB	9.4	A	12.7	B	18.1	C
17	South EW Drive & Drive 5	NB	8.6	A	0.0	A	9.0	A
		SB	8.4	A	0.0	A	8.5	A
18	South EW Drive & Drive 6	EB	8.7	A	8.9	A	9.1	A
		WB	9.3	A	9.8	A	10.0	B
19	Drive 7	WB	0.0	A	0.0	A	0.0	A
20	Bailey Road & Drive 8	SB	12.8	B	57.0	F	26.5	D

The analyses in Table 12 include an additional southbound M-291 thru-lane between Oldham Parkway through Scherer Road.

The results in **Table 12** indicate that all intersections are projected to operate at overall LOS D or better with the M-291 improvement and the additional trips assigned by Phase 2 of the development.

Intersections of interest:

M-291 & Oldham Parkway (Node 1)

All three peak hours meet LOS D at this intersection with the additional trips associated with Phase 2. The longest 95th percentile queues identified in **Figure 21** for critical movements are as follows:

Movement	Queue Length	Peak Hour	Storage Available
Northbound Left	187’	AM peak	250’
Northbound Thru	478’	SAT peak	1500’
Southbound Left	389’	SAT peak	430’
Southbound Thru	459’	PM peak	530’
Eastbound Left	376’	SAT peak	300’
Westbound Left	265’	SAT peak	250’
Westbound Right	889’	SAT Peak	720’

- The eastbound left queue is projected to exceed its storage by 76’. This lane has been approved and is currently under construction as part of the Oldham West development.

- The westbound left queue is projected to exceed its storage by 15’. Consideration was given to lengthening this lane; however, site constraints limit this option.

- The westbound right queue is projected to exceed its total potential capacity by 169’. This occurs in all peak hour scenarios and is primarily due to heavy exiting traffic from the warehouse retailer returning to northbound M-291. The distance from the westbound stop bar to the eastern signalized intersection is 545’, and the right-out lane measures 175’, which can function as storage during peak hours.

To mitigate the westbound right-turn congestion, the retailer could consider internally signing the right-out as “Exit for Northbound M-291 Patrons Only.” This would encourage patrons traveling east or south on M-291 to use the eastern exit.

M-291 & Persels/Bailey (Node 2)

Operations improve to LOS D or better with the addition of a third southbound M-291 through lane at the intersection. During the PM peak hour, the eastbound left-turn movement has a projected 95th percentile queue length of 279 feet, slightly exceeding the newly constructed eastbound left-turn storage provided with the Oldham Village improvements. Notable improvements were observed in the PM southbound M-291 through movement, with the 95th percentile queue reduced from 993 feet in Phase 1 to 615 feet in Phase 2.

M-291 & Scherer (Node 4)

Operations improve to LOS C or better with the addition of a third southbound M-291 through lane. During the PM peak hour, the projected 95th percentile queue for the southbound through movement decreases from 1,281 feet in Phase 1 to 667 feet in Phase 2.

Oldham Parkway and N/S Collector (Node 6)

With Phase 2, the proposed signalized intersection of Oldham Parkway and the N/S collector will have its southern approach opened, forming a four-legged intersection. The eastbound right-turn volume during the Saturday peak hour is projected to be 329 vehicles, with a corresponding northbound left-turn projection of 285 vehicles. Capacity analysis indicates that the intersection will operate at LOS C or better. The projected Saturday 95th percentile queue for the northbound left-turn is 194 feet, which is close to the provided storage of 192 feet.

Bailey Road & N/S Collector (Node 7)

Median improvements along Bailey Road east of M-291 are proposed to allow the new T-intersection of Bailey Road & N/S Collector to operate as a westbound RIRO with an eastbound left-turn permitted. Southbound left turns from the N/S collector will not be allowed.

As shown in **Figure 19**, the largest peak hour eastbound left-turn movement occurs during the Saturday peak at 202 vehicles. This movement opposes 413 westbound through vehicles and an additional 114 westbound right-turn vehicles. Unsignalized capacity analyses for Node 7 indicate small 95th percentile queue lengths, as illustrated in **Figure 21**.

Bailey Road & Drive 8 (Node 20)

A peak hour signal warrant analysis was run for the intersection of Bailey Road & Drive 8. The warrant was not met with Phase 2. This intersection is the only full-access point on Bailey between M-291 and the railroad bridge. It will need to be signalized before Phase 3 development is open.

6.5 BASE + FULL DEVELOPMENT CONDITIONS ANALYSIS

Capacity analyses were conducted for Base plus Full Development conditions at the study intersections to determine the impact of the site generated traffic from Phase 3 of the proposed development. The cycle lengths were optimized for the study intersections for the analysis. The analysis was performed for the weekday AM, PM, and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown on **Figures 25** and **26**. The 95th percentile queues for each movement are shown in **Figure 27**. The Synchro reports are provided in **Appendix D**.

Table 13 provides a summary of the analysis at the study intersections applicable to this condition.

TABLE 13: BASE + FULL DEVELOPMENT (LOS)

Intersection		Movement	Operational Analysis Results					
			AM Peak Hour		PM Peak Hour		Sat Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	M-291 & Oldham Parkway	Signalized	49.5	D	54.0	D	58.5	E
2	M-291 & Persels/Bailey	Signalized	38.2	C	41.7	D	50.5	D
3	M-291 & 16th Street	WB	31.1	D	31.1	D	29.0	D
4	M-291 & Scherer	Signalized	37.6	D	31.3	C	34.5	C
5	Bailey Road & Hamblen Road	Signalized	13.5	B	34.8	C	24.0	C
6	Oldham Pkwy & N/S Collector	Signalized	16.1	B	19.0	B	23.2	C
7	Bailey Road & N/S Collector	NB	12.1	B	13.2	B	14.8	B
		SB	12.5	B	22.1	C	34.8	D
8	N/S Collector & 16th Street	SB	8.6	A	8.6	A	8.6	A
9	Oldham Pkwy & RO	SB	9.6	A	14.4	B	20.5	C
10	Oldham Pkwy & Fuel Station	NB	9.9	A	13.2	B	15.7	C
		SB	8.6	A	9.0	A	9.2	A
11	N/S Collector & Drive 1	EB	11.1	B	15.4	C	25.3	D
		WB	8.8	A	9.6	B	10.4	B
12	N/S Collector & North EW Drive	EB	9.6	A	11.2	B	14.3	B
		WB	8.5	A	8.7	A	8.8	A
13	North EW Drive & Drive 2	SB	8.8	A	9.1	A	9.3	A
14	North EW Drive & Drive 3	NB	8.6	A	8.8	A	8.8	A
15	North EW Drive & Drive 4	SB	0.0	A	0.0	A	0.0	A
16	N/S Collector & South EW Drive	EB	8.6	A	9.3	A	9.8	A
		WB	9.4	A	12.7	B	18.1	C
17	South EW Drive & Drive 5	NB	8.6	A	7.3	A	9.0	A
18	South EW Drive & Drive 6	EB	8.7	A	8.9	A	9.1	A
		WB	9.3	A	9.8	A	10.0	B
19	Drive 7	WB	0.0	A	0.0	A	0.0	A
20	Bailey Road & Drive 8	Signalized	21.6	C	32.4	C	29.1	C
21	N/S Collector & Drive 9	EB	13.1	B	12.3	B	17.8	C
		WB	8.6	A	8.6	A	0.0	A
22	N/S Collector & Drive 10	EB	9.1	A	9.2	A	10.1	B
23	N/S Collector & Drive 11	EB	9.1	A	9.1	A	9.3	A
		WB	9.3	A	9.4	A	10.0	B
24	16th Street & Park Driveway	NB	8.8	A	8.8	A	8.7	A
25	Drive 12	EB	10.0	B	10.9	B	11.8	B
		WB	8.9	A	8.8	A	9.2	A
26	Drive 13	EB	9.7	A	10.3	B	12.7	B
		WB	8.5	A	8.5	A	8.6	A

The analyses in **Table 13** include the addition of a southbound M-291 left-turn lane to Bailey Road. The results indicate that nearly all intersections are projected to operate at overall LOS D or better with the additional trips assigned by Phase 3 of the development.

The intersection of M-291 & Oldham Parkway is projected to operate at LOS E during the Saturday peak hour.

Intersections of interest:

M-291 & Oldham Parkway (Node 1)

With the additional trips associated with Phase 3, all three peak hours at this intersection are projected to meet or exceed LOS D. The longest 95th percentile queues identified in **Figure 27** for critical movements are as follows:

Movement	Queue Length	Peak Hour	Storage Available
Northbound Left	177’	AM peak	250’
Northbound Thru	680’	SAT peak	1500’
Southbound Left	417’	SAT peak	430’
Southbound Thru	505’	PM peak	530’
Eastbound Left	413’	SAT peak	300’
Westbound Left	289’	SAT peak	250’
Westbound Right	1002’	SAT Peak	720’

- The eastbound left queue is projected to exceed its storage by 113’. This lane has been approved and is currently under construction as part of the Oldham West development.

- The westbound left queue is projected to exceed its storage by 39’. Consideration was given to lengthening this lane; however, site constraints limit this option.

- The westbound right queue is projected to exceed its total potential capacity by 282’. This occurs due to heavy exiting traffic from the warehouse retailer returning to northbound M-291. The distance from the westbound stop bar to the eastern signalized intersection is 545’, and the right-out lane measures 175’, which can function as storage during peak hours.

M-291 & Persels/Bailey (Node 2)

This intersection remains at an overall LOS D for all peak hours, with the addition of a second southbound left-turn lane. The longest 95% queues identified in **Figure 27** for critical movements are as follows:

Movement	Queue Length	Peak Hour	Storage Available
Northbound Left	251’	AM peak	310’
Northbound Thru	598’	SAT peak	1300’
Southbound Left	383’	SAT peak	330’
Southbound Thru	404’	PM peak	1300’
Eastbound Left	296’	AM peak	230’
Westbound Left	321’	PM peak	260’

- The southbound left queue is projected to exceed its storage by 53’. The existing southbound left-turn lane can be lengthened with the additional lane planned for the Phase 3 M-291 & Bailey improvements.
- The eastbound left queue is projected to exceed its storage by 66’. This lane has been approved and is currently under construction as part of the Oldham West development.
- The westbound left queue is projected to exceed its total potential capacity by 61’. Consideration was given to lengthening this lane; however, site constraints prevent this modification.

M-291 & Scherer (Node 4)

The intersection of M-291 & Scherer is projected to operate at LOS D or better during each peak hour.

Oldham Parkway and N/S Collector (Node 6)

With Phase 3, no additional trips are assigned to this intersection; it is expected to operate similarly to Phase 2.

Bailey Road & N/S Collector (Node 7)

This median-controlled T-intersection will have a southern leg added in Phase 3. The intersection will function as a RIRO for eastbound and westbound Bailey Road, while also allowing an eastbound left-turn in. No westbound left-turn or north/south through movements will be permitted.

As shown in **Figure 25**, the largest peak hour eastbound left-turn movement occurs during the Saturday peak, with 202 vehicles. This movement opposes 879 westbound through vehicles, plus an additional 114 westbound right-turn vehicles. Unsignalized capacity analyses for Node 7 indicate relatively small 95th percentile queue lengths, as illustrated in **Figure 27**.

Bailey Road & Drive 8 (Node 20)

A peak hour signal warrant analysis was run for the intersection of Bailey Road & Drive 8. The warrant was met with Phase 3 for the PM and Saturday peak hours. See **Figure 28**. This intersection is the only full-access point on Bailey between M-291 and the railroad bridge. It will need to be signalized before Phase 3 development is open.

N/S Collector & Drive 9 (Node 21)

The first driveway south of Bailey Road along the new N/S Collector provides shared access to Lots 14–15 to the west and Lot 19 to the east. During the Saturday peak hour, the projected eastbound left-turn exiting volume is 162 vehicles, while only a 50-foot throat lane is provided. Consideration should be given to increasing the throat length at this driveway to better accommodate potential peak hour queues at full build-out.

N/S Collector & Drive 10 (Node 22)

The second driveway south of Bailey Road along the new N/S Collector provides shared access to Lots 16–17 to the west. During the Saturday peak hour, the projected eastbound exiting volume is 176 vehicles, while only a 70-foot throat lane is provided. Consideration should be given to increasing the throat length at this driveway to better accommodate potential peak hour queues at full build-out.

6.6 FUTURE YEAR 2045 CONDITIONS ANALYSIS

Capacity analyses were conducted for Future Year 2045 Base Conditions at the study intersections to assess the impact of site-generated traffic under 2045 conditions. To estimate background traffic growth, existing through volumes on M-291 were assumed to increase at a rate of 1% per year.

Signal cycle lengths were optimized for each study intersection. The analysis was performed for the weekday AM, PM, and Saturday peak hours based on the projected traffic volumes, existing plus recommended lane configurations, and traffic control devices shown on **Figures 30 and 31**. The 95th percentile queue lengths for each movement are presented in **Figure 32**, and the detailed Synchro reports are included in **Appendix D**.

Table 14 summarizes the level of service (LOS) and delay results for the analyzed intersections.

TABLE 14: FUTURE YEAR 2045 (LOS)

Intersection		Movement	Operational Analysis Results					
			AM Peak Hour		PM Peak Hour		Sat Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	M-291 & Oldham Parkway	Signalized	57.4	E	69.2	E	83.7	F
2	M-291 & Persels/Bailey	Signalized	37.5	D	62.2	E	71.6	E
3	M-291 & 16th Street	WB	48.4	E	46.9	E	39.2	E
4	M-291 & Scherer	Signalized	79.0	E	62.2	E	62.0	E

The results in **Table 14** indicate that the signalized intersections along M-291 are projected to operate at LOS D, E and F during peak hours under Year 2045 conditions.

If all projected traffic volumes are realized, opportunities for geometric improvements at M-291 & Oldham Parkway will be limited due to existing constraints. The intersection of M-291 & Persels/Bailey could benefit from the addition of eastbound and westbound through lanes and a dual northbound left-turn lane. Similarly, M-291 & Scherer Road could benefit from the construction of a third northbound through lane to improve future operations.

7.0 FINDINGS AND RECOMMENDATIONS

This traffic impact study for Village East evaluated existing and projected traffic conditions to assess the impacts of the proposed 22-lot development, which will be constructed in three phases. The analysis included collection of existing traffic counts, development of trip generation and distribution models, and intersection capacity analyses at 26 study intersections under the following conditions:

- Base Conditions
- Base + Phase 1 Conditions
- Base + Phase 1–2 Conditions
- Base + Phase 1–3 (Full Development Conditions)
- Future Year 2045 Conditions

At full build-out, the Village East development is projected to generate approximately 32,669 daily trips, 1,758 AM peak hour trips, 2,798 PM peak hour trips, and 3,984 Saturday peak hour trips. These represent *primary site-generated trips.*

The analyses identified several locations where targeted intersection or roadway improvements will be necessary to maintain acceptable levels of service and to mitigate the additional traffic introduced by the project. The following summarizes recommended improvements by development phase and intersection.

Phase 1 Recommendations

1. M-291 & Oldham Parkway (Node 1)
    - Extend the existing southbound dual left-turn lanes to provide a minimum of 430 feet of storage, or as much as feasible within existing geometrics.
2. Oldham Parkway & N/S Collector (Node 6)
    - Construct a full intersection with traffic signal installation, including the future south leg and pedestrian facilities.
3. Lot 1 Access Drive
    - Retail tenant could post signage at the western right-out restricting use to northbound M-291 patrons to discourage Oldham Parkway weaving movements.

Phase 2 Recommendations

1. M-291 Corridor Improvements
    - Construct a third southbound through-lane from south of Oldham Parkway through Persels and continue to (or through) Scherer Road. This should include removal of existing shoulder, new paved lane, and new paved shoulder.
    - Include associated shoulder, lane, and signal modifications primarily along the western half of M-291.
2. Traffic Impact Study Update
    - Upon completion of Phase 1, update the TIA to confirm southbound widening limits and validate prior recommendations.
3. Bailey Road at N/S Collector (Node 7)
    - Implement center median and lane improvements to accommodate future Phase 3 traffic and establish this intersection as a westbound right-in/right-out with eastbound left-turn in capability.
4. Bailey Road at Drive 8 (Node 20)
    - Implement lane improvements to accommodate future Phase 3 traffic and the signalization of this intersection.

Phase 3 Recommendations (Full Development)

1. M-291 & Persels/Bailey (Node 2)
    - Add a second southbound left-turn lane (380 feet storage) and improve the westbound right-turn configuration. Westbound left-turn storage should strive for 320’ of storage pending an updated TIA.
    - Include shoulder, lane, and signal improvements along the eastern half of M-291 at Bailey Road.
2. Bailey Road & Drive 8 (Node 20)
    - Install a traffic signal to provide protected northbound left-turn and eastbound U-turn movements for Phase 3 traffic to provide full access to M-291.

Other Intersection-Specific Recommendations

- M-291 & Scherer (Node 4) – Continue monitoring corridor traffic growth; the additional southbound through-lane may be necessary in Phase 2 or Phase 3 or as traffic grows from other developments in the region.
- N/S Collector Intersections (Nodes 11, 21–23) – Provide southbound right-turn lanes (minimum 100’ + taper) and revise lot access throat lengths to accommodate projected Saturday peak-hour queues.
- Private Street Option: The City and Developer may consider classifying the N/S Collector from Bailey Road to 16th Street as a private street, which could alleviate spacing and access control issues under current AMC requirements.

A summary of these Recommendations can be viewed on **Figure 33**.

Summary

In total, this study recommends targeted intersection and corridor improvements primarily focused on:

- Expanding M-291 capacity through additional southbound lanes and turn lanes
- Installing new traffic signals where warranted
- Refining access spacing and driveway throat lengths within the development
- Updating the TIA between phases to validate and refine future-phase improvements

These phased improvements will maintain acceptable operations on the surrounding roadway network while supporting the safe and efficient build-out of the Village East development.

If there are any questions regarding this study, please contact me at your convenience at 816-898-0669 or mark.sherfy@ibhc.com.

Sincerely,
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Vice-President │ Development Group Director
BHC