Traffic Impact Study

Oldham Village

Lee’s Summit, Missouri

Prepared For:

Engineering Solutions

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Kimley»Horn

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Lee's Summit, Missouri

Prepared for:
Engineering Solutions
50 SE 30th Street,
Lee's Summit, Missouri 64082

Prepared by:
Kimley-Horn and Associates, Inc.
805 Pennsylvania Avenue, Suite 150
Kansas City, Missouri 64105

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1.0 INTRODUCTION

This report serves as the traffic impact study for the Oldham Village development, generally located in the southwest quadrant of the US-50 Highway (US-50) and M-291 Highway (M-291) interchange in Lee's Summit, Missouri. The location of the development is shown on **Exhibit 1** in **Appendix A**.

1.1 REPORT PURPOSE AND OBJECTIVES

The purpose of this study is to address traffic and transportation impacts of the proposed development on surrounding streets and intersections. This traffic impact study was prepared based on criteria set forth by the City of Lee's Summit *Access Management Code* and the Missouri Department of Transportation (MoDOT) *Engineering Policy Guide*. The following information is provided:

- A description and map of the existing and proposed street network to be affected by the proposed development. This information includes existing roadway characteristics and existing traffic volumes.
- Trip generation calculations based on the Institute of Traffic Engineers (ITE) *Trip Generation Manual,* 11th Edition, for the proposed development. In addition, projected trip distributions onto the street network are provided.
- Development of future year (2044) traffic volume projections.
- Analysis of impacts of the traffic generated by the proposed development on the street network, including analysis of peak period levels of service (LOS), delay times, and queuing at study area intersections for the analysis scenarios.
- Review of site access points relative to the City's access management guidelines based on the *Access Management Code*.
- Discussion of potential improvements and traffic management measures identified to mitigate operational concerns.
- Signal warrant analysis for Oldham Parkway & Drive 2, based on the vehicular volume traffic signal warrants of the *Manual on Uniform Traffic Control Devices* (MUTCD).

In summary, the study is to determine the trip generation of the Oldham Village development, assign new development trips to the street network, analyze various scenarios to determine the impacts of proposed site traffic, and identify potential mitigation measures, if necessary, to achieve acceptable operations at the study intersections.

2.0 EXISTING CONDITIONS

2.1 STUDY AREA

The development site is generally located in the southwest quadrant of the M-291 & US-50 Interchange in Lee's Summit, Missouri. The entire site is approximately 45 acres. The northern portion of the site mostly consists of a paved parking lot currently used for long-term car storage. Two small, vacant commercial buildings are located in the northeast corner of the site, north of Oldham Parkway. South of the large parking lot is a large, vacant industrial building. The development site also includes several parcels between Jefferson Street and M-291, from Oldham Parkway to Persels Road. Land uses on these parcels currently include parking lots, contractor offices, auto repair businesses, and some commercial businesses located between Jefferson Street and M-291. Three of the small existing parcels in this area are not included in the proposed development.

The site is bounded on the north by Oldham Parkway, which is the frontage road along the south side of US-50. To the west of the site there is an office building owned by Summit Park Church along Oldham Parkway. South of the office building is a neighborhood of single-family homes and Pleasant Lea Park. To the south of the site undeveloped land and parking lots for Abundant Life Church. South of the site across Persels Road there is a business park and a gas station. The east edge of the site is bounded by Market Street and M-291. To the east of the site across M-291 is undeveloped land and one large industrial building.

Through discussion with City and MoDOT staff, the following intersections were included within the study area for the traffic analysis. The list provides the existing intersection control for each of the study intersections.

- Oldham Parkway & Ward Road (Traffic Signal)
- Oldham Parkway & Jefferson Street (Side Street Stop)
- M-291 & Oldham Parkway (Traffic Signal)
- Persels Road & Jefferson Street (Traffic Signal)
- M-291 & Persels Road/Bailey Road (Traffic Signal)

In 2015, MoDOT analyzed the US-50 & M-291 interchange prior to a major construction project that included reconfiguring the interchange. The project and analysis also included the M-291 corridor from US-50 to Persels Road, including the intersection at Oldham Parkway. As part of the analysis major commercial developments were assumed to be constructed to the west and the east of M-291 along Oldham Parkway. The assumptions made for the land uses west of the interchange were similar to the proposed development, therefore the interchange was not identified for analysis in this study.

2.2 STREET NETWORK

The existing street network within the study area includes US-50, M-291, Oldham Parkway, Jefferson Street, Persels Road, Bailey Road, and Ward Road. The following provides a summary of the existing street network within the study area:

US-50 is an east-west freeway that is part of the regional highway system. US-50 is a four-lane divided freeway with a posted speed limit of 60 miles per hour (mph). There is an interchange along US-50 at M-291. The interchange was reconstructed in 2018 as a diverging diamond interchange. The crossover on the north side of US-50 is a roundabout intersection and the crossover on the south side is signalized.

M-291 is a north-south expressway that connects the Kansas City metro area to Harrisonville to the south. 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. The posted speed limit is 45 mph. Access is controlled along the portion of M-291 adjacent to the development site. There is a shared use path along the west side of M-291 extending south from the interchange to Oldham Parkway.

Oldham Parkway is a northwest-southeast commercial collector type street, according to the Lee's Summit Thoroughfare Master Plan. It serves as the frontage road along the south side of US-50, and it is maintained by MoDOT. Oldham Parkway is a two-lane undivided roadway with paved shoulders. No sidewalks are provided along Oldham Parkway. The posted speed limit is 35 mph. In the northeast corner of the development site, Oldham Parkway curves to become a north/south street that aligns with Jefferson Street at a T-intersection. Oldham Parkway follows an east/west alignment for a short distance between Jefferson Street and M-291. This east/west segment of Oldham Parkway was constructed with the interchange reconfiguration. This segment has two lanes in the westbound direction, a raised median, and four lanes in the eastbound direction. There are curbs and gutters with a shared use path along the south side of this street segment.

Jefferson Street is a north-south commercial collector type street extending south of Oldham Parkway. The three-lane roadway is 40 feet wide, measured between the backs of curbs, with a center two-way-left-turn lane and one travel lane in each direction. The posted speed limit is 35 mph. There is sidewalk along the west side of Jefferson Street and a shared use path on the east side.

Persels Road/Bailey Road is an east-west minor arterial street located at the far south end of the proposed development site. West of M-291 the road is called Persels Road and east of M-291, the road is named Bailey Road. Persels Road generally has a two-lane cross section that widens to a four-lane cross section for the segment between Jefferson Street and M-291. The four-lane segment includes one through lane in each direction, and the two center lanes are configured as left-turn lanes. Bailey Road is also generally a two-lane roadway that widens for turn lanes at the intersection with M-291. The posted speed limit is 35 mph for Persels Road and for Bailey Road. A sidewalk of varying widths is provided on the south side of Persels Road/Bailey Road throughout the study area. There is sidewalk on the north side of the Persels Road to the west of the site, but no other sidewalks along the north side of either roadway.

Ward Road is a north-south major arterial street located approximately one mile west of the proposed development site. The four-lane, undivided roadway has curb and gutters with sidewalk on the east side of the street and a shared use path along the west side. Ward Road connects to 3rd Street near a diamond interchange with US-50. The posted speed limit is 35 mph.

2.3 DATA COLLECTION

Turning Movement Counts (TMCs) were collected the study intersections on Thursday, October 20th, 2022, and Saturday, October 22nd, 2022. The turning movement count data collected is included in **Appendix B**. The AM peak hour occurred between 7:15 AM and 8:15 AM, the PM peak hour occurred between 4:15 PM and 5:15 PM, and the Saturday peak hour occurred between 12:00 PM and 1:00 PM. The existing conditions peak hour turning movement volumes are shown on **Exhibit 2**. The existing geometry with lane configurations and intersection control at the study intersections is shown on **Exhibit 3**.

3.0 PROPOSED DEVELOPMENT

3.1 SITE PLAN DESCRIPTION

The proposed Oldham Village development is anticipated to be constructed in two phases. Phase 1 includes the realignment of Oldham Parkway through the northern portion of the site. At the northwest corner of the site, the roadway will be reconstructed as a two-lane roadway with curbs and gutters and sidewalk along the south side of the street. A large surface parking lot and a small retail building are to be located south of the street. A connection is shown between the parking lot and the adjacent existing office building in the northwest corner of the site. It is intended that the Summit Park Church will also use the large surface parking lot. The proposed site plan is included in **Appendix C** for reference.

Oldham Parkway will then curve to the south and widen for a raised median and left-turn lanes at intersections. Curbs and gutters and sidewalks will be provided along both sides of this street segment. The realignment of Oldham Parkway creates a larger area on the east side of the street for pad sites. The pad sites to the east of Oldham Parkway include a sit-down restaurant, two fast-food restaurants with drive through windows, a drive-through car wash, and two small buildings with retail space and drive-through coffee shops. West of Oldham Parkway, a sit-down restaurant with outdoor entertainment areas and a 120,000 square foot building for fitness and athletic events are to be located adjacent to the large surface parking lot.

Oldham Parkway will then curve to the east to align with the existing east/west segment of Oldham Parkway that intersects M-291. The roadway will widen for additional through lanes and turn lanes. Curbs and gutters and sidewalks will be provided along both sides of the street. The posted speed limit on Oldham Parkway will remain at 35 mph. The reconstructed and realigned section of Oldham Parkway will then be maintained by the City of Lee's Summit.

A portion of Jefferson Street will also be realigned to the west to create greater separation from M-291. Jefferson Street will intersect Oldham Parkway 260 feet west of the existing intersection. Access will be restricted to left-in/right-in/right-out (LIRIRO) only at this intersection. The raised median on Oldham Parkway will allow east/west left-turn movements, but north/south left-turn and through movements will be restricted. This restriction is due to the close proximity to the Oldham Parkway & M-291 intersection.

Phase 2 includes a four-story apartment building with 307 units located west of Jefferson Street and south of the fitness and athletic building. The parking lot for the apartments will also connect to the parking area for the fitness and athletic building near Access 1 providing circulation around the apartment building.

A number of pad sites are planned in the Phase 2 portion of the site between Jefferson Street and M-291, to the south of Oldham Parkway. The pad sites include two small buildings with retail space and coffee shops with drive through windows, a small grocery store and two fast-food restaurants with drive-through windows.

Market Street is an existing dead-end local street that will be almost fully removed to create more space for these pad sites. A small portion of Market Street will remain to provide access to two small existing properties that are not part of the proposed development. The existing properties will be accessed from a new east/west public street that connects Jefferson Street to the small remaining segment of Market Street that will remain. South of the new public street is a gas station with 10 fueling positions and a 4,500 square foot convenience store. A small existing office building in the northeast corner of Persels Road & Jefferson Street will remain, adjacent to the gas station.

3.2 SITE ACCESS

The Phase 1 portion of the site will be accessed from six driveway intersections with public streets. The Phase 1 accesses are described below. All access spacing distances provided are measured between centerlines of streets or driveways.

- The north leg of the realigned Oldham Parkway & Jefferson Street intersection will be the primary entrance to the pad sites located north and east of Oldham Parkway. This is a LIRIRO access and is approximately 600 feet west of M-291.
- Access 1 is a RIRO access on the west side of Oldham Parkway approximately 320 feet west of Jefferson Street, near the south end of the fitness and athletic building.
- Access 2 is a full-access intersection along Oldham Parkway approximately 345 feet north of Access 1. Access 2 serves the fitness and athletic building and the pad sites north and east of Oldham Parkway. Given the LIRIRO restriction at Jefferson Street, Access 2 will be the primary exit from the pad sites north and east of Oldham Parkway.
- Access 3 is a full-access driveway along Oldham Parkway located 375 feet north of Access 2. This driveway serves the restaurants on the east and west sides of Oldham Parkway.
- Access 4 is a full-access driveway along Oldham Parkway approximately 375 feet north and west of Access 3. It provides access to the small retail building and surface parking lot south of Oldham Parkway.
- Access 5 is a full-access driveway along Oldham Parkway located 380 feet west of Access 4 and 200 feet east of an existing access point to an office building.

The Phase 2 portion will be accessed primarily from four intersections along Jefferson Street, one access along Oldham Parkway, and one access along Persels Road. The Phase 2 accesses are described below. All access spacing distances provided are measured between centerlines of streets or driveways.

- A new full-access public street connection is proposed along the east side of Jefferson Street, approximately 375 feet north of Persels Road. This intersection would be 100 feet north of an existing private driveway on the east side of the street, and 120 feet south of a driveway for Abundant Life Church on the west side of the street. This public street would provide access to the gas station and to existing properties that are not part of the proposed development.
- Access 10 is a full-access driveway on the east side of Jefferson Street located 300 feet north of the proposed public street connection. This driveway provides access to two fast-food restaurants.
- Access 6 is a full-access driveway and is located approximately 275 feet north of Access 6. This driveway serves the apartments on the west side of Jefferson Street and serves two fast-food restaurants and one coffee shop.
- Access 7 is a full-access driveway on the east side of Jefferson Street located approximately 160 feet north of Access 6 and 430 feet south of Oldham Parkway. This driveway serves a coffee shop and small retail building as well as the small grocery store. This access continues north to Oldham Parkway as Access 8.
- Access 8 is a right-in/right-out driveway on the south side of Oldham Parkway located approximately 275 feet east of Jefferson Street intersection and 325 feet west of M-291.
- Access 9 is a right-in only driveway serving the gas station with convenience store and is located approximately 175 feet east of the intersection at Jefferson Street & Persels Road and 400 feet west of M-291.

3.3 TRIP GENERATION

Trip generation estimates were prepared using the ITE *Trip Generation Manual*, 11th Edition. **Table 1** shows the expected trips to be generated by each phase of the proposed development.

TABLE 1: PROPOSED DEVELOPMENT TRIP GENERATION

Land Use Description	ITE LUC	Intensity / Units	Daily	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
				In	Out	Total	In	Out	Total	In	Out	Total
Phase 1												
Recreational Community Center	495	120,000 SF	3,458	151	78	229	141	159	300	69	59	128
Strip Retail Plaza (<40k)	822	7,500 SF	546	11	7	18	25	24	49	25	24	49
High Turnover Sit-Down Restaurant	932	17,696 SF	1,896	93	76	169	98	62	160	101	97	198
Fast Food Restaurant with Drive-Through	934	7,955 SF	3,716	181	174	355	137	126	263	224	215	439
Coffee Shop with Drive-Through	937	4,075 SF	2,172	178	172	350	79	80	159	179	179	358
Automated Car Wash	948	1 Tunnel	780	20	20	40	39	39	78	19	22	41
Phase 1 Trips (unreduced)			12,568	634	527	1,161	519	490	1,009	617	596	1,213
Phase 1 Pass-By Trips			3,107	106	106	212	128	128	256	82	82	164
Phase 1 Primary Trips			9,462	528	421	949	391	362	753	535	514	1,049
Phase 2												
Multifamily Housing (Mid-Rise)	221	307 Dwelling Units	1,418	28	95	123	73	47	120	63	61	124
Strip Retail Plaza (<40k)	822	2,700 SF	344	4	2	6	9	9	18	9	9	18
Supermarket	850	9,300 SF	1,315	16	11	27	42	41	83	47	47	94
Fast Food Restaurant with Drive-Through	934	7,800 SF	3,646	177	171	348	134	124	258	220	211	431
Coffee Shop with Drive-Through	937	3,075 SF	1,641	135	129	264	60	60	120	135	135	270
Convenience Store/Gas Station	945	10 Fueling Positions	2,571	135	135	270	114	114	228	104	100	204
Phase 2 Trips (unreduced)			10,935	495	543	1,038	432	395	827	578	563	1,141
Phase 2 Pass-By Trips			3,107	106	106	212	128	128	256	82	82	164
Phase 2 Primary Trips			7,829	389	437	826	304	267	571	496	481	977
Full Development												
Total Pass-By Trips			6,214	212	212	424	256	256	512	164	164	328
Total Primary Trips			17,291	917	858	1,775	695	629	1,324	1,031	995	2,026

Appendix D includes the calculations used to determine the trip generation of the proposed development.

Pass-by trip calculation was included in the trip generation estimates in **Table 1** because of the gas station, restaurant, and retail land uses. Pass-by trips occur when a driver already traveling on the street adjacent to the development makes a trip to the development while in route to another destination. Therefore, pass-by trips do not add new trips to the street network, but they do increase turning movements in and out of the development site accesses.

According to the *Trip Generation Handbook*, gas stations and restaurants can have pass-by rates that account for more than 50 percent of trips generated by the land use. This would equate to a significant portion of the existing traffic volume on M-291 being pass-by traffic. Therefore, the total pass-by trips in **Table 1** were estimated to be 15% of the existing volume along M-291 during each peak hour. The total number of total pass-by trips were divided equally between Phase 1 and Phase 2.

Table 2 provides a comparison of the peak hour trips assumed for the site in the analysis MoDOT prepared for the US-50 & M-291 interchange in 2015 and the trip generation for the proposed development. In the MoDOT analysis, the Saturday peak hour was not evaluated.

TABLE 2: COMPARISON OF DEVELOPMENT TRIPS

Study	Trip Type	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Proposed Development Trips	Primary	917	858	1,775	695	629	1,324
	Pass-By	212	212	424	256	256	212
	Total	1,129	1,070	2,199	951	885	1,836
US-50/M-291 Interchange Analysis	Primary	190	182	372	562	575	1,137
	Pass-By	80	51	131	270	280	550
	Total	270	233	503	832	855	1,687
Total Difference		859	837	1,696	119	30	149

The difference in trips in **Table 2** indicates a much higher AM peak hour trip generation than was assumed for the interchange analysis. In the interchange study, a high level of retail land uses was assumed for this site. With all of the restaurant land uses proposed in the development plan, the trip generation in **Table 1** indicates a high level of trip generation during the AM peak hour.

The PM peak hour has a much higher volume existing traffic already traveling through the study intersections than the AM peak hour. Therefore, the PM peak hour is the critical time period for analysis of the study area. During the PM peak hour, the proposed trip generation is slightly higher than what was assumed in the interchange analysis. Therefore, the analysis performed by MoDOT in 2015 is still valid for the interchange and the interchange was not evaluated in this study.

3.4 PROJECT TRIP DISTRIBUTION AND ASSIGNMENT

The estimated trips generated by the proposed development were assigned to the street network based on the trip distribution summarized in **Table 3**. This distribution is based on existing traffic patterns, the surrounding street network, population density, and engineering judgment. These distributions generally follow what was used for MoDOT's analysis for the US-50 & 291 interchange.

TABLE 3: PROPOSED DEVELOPMENT 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%

Peak hour site trips are predominately expected to be traveling to/from the north and south on M-291 as it is an expressway that connects to the regional highway system. Likewise, pass-by trips are expected to be from drivers traveling along M-291.

Detailed distribution patterns through the study intersections were developed for each phase of the proposed development. The Phase 1 street network and study intersections are shown on **Exhibit 5**. The Phase 1 primary trip distribution in shown on **Exhibit 6** and the Phase 1 pass-by trip distribution in shown on **Exhibit 7**. The proposed Phase 1 site trip assignments are illustrated on **Exhibit 8**. The proposed Phase 1 site trip assignments were added to the Existing Conditions traffic volumes. **Exhibit 9** illustrates the Existing plus Phase 1 Development peak hour traffic volumes.

For **Exhibit 9**, the Existing Conditions traffic volumes were adjusted for the realignment and change to LIRIRO access at Oldham Parkway & Jefferson Street. Westbound right-turn and southbound left-turn movements were changed to be east/west through movements. Southbound through movements were adjusted to be eastbound right-turn movements. Northbound through movements were adjusted to become northbound right-turn movements. These adjusted movements were then assigned to be eastbound U-turn movements at Oldham Parkway & M-291.

The Phase 1 and 2 street network and study intersections are shown on **Exhibit 12**. The Phase 2 primary trip distribution in shown on **Exhibit 13** and the Phase 2 pass-by trip distribution in shown on **Exhibit 14**. The proposed Phase 2 site trip assignments are illustrated on **Exhibit 15**. The proposed Phase 2 site trip assignments were added to the Existing plus Phase 1 Development traffic volumes. **Exhibit 16** illustrates the Existing plus Phase Full Development peak hour traffic volumes.

4.0 ACCESS MANAGEMENT

The City of Lee's Summit's *Access Management Code* (AMC) provides criteria for minimum spacing between intersections and driveways, throat lengths, and the need for turn lanes at intersections. These items are discussed in the following paragraphs.

4.1 ACCESS SPACING

The AMC includes requirements for minimum spacing between street connections, depending on street classification and the type of access. Along commercial collector streets such as Oldham Parkway and Jefferson Street, the minimum spacing for full access intersections is 300 feet, measured between centerlines. Based on the intersection spacings described in Section 3.2 of this study, the relocated Oldham Parkway & Jefferson Street intersection meets the minimum spacing requirements. Accesses 1 through 4 along Oldham Parkway also meet the minimum spacing requirements. Access 5 in the northwest corner of the site is spaced 200 feet east of an existing driveway to an office building, which does not meet the minimum spacing requirement. It is worth noting that Access 5 is in the location of an existing driveway and is expected to have a low volume of traffic.

Access 8 is a RIRO access along the south side of Oldham Parkway. This access is located 325 feet west of M-291, which is within the functional area of the intersection.

Along Jefferson Street, none of the proposed accesses meet the minimum spacing requirements. Closely spaced driveways are proposed due to the small lot sizes of the proposed development and the lack of access from other sides of the sites. Efforts have been made to share access with adjoining properties wherever possible.

For driveways along minor arterial streets such as Persels Road the minimum spacing is 400 feet. Access 9 is a right-in only driveway that just meets the minimum spacing from M-291, however the spacing to Jefferson Street is not met. As a right-in only driveway with a separate right-turn lane, the spacing from Jefferson Street should not cause any safety or operational concerns. To ensure that the driveway operates as right-in only, a raised median on Persels Road would be appropriate.

4.2 THROAT LENGTH

A driveway's throat length is the distance along a driveway from the intersecting roadway to the first location on site where a driver can make a turn. Adequate throat lengths minimize the potential for inbound traffic to queue onto the public street. The throat length also provides space for outbound traffic to queue without adversely impacting site circulation.

The throat length requirements in the *Access Management Code* are based on the number of trips generated by a development and the amount of stacking that will occur at the access driveway. The provided and required throat lengths at each site access point are provided in **Table 4** and are based on the Existing Plus Full Development traffic volumes shown on **Exhibit 16**.

TABLE 4: DRIVEWAY THROAT LENGTH

Site Driveway		Approach	Peak Hour Trips			Provided Throat Length	Required Throat Length
			AM	PM	Sat		
2	Jefferson Street	SB	326	280	310	290 feet	100 feet
6	Access 1	EB	21	18	26	75 feet	50 feet
7	Access 2	EB	294	169	319	250 feet	100 feet
		WB	382	364	408	300 feet	125 feet
8	Access 3	EB	88	79	89	100 feet	75 feet
		WB	91	75	98	50 feet	75 feet
9	Access 4	NB	19	16	20	65 feet	50 feet
10	Access 5	NB	18	16	20	100 feet	50 feet
11	Public Street	WB	238	182	256	105 feet	100 feet
12	Access 10	WB	93	70	106	280 feet	100 feet
13	Access 6	EB	125	85	147	90 feet	100 feet
		WB	229	190	244	60 feet	100 feet
14	Access 7	WB	142	137	169	235 feet	100 feet
15	Access 8	NB	65	47	68	90 feet	75 feet
16	Access 9	NB	146	134	161	110 feet	100 feet

The throat lengths provided in **Table 4** indicate that nearly all driveways meet the minimum throat length requirements. At the westbound approach of Access 3, the throat length is just below the required throat length. At Access 6, both the eastbound and westbound approaches have throat lengths that are less than the required throat length. Access 10 also has a throat length less than the required throat length. Queuing within the throat length of the driveways will be discussed in the Intersection Capacity Analysis section of this study.

The *Access Management Code* states that for driveways with 100 vehicles per hour, the minimum throat length may be longer if necessary to accommodate queue storage. Queue storage for the applicable driveways is discussed in the Existing plus Development Analysis section of this study.

4.3 TURN LANE ANALYSIS

Left-turn lanes are to be provided on collector streets at connections where the left-turn volume is at least 30 vehicles in any hour. The site plan indicates that left-turn lanes are provided on Oldham Parkway at all such locations, except for Access 3. At Access 3, the northbound left-turn volume exceeds 30 during each peak hour. With only 300 feet of separation between Access 2 and 3, there is not enough distance along Oldham Parkway to provide left-turn lanes of at least 150 feet for both of these intersections. Access 3 should be shifted north and a northbound left-turn lane with a minimum storage length of 150 feet should be provided. All proposed left-turn lanes on Oldham Parkway should have a minimum storage length of 150 feet.

Jefferson Street is currently a three-lane street with a center two-way left-turn lane. The realigned portion of Jefferson Street should also be a three-lane street. This provides left-turn lanes at all accesses proposed along Jefferson Street.

The AMC states that right-turn lanes are required on collector streets where the right-turn volume is at least 100 vehicles in any hour. All right-turn lanes should have a minimum storage length of 150 feet plus an appropriate taper.

For the proposed development, right-turn lanes are shown on the site plan at all locations with 100 right-turns in a peak hour, except for the westbound right-turn movement at Oldham Parkway & Jefferson Street. At this intersection there are two westbound lanes proposed. The right lane terminates as a right-turn lane at Access 2. There is minimal right-turn volume at Access 2. Therefore, the right lane on Oldham Parkway will essentially function as the right-turn lane at Jefferson Street, since nearly all the volume in this lane will be turning right at Jefferson Street.

Exhibit 10 shows the Existing plus Phase 1 geometry and intersection controls, which includes the turn lanes shown on the site plan and the turn lanes identified based on access management requirements. Similarly, **Exhibit 17** shows the Existing plus Full Development geometry and intersection controls.

5.0 INTERSECTION CAPACITY ANALYSIS

5.1 LEVEL OF SERVICE OVERVIEW

Intersection capacity analysis was performed at the study intersections for the following three scenarios:

- Existing Conditions
- Existing + Phase 1 Development Conditions
- Existing + Full Development Conditions
- Future Conditions

The capacity analysis was performed for the weekday AM and PM peak hours using Synchro traffic modeling software to determine intersection delay and level of service (LOS). Calculations were performed based on the methodologies outlined in the *Highway Capacity Manual (HCM)*, 7th Edition, which is published by the Transportation Research Board.

LOS is a qualitative measure used by traffic engineers to describe the operations of an intersection. It ranges from A to F, with A being the best and F being the worst level of operation. LOS A conditions are characterized by minimal vehicle delay and free-flow conditions, while LOS F is characterized by long vehicle delay – usually when demand exceeds available roadway capacity. **Table 5** shows the definition of LOS for unsignalized and signalized intersections.

TABLE 5: LEVEL OF SERVICE

Level of Service	Average Control Delay (seconds/vehicle) at:	
	Unsignalized Intersections	Signalized Intersections
A	0 – 10	0 – 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	> 25 – 35	> 35 – 55
E	> 35 – 50	> 55 – 80
F	> 50	> 80

Levels of service are evaluated based on the movement groupings which are required to yield to other traffic. Typically, these are left turns off the major street and the side street approaches for two-way stop-controlled intersections. For signalized intersections each movement grouping is evaluated, and LOS is evaluated for the intersection as a whole.

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 queues were also evaluated as part of the analyses. Long traffic queues which extend beyond the amount of storage available, either between intersections or within turn lanes, can have significant impacts on operations. The 95th percentile vehicular queues were analyzed 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. The 95th percentile queue represents the queue length that has only a 5% chance of being exceeded during the analysis period.

5.2 EXISTING CONDITIONS ANALYSIS

Capacity analysis was conducted for existing traffic conditions at the study intersections to determine baseline conditions for the existing analysis year and to calibrate the models. The analysis was performed for weekday AM, PM, and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown in **Exhibits 2** and **3**. The 95th percentile queues for each movement are shown in **Exhibit 4**. The Synchro reports are provided in **Appendix E**.

Table 6 provides a summary of the capacity analysis at the study intersections.

TABLE 6: EXISTING PEAK HOUR CONDITIONS

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	Oldham Pkwy. & Ward Road	Signalized	19.1	B	17.7	B	17.9	B
2	Oldham Pkwy. & Jefferson Street	NB	11.6	B	9.6	A	9.2	A
		SB	15.0	B	11.1	B	9.4	A
3	M-291 & Oldham Parkway	Signalized	5.3	A	8.3	A	4.4	A
4	Persels Road & Jefferson Street	Signalized	27.2	C	28.5	C	17.0	B
5	M-291 & Persels Rd./ Bailey Rd.	Signalized	34.1	C	47.1	D	21.7	C

The results in **Table 6** indicate that most of the study intersections are projected to operate at acceptable levels of service. During the PM peak hour, the intersection at M-291 & Persels Road/Bailey Road is projected to operate at LOS D. This is primarily due to the long cycle length on M-291. It is not uncommon for intersections along high volume roadways such as M-291 with 8-phase signals to operate at LOS D. During the PM peak hour, the eastbound left-turn movement at the intersection has a 95th percentile queue length of 202 feet, which exceeds the available storage length of one of the two turn lanes for this movement. The westbound left-turn lane at the closely spaced Market Street intersection limits the available storage length for the westbound left-turn movement at the M-291 intersection. The southbound through movement has a 95th percentile queue length of 843 feet, which is a lengthy queue, but it does clear within one cycle of the signal.

Several other queue lengths are worth noting. At the Persels Road & Jefferson Street intersection, the westbound left-turn queue nearly fills the available storage during the AM peak hour. This is most likely due to school traffic arriving at Summit Christian Academy, which is located south of the intersection on Jefferson Street.

At Oldham Parkway and Ward Road, southbound left-turn queues slightly exceed the short storage length of the left-turn lane. There is no ability to lengthen this lane because that would reduce the length of the adjacent northbound left-turn lane at the Ward Road & 3rd Street intersection.

5.3 EXISTING + PHASE 1 DEVELOPMENT CONDITIONS ANALYSIS

Capacity analysis was conducted for Existing plus Phase 1 Development Conditions at the study intersections to determine the impact of site generated traffic from Phase 1 of the proposed development. The cycle lengths were optimized at the study intersections for the analysis. The analysis was performed for weekday AM, PM and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown in **Exhibits 9** and **10**. The 95th percentile queues for each movement are shown in **Exhibit 11**. The Synchro reports are provided in **Appendix E**.

Table 7 provides a summary of the capacity analysis at the study intersections.

TABLE 7: EXISTING + PHASE 1 DEVELOPMENT PEAK HOUR CONDITIONS

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	Oldham Pkwy. & Ward Road	Signalized	15.9	B	14.5	B	14.7	B
2	Oldham Pkwy. & Jefferson Street	NB	11.0	B	10.6	B	10.5	B
		SB	10.9	B	10.2	B	10.5	B
		EBL	9.3	A	8.7	A	8.9	A
		WBL	9.6	A	8.9	A	8.9	A
3	M-291 & Oldham Parkway	Signalized	16.8	B	24.2	C	17.6	B
4	Persels Road & Jefferson Street	Signalized	28.1	C	48.0	D	14.6	B
5	M-291 & Persels Rd./ Bailey Rd.	Signalized	25.4	C	44.3	D	20.3	C
6	Oldham Parkway & Access 1	EBR	12.4	B	12.1	B	12.8	B
7	Oldham Parkway & Access 2	NBL	7.9	A	7.9	A	7.9	A
		SBL	7.8	A	7.7	A	7.6	A
		EBL	18.4	C	15.6	C	16.8	C
		EBT	11.8	B	11.4	B	11.4	B
		WBL	151.4	F	64.1	F	136.1	F
		WBT	16.1	C	14.4	B	14.6	B
8	Oldham Parkway & Access 3	NBL	7.6	A	7.6	A	7.5	A
		SBL	7.7	A	7.6	A	7.5	A
		EB	9.7	A	9.6	A	9.6	A
		WB	12.7	B	11.8	B	11.5	B
9	Oldham Parkway & Access 4	NB	9.7	A	9.6	A	9.4	A
		WBL	7.5	A	7.5	A	7.5	A
10	Oldham Parkway & Access 5	NB	9.8	A	9.6	A	9.4	A
		WBL	7.5	A	7.5	A	7.5	A

The results in **Table 7** indicate that most intersections operate acceptably with the addition site trips generated from Phase 1 of the proposed development. As in the Existing Conditions scenario, the M-291 & Persels Road/Bailey Road is projected to operate at LOS D during the PM peak hour. The 95th percentile queue length for the eastbound left-turn movement is projected to be 264 feet, which will extend back through the Persels Road & Market Street intersection. Long queues of southbound through traffic are projected during the PM peak hour, similar to existing conditions at the intersection.

The intersection at Persels Road & Jefferson Street is also projected to operate at LOS D. Westbound left-turn queues are projected to slightly increase with the addition of development traffic but are expected to be contained within the storage length of the turn lane.

The 95th percentile queue lengths for the movements exiting the site driveways are projected to be contained within the available throat lengths. While the provided throat length at Access 3 does not meet the minimum requirement, it is not expected to have an adverse impact on operations at the site driveway intersection.

All movements at the site driveways are projected to operate at LOS A or B during all peak hours except for one. The westbound left-turn movement at the Oldham Parkway & Access 2 intersection is projected to operate at LOS F across all peak hours. Due to the lower level of service for the movement, the intersection was also evaluated with all-way stop control. Lengthy queues and delays are projected for some movements with all-way stop control. As a signalized intersection an overall LOS A is projected for each peak hour. The evaluation of traffic signal control is discussed in the paragraphs below.

The decision to install a traffic signal is based on an engineering study as described in the MUTCD. Signal warrants included in the MUTCD are to be considered. The peak hour traffic volumes at the intersection were compared to the warranting thresholds of the Peak Hour Warrant. The volumes were found to be just below the warranting thresholds for this warrant. The signal warrant analysis is included in **Appendix F**.

The peak hour traffic volumes were also compared to the warranting thresholds of the Four-Hour Warrant. Each of the peak hour volumes far exceeds the minimum warranting thresholds of the Four-Hour Warrant. The signal warrant analysis is included in **Appendix F**. Traffic projections have not been developed for other hours of the day, so four hours of traffic volumes are not shown in the warrant analysis. Some assumptions can be made about other hours of an average day. The AM and PM peak hour traffic counts show that the volumes during both count periods, totaling 4 hours, were very similar to the peak hour volumes. Likewise, the time-of-day distributions from the *Trip Generation Manual* indicate that the hourly trips from the proposed land uses are consistent from 7:00 to 9:00 AM and from 4:00 to 6:00 PM. Therefore, it is likely that at least one other hour in the morning would have a similar volume to the AM peak hour. Also at least one other hour in the afternoon would have a similar volume to the PM peak hour. This indicates that the Four-Hour Warrant is expected to be satisfied.

The City of Lee's Summit encourages complete street design concepts to enhance access and safety for all road users. Pedestrian volumes are not considered in conjunction with the vehicular volume traffic signal warrants, but pedestrian access should be considered when evaluating the need for traffic signal installation. The development should include sidewalks and facilities to encourage walking and pedestrian access. It is likely that pedestrians would cross Oldham Parkway at Drive 2 when walking between the restaurants on the east side of the street and the field house and eventually the apartments that will be built during Phase 2 of the development on the west side of the street. A signal at Drive 2 would provide the safest form of control for pedestrians, due to the width of the intersection and volume of turning traffic.

The MUTCD states that the safe and efficient movement of all road users is the primary consideration in the engineering study to determine whether to install a traffic control signal. As a signalized intersection, vehicular delays will be minimal. The Four-Hour Warrant is expected to be satisfied with Phase 1 development traffic. Signalization will provide the safest form of control for pedestrians crossing Oldham Parkway. Given these factors, traffic signal installation is recommended for the Oldham Parkway & Drive 2 intersection.

A number of lanes and access control medians are shown on the site plan for Oldham Parkway west of M-291. The analysis indicates that these improvements operate well during the peak hours. The following list documents these improvements:

Oldham Parkway & M-291

- Construct an eastbound left-turn lane with a minimum storage length of 350 feet plus taper.
- Construct a second eastbound left turn lane. This lane will extend at least 300 feet west of Jefferson Street plus taper.
- Construct an eastbound right-turn lane with a minimum storage length of 350 feet plus taper.
- Construct two westbound lanes on Oldham Parkway, extending east of the intersection. The right lane should terminate as a right-turn lane at Access 2, and the left lane will continue as the through lane.

Oldham Parkway & Jefferson Street

- Construct a raised median on Oldham Parkway to restrict Jefferson Street access to left-in/right-in/right-out.
- Construct an eastbound left-turn lane with a minimum storage length of 150 feet plus taper.
- Construct a westbound left-turn lane with a minimum storage length of 200 feet plus taper.

Oldham Parkway & Access 2

- Install a traffic signal.
- Construct a northbound left-turn lane with a minimum storage length of 150 feet plus taper.
- Construct a southbound left-turn lane with a minimum storage length of 150 feet plus taper.
- Construct the eastbound and westbound approaches with three lanes, to provide one inbound lane and two outbound lanes.

Oldham Parkway & Access 3

- Construct a northbound left-turn lane with a minimum storage length of 150 feet plus taper. This will require moving the access farther to the north to allow for a 150-foot southbound left-turn lane to be constructed at Access 2.

Jefferson Street

- Construct the realigned portion of Jefferson Street as a three-lane roadway with a center two-way left-turn lane.

5.4 EXISTING + FULL DEVELOPMENT CONDITIONS ANALYSIS

Capacity analysis was conducted for Existing plus Full Development Conditions at the study intersections to determine the impact of site generated traffic from Phases 1 and 2 of the proposed development. The cycle lengths were optimized at the study intersections for the analysis. The analysis was performed for weekday AM, PM and Saturday peak hours and is based on the traffic volumes, lane configurations, and traffic controls shown on **Exhibits 16** and **17**. The 95th percentile queues for each movement are shown on **Exhibit 18**. The Synchro reports are provided in **Appendix E**.

Table 8 provides a summary of the capacity analysis at the study intersections.

The results in **Table 8** indicate that the intersections along the Oldham Parkway and the Jefferson Street corridors are projected to operate acceptably with the addition of site trips generated from both phases of the proposed development. The exception is the intersection of M-291 & Persels Road/Bailey Road. The intersection is projected to operate at an overall LOS E during the PM peak hour, with 55.1 seconds of delay. This level of delay slightly exceeds the 55 second threshold for LOS D conditions. Long queues of 900 feet projected for the southbound through lanes, however these queues are projected to clear during each cycle of the signal.

On the eastbound Persels Road approach to the intersection, long queues are projected to extend back to the Jefferson Street intersection with a single shared right-turn/through lane. The need for an eastbound right-turn lane was identified to mitigate this level of queuing. With the separate eastbound right-turn lane, the queue lengths in **Exhibit 18** indicate that all queues in the eastbound through lane are projected to be less than 200 feet.

During the PM peak hour, the eastbound left-turn movement at the intersection is projected to have a 95th percentile queue length of 273 feet, extending through the Market Street intersection. To reduce the number of potential conflict points in this area and provide more queue storage, a raised median is recommended along Persels Road. The median will restrict left-turn movements at the intersection with Market Street; resulting in RIRO access only at Persels Road. Since a left-turn lane will no longer be needed for the Market Street intersection, the eastbound left-turn lane for the M-291 & Persels Road intersection and the westbound left-turn lane for the Persels Road & Jefferson Street intersection can be lengthened.

At the intersection of M-291 & Oldham Parkway, the 95th percentile queue in the southbound right-turn lane is projected to exceed the storage length of the existing turn lane during the PM peak hour. The southbound right-turn lane should be lengthened to provide a storage length equal to the left-turn lanes on the southbound approach.

A summary of the Phase 2 improvements identified is provided below:

Oldham Parkway & M-291

- Lengthen the southbound right-turn lane to provide a minimum storage length of 300 feet plus taper.

Persels Road & M-291

- Construct an eastbound right-turn lane with a minimum storage length of 150 feet plus taper.

Persels Road & Market Street

- Construct a raised median on Persels Road to restrict Market Street access to right-in/right-out.

Persels Road & Gas Station Access

- Construct a westbound right-turn lane with a minimum storage length of 150 feet plus taper.

The Persels Road & Jefferson Street intersection is projected to operate at LOS D during all peak hours. The queues for the westbound left-turn movement are projected to exceed the storage available for this movement. Some additional storage can be provided for this movement when the median is added to Persels Road.

At the site driveways, the 95th percentile queue lengths are expected to be contained within the available throat length, even for the driveways with throats that are less the lengths required by the *Access Management Code*. Therefore the short throat lengths are not expected to have an adverse impact on operations at the site driveway intersections.

TABLE 8: EXISTING + FULL DEVELOPMENT PEAK HOUR CONDITIONS

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	Oldham Pkwy. & Ward Road	Signalized	15.7	B	14.6	B	14.8	B
2	Oldham Pkwy. & Jefferson Street	NB	13.7	B	12.3	B	13.3	B
		SB	10.8	B	10.2	B	10.3	B
		EBL	9.2	A	8.7	A	8.8	A
		WBL	11.2	B	9.9	A	10.5	B
3	M-291 & Oldham Parkway	Signalized	24.9	C	27.7	C	27.4	C
4	Persels Road & Jefferson Street	Signalized	46.7	D	48.7	D	49.7	D
5	M-291 & Persels Rd./ Bailey Rd.	Signalized	35.0	D	55.1	E	32.1	C
6	Oldham Parkway & Access 1	EBR	12.3	B	12.2	B	12.8	B
7	Oldham Parkway & Access 2	Signalized	8.3	A	7.7	A	8.6	A
8	Oldham Parkway & Access 3	NBL	7.6	A	7.6	A	7.6	A
		SBL	7.7	A	7.6	A	7.5	A
		EB	9.7	A	9.7	A	9.6	A
		WB	12.6	B	11.9	B	11.6	B
9	Oldham Parkway & Access 4	NB	9.7	A	9.7	A	9.5	A
		WBL	7.5	A	7.6	A	7.5	A
10	Oldham Parkway & Access 5	NB	9.8	A	9.7	A	9.5	A
		WBL	7.5	A	7.6	A	7.5	A
11	Jefferson Street & Public Street	SBL	7.7	A	7.6	A	7.6	A
		WB	14.4	B	11.7	B	12.4	B
12	Jefferson Street & Access 10	SBL	7.7	A	7.6	A	7.6	A
		WB	10.6	B	9.8	B	10.0	B
13	Jefferson Street & Access 6	NBL	8.0	A	7.6	A	7.6	A
		SBL	7.7	A	7.6	A	7.7	A
		EB	15.8	C	12.1	B	13.2	B
		WB	12.6	B	10.9	B	11.1	B
14	Jefferson Street & Access 7	SBL	8.0	A	7.8	A	7.9	A
		WB	12.0	B	10.6	B	11.2	B
15	Oldham Parkway & Access 8	NBR	9.9	A	9.7	A	9.9	A

5.5 FUTURE (YEAR 2044) CONDITIONS ANALYSIS

For the future year, background traffic growth was added to the existing traffic volumes, then the proposed development and planned development site trips were added. To estimate background traffic growth, the existing traffic volumes at the study intersections were assumed to increase at a rate of 1% per year to estimate conditions in 2044. In the future, development is assumed on the undeveloped land to the east of M-291. The same development trip assumptions from the MoDOT traffic analysis for the US-50 & M-291 interchange were used.

The Future (Year 2044) peak hour traffic volumes are shown on **Exhibit 12**.

In the future additional capacity improvements are needed to achieve acceptable levels of service. These improvements are listed below:

M-291 & Oldham Parkway

- Extend the southbound right-turn lane to the M-291 southbound exit ramp from US-50. This is consistent with the future conditions analysis from the US-50 & M-291 interchange project.

M-291 & Persels Road/Bailey Road

- Construct an additional eastbound through lane.
- Construct an additional westbound through lane. This lane will terminate as a right-turn lane at Jefferson Street.
- Construct an additional northbound left-turn lane.
- Construct an additional southbound left-turn lane.
- Construct an additional southbound through lane.

Capacity analysis was conducted for Future Conditions at the study intersections to determine the need for capacity improvements within the study network in the future. The cycle lengths were optimized at the study intersections for the analysis. The analysis was performed for weekday AM, PM and Saturday peak hours and is based on the traffic volumes, lane configurations, and intersection controls shown on **Exhibits 19** and **20**. The 95th percentile queues for each movement are shown on **Exhibit 21**. The Synchro reports are provided in **Appendix F**.

Table 9 provides a summary of the capacity analysis at the study intersections.

The analysis results indicate that the signalized intersections along M-291 are projected to operate at LOS E in the future during the PM and Saturday peak hour. Several individual movements at these intersections are projected to operate over capacity in the future. Additional improvements will be needed to achieve acceptable levels of service at these intersections if the future volumes projected in this study are realized.

At the site driveways, all 95th percentile queue lengths are expected to be contained within the available throat length.

TABLE 9: FUTURE (YEAR 2044) PEAK HOUR CONDITIONS

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	Oldham Pkwy. & Ward Road	Signalized	18.3	B	17.0	B	17.6	B
2	Oldham Pkwy. & Jefferson Street	NB	14.5	B	12.7	B	13.5	B
		SB	10.9	B	10.3	B	10.4	B
		EBL	9.3	A	8.8	A	8.9	A
		WBL	12.0	B	9.9	A	10.2	B
3	M-291 & Oldham Parkway	Signalized	28.6	C	64.1	E	59.9	E
4	Persels Road & Jefferson Street	Signalized	46.0	D	44.7	D	46.9	D
5	M-291 & Persels Rd./ Bailey Rd.	Signalized	34.7	C	62.1	E	44.5	D
6	Oldham Parkway & Access 1	EBR	12.5	B	12.6	B	13.1	B
7	Oldham Parkway & Access 2	Signalized	8.5	A	7.9	A	8.8	A
8	Oldham Parkway & Access 3	NBL	7.6	A	7.7	A	7.6	A
		SBL	7.8	A	7.6	A	7.6	A
		EB	10.0	B	10.2	A	9.9	A
		WB	13.4	B	12.8	B	12.2	B
9	Oldham Parkway & Access 4	NB	10.0	A	10.1	B	9.7	A
		WBL	7.6	B	7.6	A	7.5	A
10	Oldham Parkway & Access 5	NB	10.1	B	10.0	B	9.7	A
		WBL	7.6	A	7.6	A	7.5	A
11	Jefferson Street & Public Street	SBL	7.7	A	7.6	A	7.6	A
		WB	15.3	C	11.4	B	11.6	B
12	Jefferson Street & Access 10	SBL	7.7	A	7.6	A	7.6	A
		WB	10.9	B	9.4	B	9.4	B
13	Jefferson Street & Access 6	NBL	8.7	A	7.6	A	7.5	A
		SBL	7.8	A	7.7	A	7.8	A
		EB	17.2	C	12.0	B	12.6	B
		WB	13.3	C	12.1	B	13.1	B
14	Jefferson Street & Access 7	SBL	8.0	A	7.8	A	7.9	A
		WB	12.4	B	10.6	B	11.0	B
15	Oldham Parkway & Access 8	NBR	9.9	A	9.7	A	10.0	A

6.0 CONCLUSIONS AND RECOMMENDATIONS

A traffic impact study for the Oldham Village development has been prepared by Kimley-Horn. The proposed site is generally located in the southwest quadrant of the US-50 and M-291 interchange in Lee's Summit, Missouri. The purpose of this study was to assess the impact of the proposed development on the surrounding transportation system. The following provides a summary of the analysis.

Intersection capacity analysis was performed at the study intersections for the following scenarios:

- Existing Conditions
- Existing + Phase 1 Development Conditions
- Existing + Full Development Conditions
- Future Conditions

All study intersections were found to currently be operating at acceptable levels of service. Some long queues were observed at several locations that exceed the exiting storage length of the turn lanes.

The proposed development is projected to generate 17,291 daily trips, 1,775 AM peak hour trips, 1,324 PM peak hour trips, and 2,026 Saturday peak hour trips. These trips represent primary trips generated by the site, and do not include pass-by trips. During the PM peak hour, the proposed trip generation is slightly higher than what was assumed in the interchange analysis prepared by MoDOT in 2015. The PM peak hour is the critical time period for analysis of the study area. Therefore, the analysis performed by MoDOT in 2015 is still valid for the interchange and the interchange was not evaluated in this study.

The proposed Oldham Village development is anticipated to be constructed in two phases. Phase 1 includes the realignment of Oldham Parkway through the northern portion of the site. A portion of Jefferson Street will also be realigned to the west to create greater separation from M-291. The Phase 1 portion of the site will be accessed from six driveway intersections with public streets. Phase 1 includes several restaurants and a large building for fitness and athletic events.

Phase 2 includes an apartment building in the southwest corner of Oldham Parkway & Jefferson Street. A number of pad sites are also proposed east of Jefferson Street in Phase 2. The Phase 2 portion will be accessed primarily from four intersections along Jefferson Street, one access along Oldham Parkway, and one access along Persels Road.

The proposed accesses along Oldham are generally spaced appropriately. Two of the accesses have throats that are shorter than required, but all queues are projected to be contained within the throat lengths. On Jefferson Street, the proposed accesses do not meet the minimum spacing requirements from the *Access Management Code*. However, all of the accesses are projected to operate acceptably, and all queues are projected to be contained within the available throat lengths.

Several improvements are shown on the site plan or have been identified in this study to mitigate the addition of Phase 1 development site traffic and achieve acceptable operations. These improvements are listed below:

Oldham Parkway & M-291

- Construct an eastbound left-turn lane with a minimum storage length of 350 feet plus taper.
- Construct a second eastbound left turn lane. This lane will extend at least 300 feet west of Jefferson Street plus taper.
- Construct an eastbound right-turn lane with a minimum storage length of 350 feet plus taper.
- Construct two westbound lanes on Oldham Parkway, extending east of the intersection. The right lane should terminate as a right-turn lane at Access 2, and the left lane will continue as the through lane.

Oldham Parkway & Jefferson Street

- Construct a raised median on Oldham Parkway to restrict Jefferson Street access to left-in/right-in/right-out.
- Construct an eastbound left-turn lane with a minimum storage length of 150 feet plus taper.
- Construct a westbound left-turn lane with a minimum storage length of 200 feet plus taper.

Oldham Parkway & Access 2

- Install a traffic signal.
- Construct a northbound left-turn lane with a minimum storage length of 150 feet plus taper.
- Construct a southbound left-turn lane with a minimum storage length of 150 feet plus taper.
- Construct the eastbound and westbound approaches with three lanes, to provide one inbound lane and two outbound lanes.

Oldham Parkway & Access 3

- Construct a northbound left-turn lane with a minimum storage length of 150 feet plus taper. This will require moving the access farther to the north to allow for a 150-foot southbound left-turn lane to be constructed at Access 2.

Jefferson Street

- Construct the realigned portion of Jefferson Street as a three-lane roadway with a center two-way left-turn lane.

Signal installation is recommended for the Oldham Parkway & Drive 2 intersection because it will be the most efficient form of control for vehicles, the Four-Hour Warrant is expected to be satisfied, and signalization will provide the safest form of control for pedestrians crossing Oldham Parkway.

Additional improvements are identified for Phase 2 of the development. These improvements are listed below:

Oldham Parkway & M-291

- Lengthen the southbound right-turn lane to provide a minimum storage length of 300 feet plus taper.

Persels Road & M-291

- *Construct an eastbound right-turn lane with a minimum storage length of 150 feet plus taper.*

Persels Road & Market Street

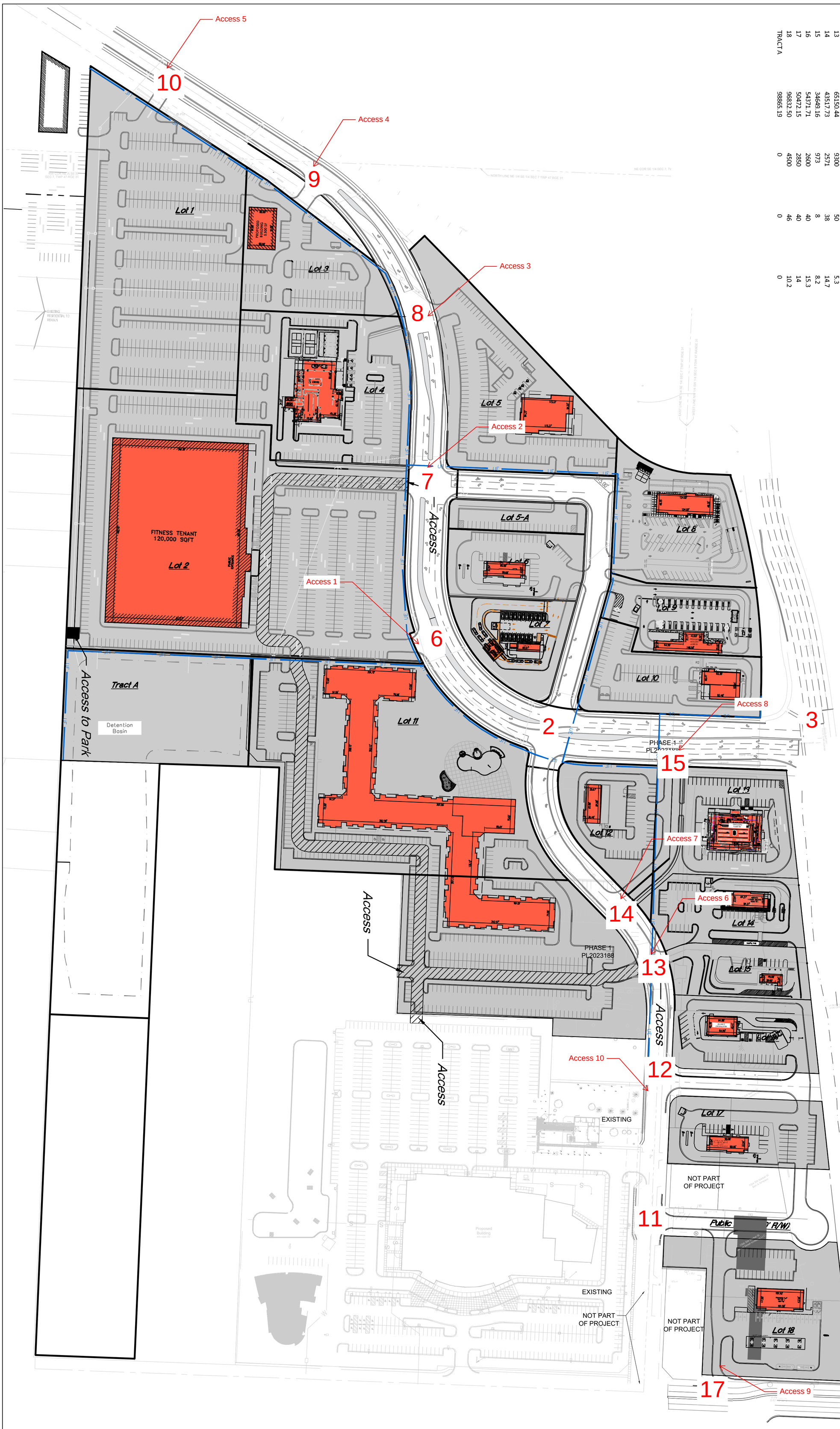
- Construct a raised median on Persels Road to restrict Market Street access to right-in/right-out.

Persels Road & Gas Station Access

- Construct a westbound right-turn lane with a minimum storage length of 150 feet plus taper.

Future Conditions were also analyzed to determine the need for capacity improvements within the study network. Additional improvements were identified for the future at the M-291 & Persels Road intersection, such as three southbound through lanes dual north/south left-turn lanes, and two east/west through lanes. The signalized intersections along M-291 are projected to operate at LOS E during the PM and Saturday peak hour. Additional improvements will be needed to achieve acceptable levels of service at these intersections if the future volumes projected in this study are realized.

Lot Number	Lot Area (Sq. Ft.)	Building Area	Parking	Ratio
1	209649.79	0	536	0
2	370916.90	120000	505	4.2
3	67271.42	5500	100	18.1
4	116312.91	9696	165	17
5	110033.60	8000	141	17.6
5-A	19459.32	0	26	0
6	43311.53	2850	40	14
7	44532.00	930	20	21.5
8	73114.12	5355	75	14
9	53805.91	3900	19	4.8
10	50513.21	4550	54	11.8
11	399182.25	80896	469	5.7
12	53907.80	2500	35	14
13	65150.44	9300	50	5.3
14	43517.73	2571	38	14.7
15	34649.16	973	8	8.2
16	54371.71	2600	40	15.3
17	50472.15	2850	40	14
18	96832.50	4500	46	10.2
TRACT A	98865.19	0	0	0



SITE PLAN OVERALL

SCALE: 1" = 100'

0 50' 100' 200'

North

C: 100

REVISIONS	
1	REV. 6/25/2024
2	REV. 7/9/2024
	REV. 8/7/2024

Matthew J. Schlicht
MO PE 2006019708
KS PE 19077
OK PE 25326

STATE OF MISSOURI — MATTHEW J. SCHLICHT — NUMBER PE-2006019708 — PROFESSIONAL ENGINEER

SITE PLAN OVERALL

Phase 2 Preliminary Development Plans for:

Oldham Village

LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

Project: OLDHAM VILLAGE

Issue Date: June 10, 2024

Oldham Village

LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

Professional Registration

Missouri
Engineering 2005002186-D
Surveying 2005003819-D
Kansas
Engineering E-1665
Surveying LS-218
Oklahoma
Engineering 6254
Nebraska
Engineering CA2821

ENGINEERING SOLUTIONS
ENGINEERING & SURVEYING
50 SE 30TH STREET
LEE'S SUMMIT, MO 64082
P:(816) 623-9888 F:(816)623-9849