TJKM
Transportation
Consultants

Draft Traffic Impact Analysis Report

Commercial Development at the southeast corner of Yosemite Avenue and Mckee Road

Merced, CA

January 30, 2015

ATTACHMENT 7

Table of Contents

Tables

Figures

Appendices

Executive Summary

This report presents the results of the Traffic Impact Analysis (TIA) conducted for the proposed commercial development located at the southeast corner of Yosemite Avenue and McKee Road in the City of Merced, California. The project proposes construction of three new buildings totaling 62,000 square feet built on a 5.42-acre site. The development would be constructed in two phases as per the site plan, and will consist of few eateries and retail shops. The current parcel is mostly vacant land with two single family homes. Per City of Merced's land use map, the project is zoned for low density residential. Therefore, a rezoning application will have to be filed with the City of Merced for the proposed commercial development.

The purpose of this Traffic Impact Analysis is to evaluate the potential traffic impacts, identify short-term and long-term roadway circulation needs, determine potential mitigation measures and identify any critical traffic issues that should be addressed in the on-going planning process. The scope of work was prepared in consultation with the City of Merced staff. Roadway system operations were evaluated under the following scenarios:

1. Existing Conditions
2. Existing plus Project Conditions
3. Existing plus Approved Conditions
4. Existing plus Approved plus Project Conditions
5. Cumulative Conditions
6. Cumulative plus Project Conditions

Project Trip Generation

The proposed project trip rates were obtained from the standard reference *Trip Generation,* 9th Edition, published by the Institute of Transportation Engineers (ITE). The proposed project is estimated to generate 1,721 net new daily trips, 39 net new a.m. peak hour trips and 150 net new p.m. peak hour trips.

Project Trip Distribution

Trip distribution assumptions for the proposed project were developed based on existing travel patterns, Merced County Association of Governments (MCAG) travel demand model, and knowledge of the study area. Project trips were assigned to the study intersections based on the following trip distribution assumptions:

- 50 percent from/ to west of Yosemite Avenue and Mckee Road
- 20 percent from/ to south of Yosemite Avenue and Mckee Road
- 20 percent from/ to east of Hatch Road and Yosemite Avenue
- 5 percent from/ to Hatch Road
- 5 percent from/ to Whitewater Way

Project Impacts

Intersection Impacts

Existing plus Project Traffic Conditions

The intersections of Yosemite Avenue and Parsons Avenue operates at an unacceptable Level of Service. In order to improve the intersections operations, it is recommended to modify the westbound approach to accommodate an additional 100 ft. shared thru/right turn lane. In addition, re-stripe the existing shared left/thru/right lane to shared left/thru lane.

Existing plus Approved plus Project Traffic Conditions

The intersections of Yosemite Avenue and Parsons Avenue operates at an unacceptable Level of Service. In order to improve the intersections operations, the same mitigation measures are recommended as in Existing plus Project Conditions.

Cumulative (2035) plus Project Traffic Conditions

The intersections of Yosemite Avenue / Parsons Avenue and McKee Road / Olive Avenue operates at an unacceptable Level of Service. In order to improve the intersection operations the following mitigation measures are recommended:

<u>Yosemite Avenue and Parsons Avenue</u>

The same mitigation measures are recommended as in Existing plus Project Conditions.

<u>Olive Avenue and McKee Road</u>

- Southbound Approach
  - Remove the adjacent on-street parking for 100 ft. on the southbound approach.
  - Re-stripe the approach as shared left/thru lane and shared right/thru lane.
  - Remove the adjacent on-street parking for 100 ft. on the southbound receiving lane and stripe it as a lane drop.
- Northbound Approach
  - Remove the adjacent on-street parking for 100 ft. on the northbound approach.
  - Re-stripe the approach as shared left/thru lane and shared right/thru lane.
  - Remove the adjacent on-street parking for 100 ft. on the northbound receiving lane and stripe it as a lane drop. Although this might not be feasible due to residential driveways.

If the proposed lane modification changes are not feasible, it is recommended to install a traffic signal to improve the level of service operations to acceptable levels.

Roadway Segment Impacts

Based on the results of the roadway segment analysis, it can be expected that the study roadway segments would operate at or better than the City of Merced's LOS threshold of 'D'.

Weekday vs Sunday Analysis

Based on the comparison of ADT between weekday and Sunday, it was determined that the Sunday ADT's were either lower or about the same as that of the weekday ADT's. Therefore, all recommended mitigation measures under all scenarios for the weekday operations would also apply to Sunday traffic.

Queuing Analysis

At the intersection of Olive Avenue and McKee Road, It is recommended to increase the eastbound left turn lane storage capacity from 60 to 100 feet. This would require re-striping the eastbound left turn approach and reduction of the TWLT lane to the west of this intersection.

Site-Access, On-Site Circulation, and Parking

TJKM reviewed the project site plan to evaluate on-site circulation and access to the project. The proposed project's access will be via one full access driveway on McKee Road, one right-in and right-out driveway on Yosemite Avenue and one full access driveway on Whitewater Way for the single-family home subdivision to the east. A separate entrance only driveway is provided for service trucks on Yosemite Avenue at the northeast corner of the project site and an exit only driveway is provided onto McKee Road at the southwest corner of project site. The project also provides enough parking spaces based on size of development, this will result in adequate on-site circulation with minor to no delays to adjacent roadways.

Introduction

This report presents the results of the Traffic Impact Analysis (TIA) conducted for the proposed commercial development located at the southeast corner of Yosemite Avenue and McKee Road in the City of Merced, California, as shown in Figure 1. The project proposes construction of a shopping center with few eateries and retail shops, see site plan on Figure 2

Purpose

The purpose of this Traffic Impact Analysis is to evaluate the potential traffic impacts, identify short-term and long-term roadway circulation needs, determine potential mitigation measures and identify any critical traffic issues that should be addressed in the on-going planning process. The scope of work was prepared in consultation with the City of Merced staff.

Project Study Area

Study Intersections

TJKM evaluated traffic conditions at the study intersections during a.m. and p.m. peak hours for a typical weekday and also on Sunday. The study intersections were selected in consultation with the City staff. The peak periods were observed between 7:00 a.m. - 9:00 a.m. and 4:00 p.m. - 6:00 p.m. The study intersections and the associated traffic controls are as follows:

1. Yosemite Avenue and Parsons Avenue/ Gardner Avenue (All -Way Stop)
2. Yosemite Avenue and McKee Road (Signal)
3. Yosemite Avenue and Hatch Road (Side-Street Stop)
4. Olive Avenue and McKee Road (All -Way Stop)

Project Driveways

TJKM evaluated the proposed project traffic at the following project driveways:

1. Yosemite Avenue and Project Driveway
2. McKee Road and Project Driveway
3. Whitewater Way and Project Driveway

Roadway Segments

TJKM evaluated the traffic operations at the following roadway segments:

1. Yosemite Avenue, between Parsons Avenue and McKee Road
2. McKee Road, between Yosemite Avenue and Silverado Avenue

Intersection Analysis Scenarios

The study intersections were evaluated during the a.m. and p.m. peak hours for the following scenarios:

- ***Existing Traffic Conditions*** – This scenario evaluates existing traffic volumes and roadway conditions based on traffic counts and field surveys.
- ***Existing Plus Project Traffic Conditions*** – This scenario is similar to Existing Conditions, but with addition of traffic projected to be generated from the proposed project.
- ***Existing Plus Approved Traffic Conditions*** – This scenario evaluates existing volumes plus traffic from approved but not yet constructed developments in the area.
- ***Existing Plus Approved Plus Project Traffic Conditions*** - This scenario is similar to Existing Plus Approved Conditions, but with addition of traffic projected to be generated from the proposed project.
- ***Cumulative (2035) No Project Conditions*** – This scenario evaluates total traffic volumes and roadway conditions based on the year 2035 without the proposed project.
- ***Cumulative (2035) Plus Project Conditions*** – This scenario is similar to Cumulative No Project Conditions, but with addition of traffic projected to be generated from the proposed project.

Level of Service Analysis Methodology

Level of Service is a qualitative index of the performance of an element of the transportation system. Level of Service (LOS) is a rating scale running from A to F, with LOS A indicating no congestion, and LOS F indicating unacceptable congestion and delays. LOS in this study describes the operating conditions for unsignalized , signalized intersections and roadway segments.

The *2000 Highway Capacity Manual* is the standard reference published by the Transportation Research Board, and contains the specific criteria and methods to be used in assessing LOS. HCS 2000 and Synchro software were used to define LOS for the intersections in this study.

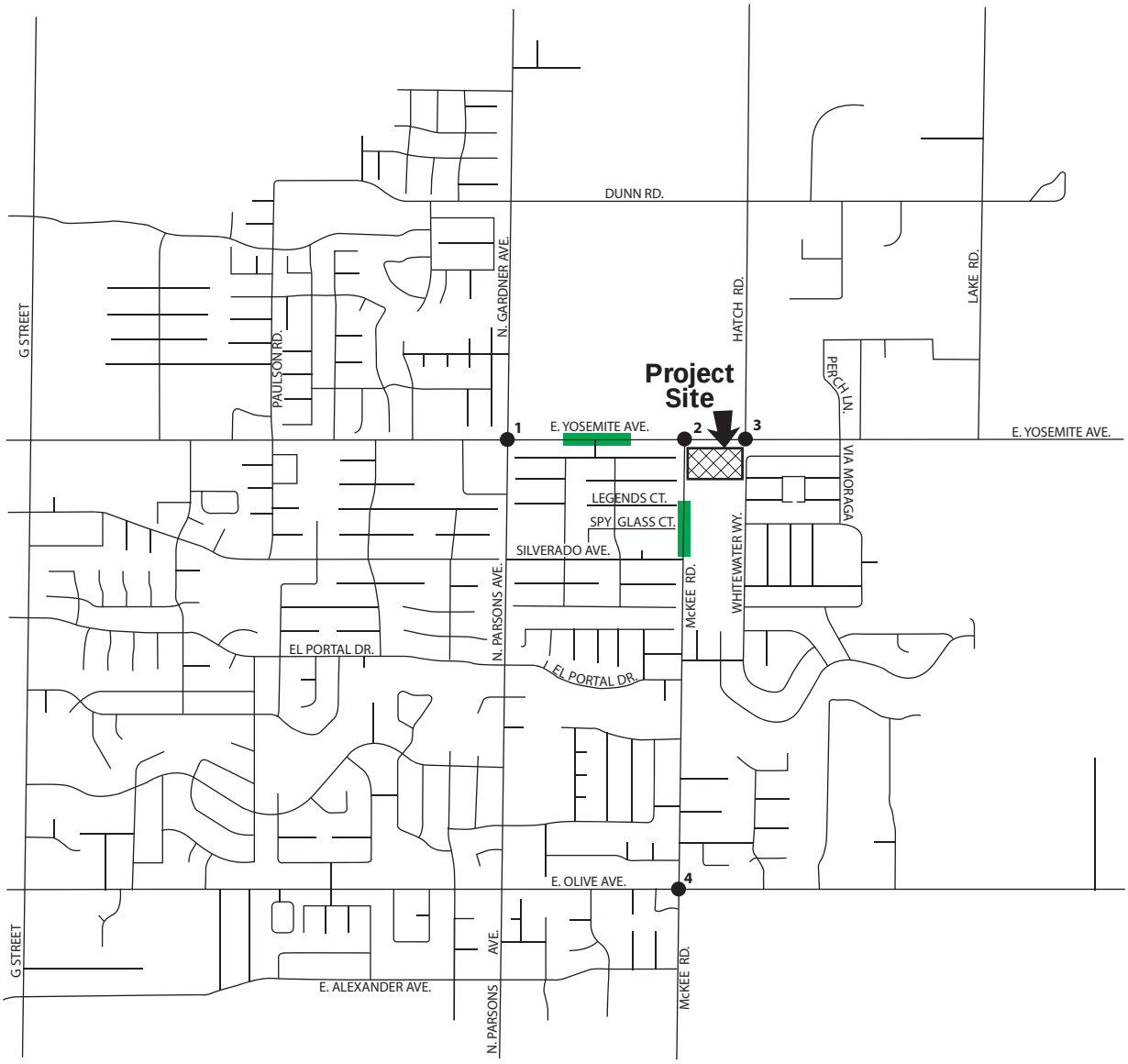
The City of Merced's Vision 2030 General Plan- Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type" was used to define the LOS for the roadway segments in this study. Details regarding the HCM methodology and roadway segment's LOS threshold are in Appendix A.

Criteria of Significance

The Merced Vision 2030 General Plan Transportation and Circulation Element has established LOS D as the acceptable level of traffic congestion on larger roads and major intersections. LOS D is used to evaluate the potential significance of LOS impacts to intersections and segments within the City of Merced and in its sphere of influence (SOI).

TJKM
Transportation
Consultants

Vicinity Map



LEGEND

- Study Intersection
- Proposed Study Segment

NORTH
Not to Scale

Figure 1

TJKM
Transportation
Consultants

Site Plan

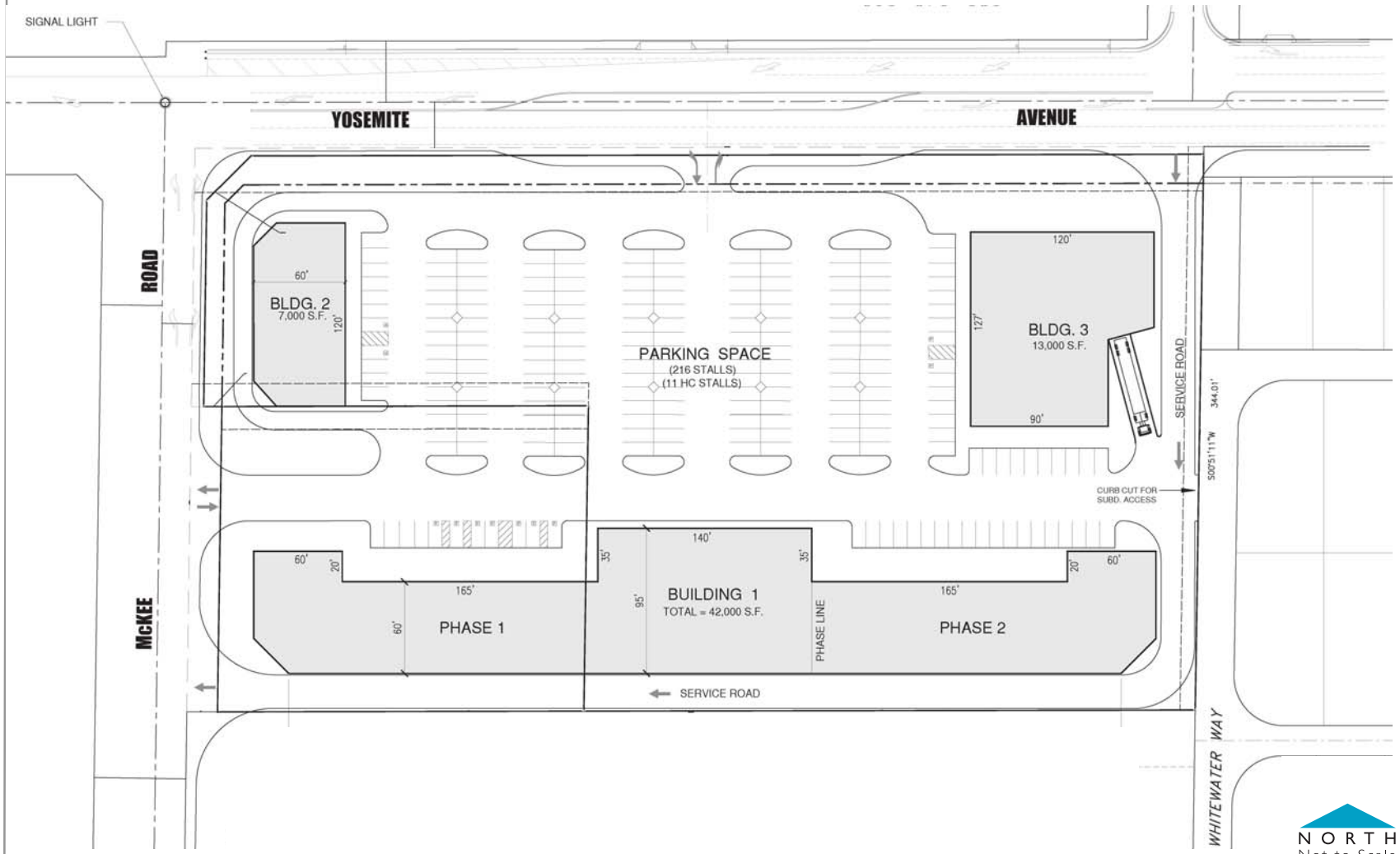


Figure 2

Existing Conditions

Roadway Network

The project site and surrounding study area are illustrated in Figure 1. Important roadways adjacent to the project site are discussed below.

Yosemite Avenue is a four-lane, east-west divided arterial road that connects Snelling Highway to the west and N Arboleda Drive to the east. Near the project site, Yosemite Avenue has a three-lane cross-section with two lanes running east and one lane running west. Near the project site, Yosemite Avenue includes bike lanes on both sides of the roadway. The posted speed limit is between 45 and 50 miles per hour (mph). Yosemite Avenue provides direct access to the project site.

Mckee Road is a two-lane, north-south collector that extends between Yosemite Avenue to the north and E Santa Fe Avenue to the south. Mckee Road includes on-street parking on both sides of the roadway. The speed limit along Mckee Road near the project site is 40 mph. Mckee Road provides direct access to the project site.

Hatch Road is a two-lane, north-south local roadway that runs between E Cardella Road to the north and Yosemite Avenue to the south.

Parsons Avenue / Gardner Avenue is a two-lane, north-south arterial that extends between E Cardella Road to the north and Stretch Road to the south. The posted speed limit is between 40 and 45 miles per hour (mph).

Whitewater Way is a two-lane, north-south local roadway that would connect the residents near the project site with the proposed project. Whitewater Way provides direct access to the project site.

Existing Transit Facilities

Merced County Transit, or "The Bus", is the transit operator in the City of Merced. At present, UC transit routes operate near the proposed project. Retention of the existing routes and the increase or decrease of route intervals is dependent on transit ridership and on available funding.

Existing Pedestrian and Bike Facilities

Currently, Class II bike lanes exist adjacent to the proposed project site along Yosemite Avenue. The existing bike lanes are in conformance with the *Merced County Regional Bicycle Transportation Plan.*

Pedestrian facilities include sidewalks and crosswalks. Crosswalks are present across all legs of the intersection of Olive Avenue and McKee Road. Crosswalks are present on the southern and eastern leg of the intersection of Yosemite Avenue and McKee Road. A part of Mckee Road has sidewalks along the northern side.

Existing Peak Hour Traffic Volumes

The weekday and Sunday peak hour turning movement volumes at the study intersections during the a.m. and p.m. peak hours were based on the counts that were collected during January 2015. The existing weekday turning movement volumes, lane geometry and intersection controls are illustrated in Figure 3. Existing traffic counts are provided in Appendix B.

Existing Roadway Segment Volumes

The seven day bi-directional Average Daily Traffic (ADT) at the study roadway segments were collected during January 2015. The ADT counts are provided in Appendix B.

TJKM
Transportation
Consultants

Existing Conditions Traffic Volumes, Lane Geometry, and Controls

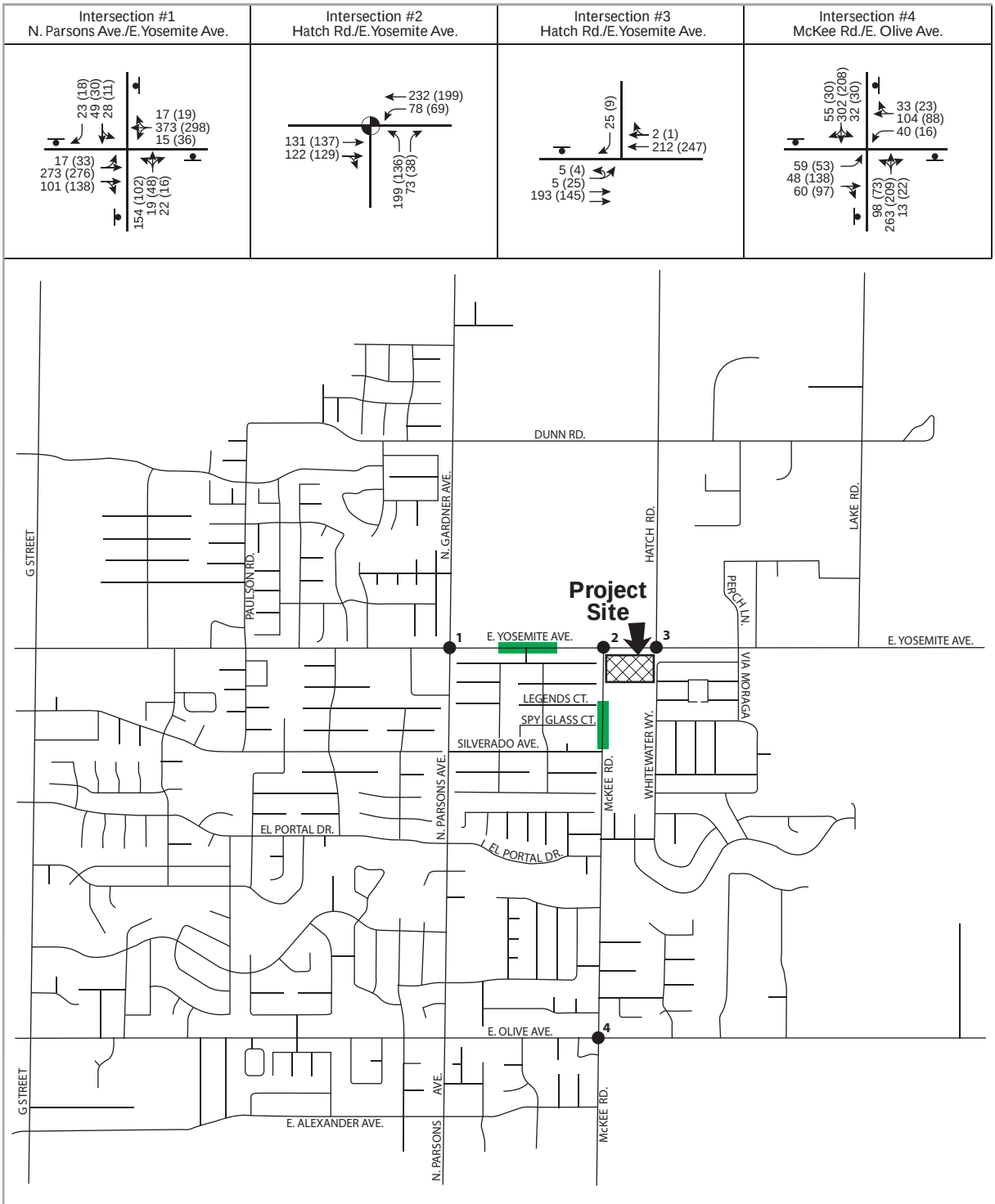


Figure 3

Existing Level of Service Analysis

Table 1 and Table 2 below summarize the levels of service at the study intersections and roadway segments respectively. Levels of service worksheets for the existing traffic conditions are provided in Appendix C.

Table 1: Intersection Level of Service Analysis - Existing Conditions

ID	*Intersection*	*Intersection Control*	*A.M. Peak Hour*		*P.M. Peak Hour*	
			Average Delay	*LOS*	*Average Delay*	*LOS*
1	Yosemite Avenue & Parsons Avenue	All -Way Stop	**36.3**	**E**	16.8	C
2	Yosemite Avenue & McKee Road	Signal	17.5	B	16.5	B
3	Yosemite Avenue & Hatch Road	Side-Street Stop	9.2	A	9.3	A
4	Olive Avenue & McKee Road	All -Way Stop	21.2	C	15.4	C

Notes: 1. LOS = Level of Service;
2. Average intersection delay expressed in seconds per vehicle for signalized intersections and all way stop controlled intersections. Total control delay for the worst movement is presented for stop controlled intersections.
Bold indicates deficient intersection operations.

Table 2: Roadway Segment Level of Service Analysis - Existing Conditions

ID	*Limits*	*Lanes*	*24-hr Volume*	*LOS*
Yosemite Avenue	Between Parsons Avenue and Mckee Road	3	7,081	C
Mckee Road	Between Yosemite Avenue and Silverado Avenue	2	4,263	C

Notes: LOS = Level of Service per the city of Merced Vision 2030 General Plan Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type"

Traffic Signal Warrants

Based on TJKM's peak hour signal warrant analysis, the intersection of Yosemite Avenue and Parsons Avenue meets the signal warrant during the a.m. peak hour. It is worth noting that MUTCD states "satisfaction of a signal warrant or warrants shall not in itself require the installation of a "traffic signal". Based on the impact criteria, it is recommended that prior to installation of a traffic signal, the remaining California MUTCD warrants as applicable be conducted. Peak Hour Signal Warrant sheets are provided in Appendix J.

Proposed Project

Project Description

The proposed commercial development is located at the southeast corner of Yosemite Avenue and McKee Road in the City of Merced, California. The project proposes construction of three new buildings totaling 62,000 square feet built on a 5.42-acre site. The project plans to build a shopping center with few eateries and retail shops. The proposed development would be constructed in two phases as per the Site plan. The current parcel is a mostly vacant lot with two single-family homes on the parcel.

The proposed project is bound by Yosemite Avenue to the North, McKee Road to the west, Whitewater Way to the East and Project's Service Road to the South. The proposed development will be approximately 2 miles west of University of California, Merced. Per City of Merced's land use map, the project is zoned for low density residential. Therefore, a rezoning application will have to be filed with the City for the proposed commercial development.

According to the site plan, access to the proposed development will be via one proposed full access driveway on McKee Road, one proposed full access driveway on Whitewater Way and one proposed right-in & right-out driveway on Yosemite Avenue. In addition, a separate entrance only driveway is provided for service trucks on Yosemite Avenue at the northeast corner of the project site and an exit only driveway is provided onto McKee Road at the southwest corner of project site.

Project Trip Generation

The proposed project trip rates were obtained from the standard reference *Trip Generation,* 9th Edition, published by the Institute of Transportation Engineers (ITE). The trip generation estimates were developed using the rates for "Shopping Center" (ITE Land Use 820). The proposed project is expected to generate 1,721 net daily trips, including 39 net trips during the a.m. peak hour and 150 net trips during the p.m. peak hour. Per City's request, the trip generation estimates include a passer-by trip reduction of 35 percent. Table 3 summarizes the proposed project trip generation.

Table 3: Proposed Project Trip Generation

Land Use (ITE Code)	*Size*	*Daily*		*A.M. Peak Hour Trips*					*P.M. Peak Hour Trips*				
		Rate[2]	*Trips*	*Rate*	*(In:Out)%*	*In*	*Out*	*Total*	*Rate*	*(In:Out)%*	*In*	*Out*	*Total*
Shopping Center (820)	62.0 KSF[1]	42.70	2,647	0.96	62:38	37	23	60	3.71	48:52	110	120	230
Passer-By-Trip Reductions (35%)		*(926)*				*(13)*	*(8)*	*(21)*			*(38)*	*(42)*	*(80)*
Total New Project Trips			**1,721**			**24**	**15**	**39**			**72**	**78**	**150**

Notes: 1. KSF = Thousand Square Feet
2. Rate = Trips per KSF
Source: Trip Generation (9th Edition), Institute of Transportation Engineer (2012)

Project Trip Distribution and Assignment

Trip distribution assumptions for the proposed project were developed based on existing travel patterns, Merced County Association of Governments (MCAG) travel demand model, and knowledge of the study area. Project trips were assigned to the study intersections based on the following trip distribution assumptions:

- 50 percent from/ to west of Yosemite Avenue and Mckee Road
- 20 percent from/ to south of Yosemite Avenue and Mckee Road
- 20 percent from/ to east of Hatch Road and Yosemite Avenue
- 5 percent from/ to Hatch Road
- 5 percent from/ to Whitewater Way

Figure 4 illustrates the project trip distribution and Project Only trip assignment at the study intersections. Figure 5 shows the project trips at the proposed driveways.

The Existing plus Project turning movement volumes resulting from project trip assignment are illustrated in Figure 6.

TJKM
Transportation
Consultants

Project Trip Distribution and Assignment

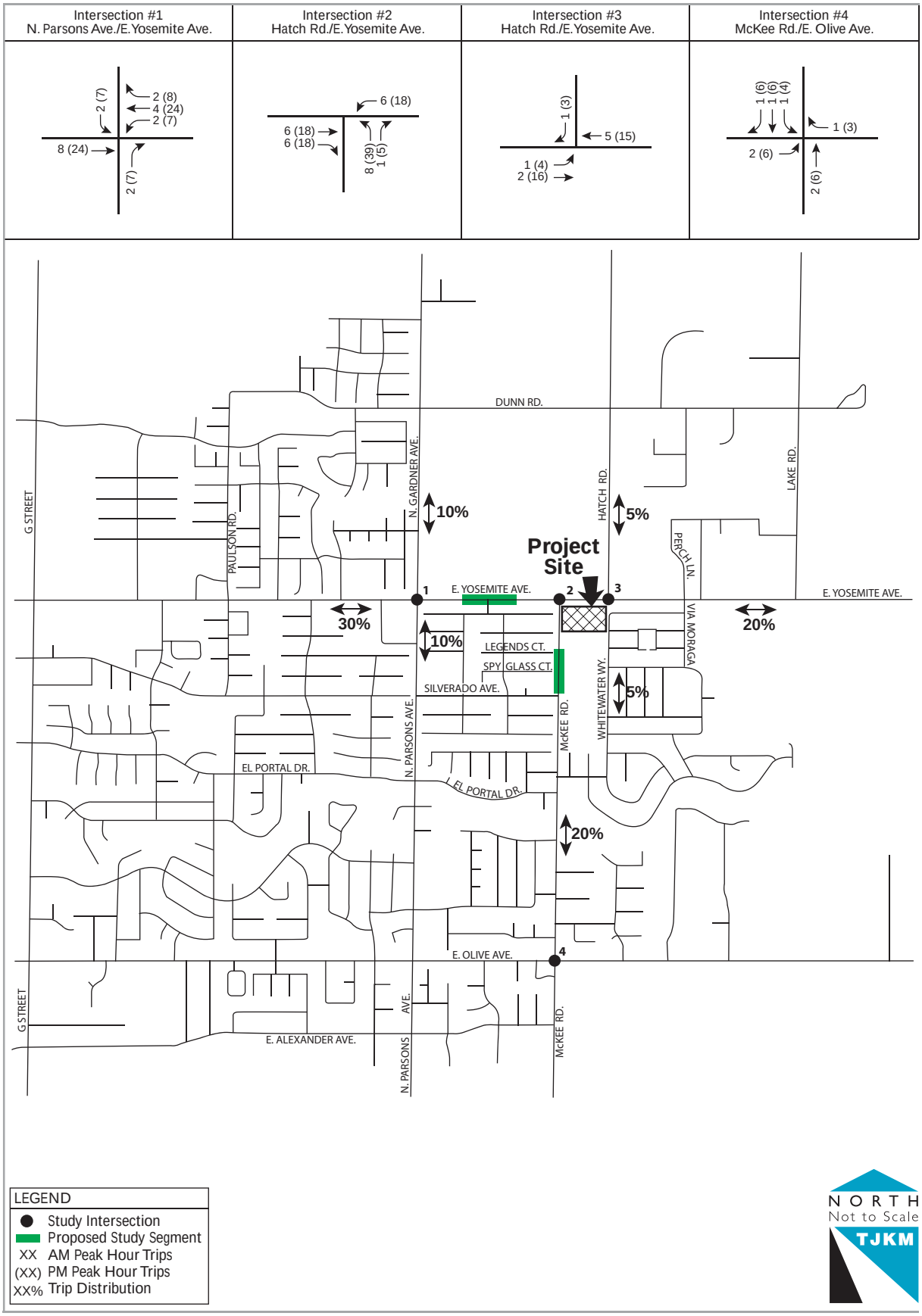
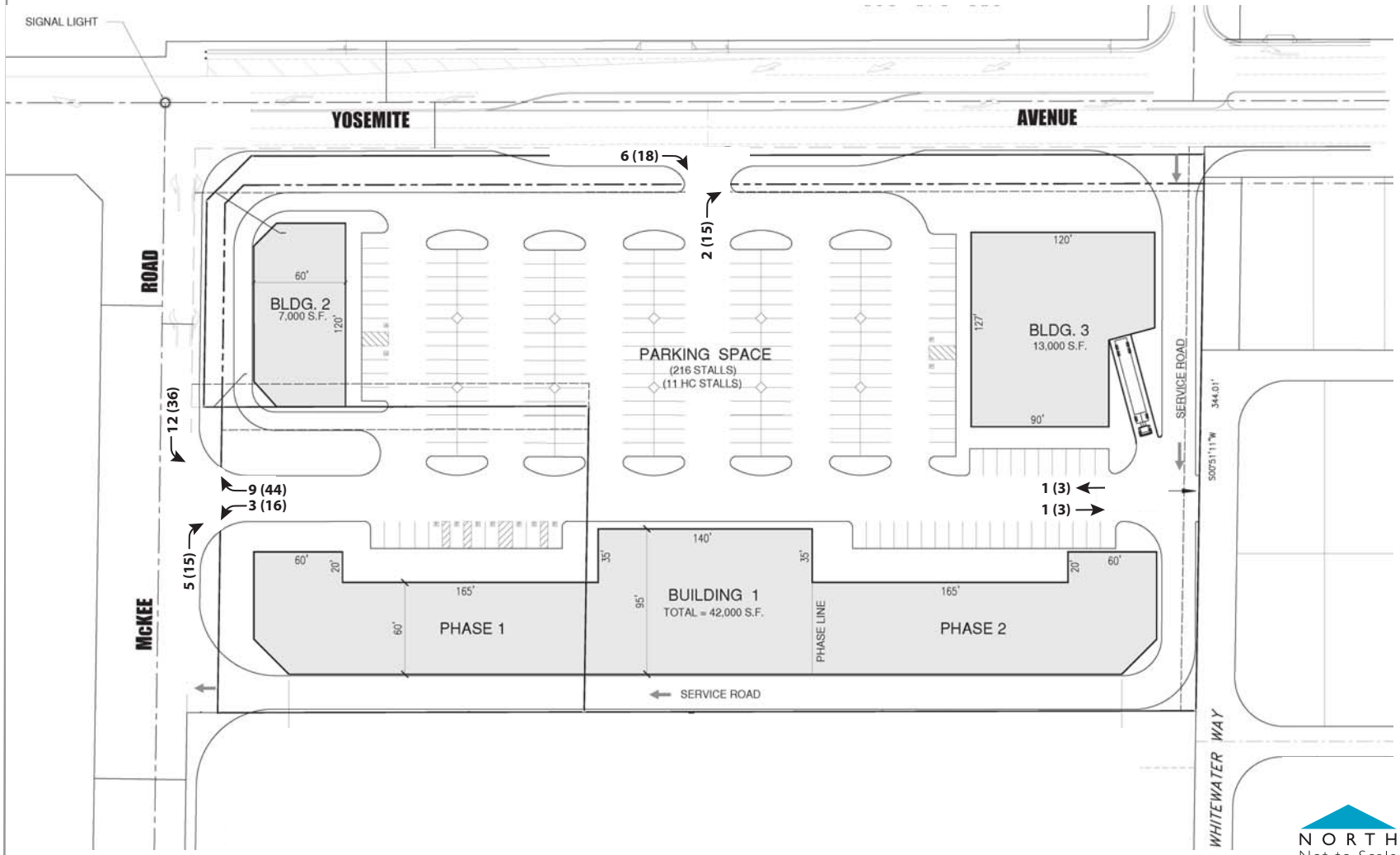


Figure 4

TJKM
Transportation
Consultants

Project Driveway Trip Assignment



LEGEND
XX AM Project Driveway Trips
(XX) PM Project Driveway Trips

Figure 5

TJKM
Transportation
Consultants

Existing plus Project Conditions Traffic Volumes, Lane Geometry, and Controls

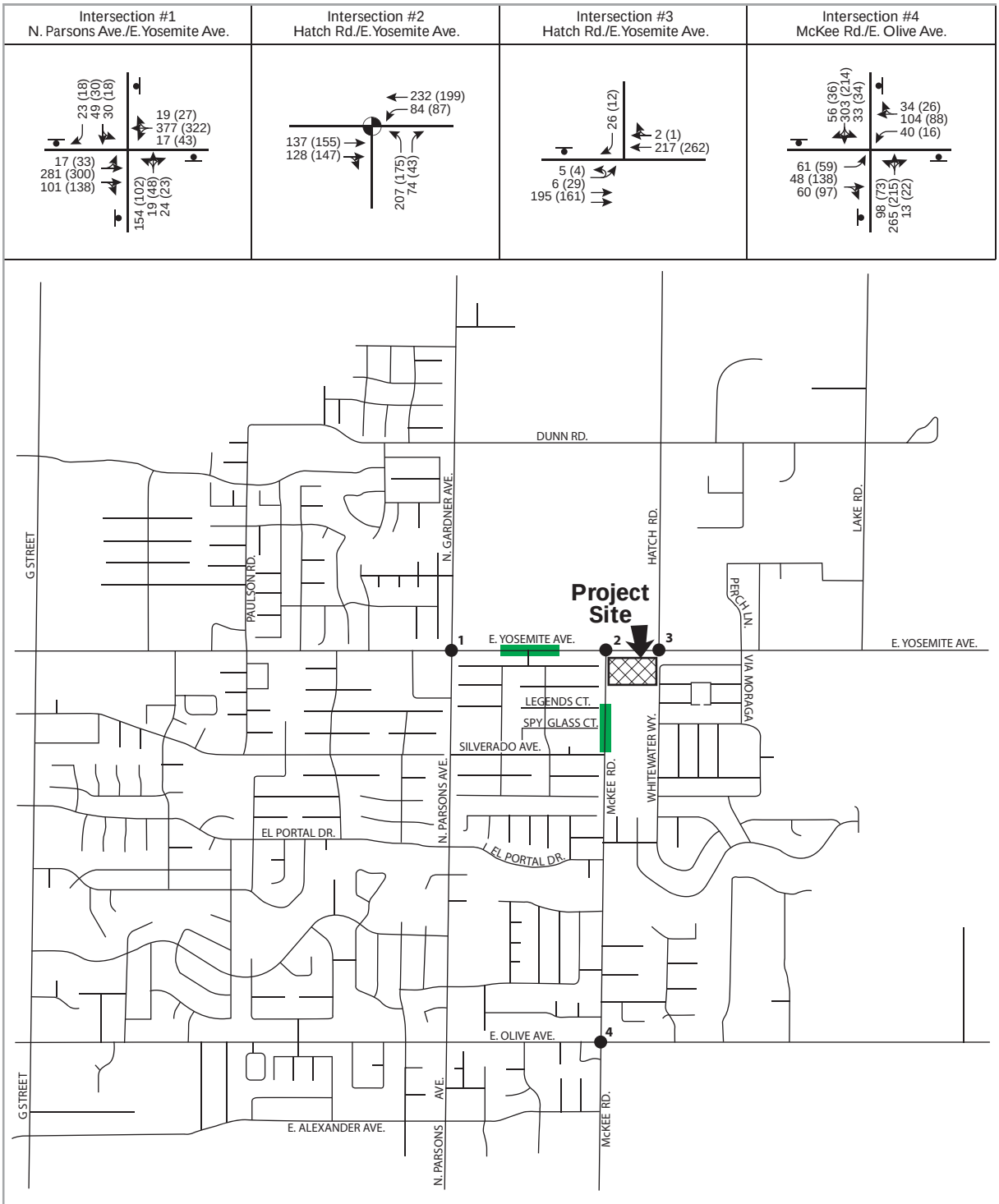


Figure 6

Existing plus Project Level of Service Analysis

Table 4 and Table 5 below summarize the levels of service at the study intersections and the roadway segments respectively. The project trips on the roadway segments were calculated by distributing the proposed project daily trips (from trip generation estimate) based on project trip distribution assumptions. The study intersection levels of service calculation results for this scenario are contained in Appendix D.

Table 4: Intersection Level of Service Analysis – Existing plus Project Conditions

ID	*Intersection*	*Peak Hour*	*Existing Conditions*		*Existing plus Project Conditions*		*Mitigated Conditions*	
			Average Delay[2]	*LOS[1]*	*Average Delay[2]*	*LOS[1]*	*Average Delay[2]*	*LOS[1]*
1	Yosemite Avenue & Parsons Avenue	AM	**36.3**	**E**	**38.1**	**E**	15.8	C
		PM	16.8	C	20.6	C	13.4	B
2	Yosemite Avenue & McKee Road	AM	17.5	B	17.8	B		
		PM	16.5	B	17.9	B		
3	Yosemite Avenue & Hatch Road	AM	9.2	A	9.2	A		
		PM	9.3	A	9.4	A		
4	McKee Road & Olive Avenue	AM	21.2	C	21.7	C		
		PM	15.4	C	16.2	C		

Notes: 1. LOS = Level of Service;
2. Average intersection delay expressed in second per vehicle for signalized intersections and all way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop controlled intersections.
Bold indicates deficient intersection operations.

Table 5: Roadway Segment Level of Service Analysis – Existing plus Project Conditions

ID	*Limits*	*Lanes*	*24-hr Volume*	*LOS*
Yosemite Avenue	Between Parsons Avenue and Mckee Road	3	7,942	C
Mckee Road	Between Yosemite Avenue and Silverado Avenue	2	4,607	C

Notes: LOS = Level of Service per the city of Merced Vision 2030 General Plan Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type"

Traffic Signal Warrants

Based on TJKM's peak hour signal warrant analysis, the intersection of Yosemite Avenue and Parsons Avenue warrants a traffic signal under this scenario. It is worth noting that MUTCD states "satisfaction of a signal warrant or warrants shall not in itself require the installation of a "traffic signal"; Based on the impact criteria, it is recommended that prior to installation of a traffic signal, the remaining California MUTCD warrants as applicable be conducted. Peak Hour Signal Warrant sheets are provided in Appendix J.

Mitigation Measures

In order to improve the level of service at the deficient intersection, TJKM recommends the following mitigation measures:

Yosemite Avenue and Parsons Avenue

Modify the westbound approach to accommodate an additional 100 ft. shared thru/right turn lane. In addition, re-stripe the existing shared left/thru/right lane to shared left/thru lane.

Existing plus Approved Conditions

This scenario evaluates existing volumes plus traffic from approved but not yet constructed developments in the area.

Approved Project Trip Generation

Per City's request, the trips from Wathen Commercial Project located at the northeast corner of G Street and Yosemite Avenue were included for this analysis. The project proposes construction of a Hotel, Restaurant, Pharmacy, Bank and a few office buildings. The trips for the project were estimated based on the Trip Generation (9th Edition) Manual published by the Institute of Transportation Engineers (ITE) and data provided by the City staff (See Appendix K). Table 6 summarizes the project trip generation.

Table 6: Approved Project Trip Generation

Land Use (ITE Code)	*Size*	*Daily*		*A.M. Peak Hour Trips*					*P.M. Peak Hour Trips*				
		Rate[2]	*Trips*	*Rate*	*(In:Out)%*	*In*	*Out*	*Total*	*Rate*	*(In:Out)%*	*In*	*Out*	*Total*
Hotel (310)	84 Rooms	8.17	686	0.53	59:41	26	18	44	0.60	51:49	25	25	50
Restaurant (932)	5.88 KSF[1]	127.15	748	10.81	55:45	35	28	63	9.85	60:40	34	23	57
Pharmacy (880)	17.34 KSF	90.06	1,561	2.94	65:35	32	18	50	8.40	49:51	71	74	145
Bank w/ Drive-Thru (912)	4.54 KSF	148.15	672	12.08	57:43	31	23	54	24.30	50:50	55	55	110
Medical Office (720)	34.54 KSF	36.13	1,247	2.39	79:21	65	17	82	3.57	28:72	34	89	123
General Office (710)	23.02 KSF	11.03	253	1.56	88:12	31	4	35	1.49	17:83	6	28	34
Total New Project Trips			**5,167**			**220**	**108**	**328**			**225**	**294**	**519**

Notes: 1. KSF = Thousand Square Feet
2. Rate = Trips per KSF
Source: Trip Generation (9th Edition), Institute of Transportation Engineer (2012)

Approved Project Trip Distribution and Assignment

Trip distribution assumptions for the above-approved project were developed based on the existing travel patterns and knowledge of the study area. Among the trips that would be generated from the approved project, only 30 percent of the trips are assumed to pass through the study intersections. The trip distribution and assignment assumptions at the study intersections for the above referenced project in the project vicinity are illustrated in Figure 7. The assigned trips were added to Existing Conditions traffic volumes to generate Existing plus Approved Conditions' traffic volumes. The resulting intersection turning movement volumes at the study intersections for this scenario are shown in Figure 8.

Approved Project Trip Distribution and Assignment

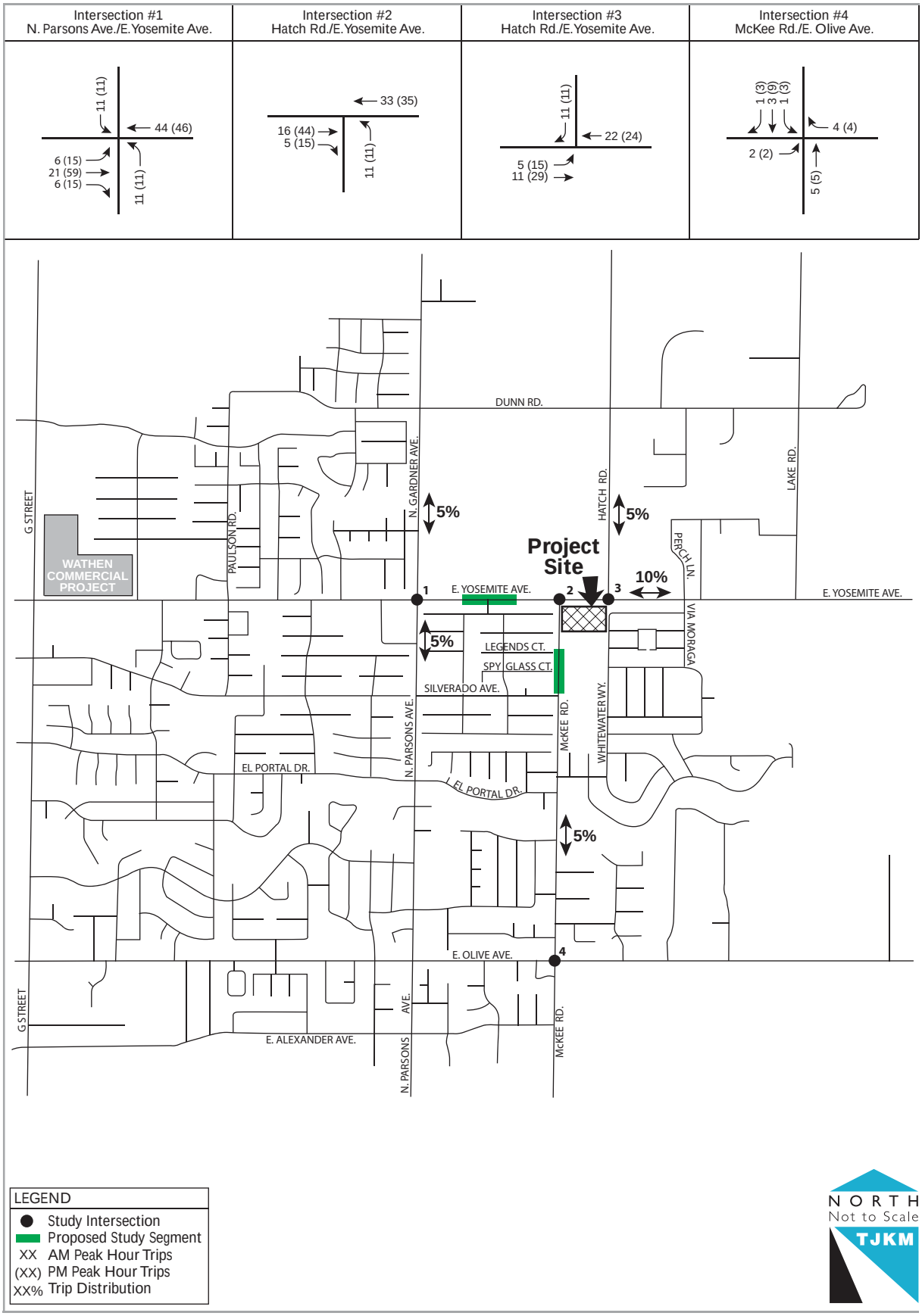


Figure 7

Existing plus Approved Project Conditions Traffic Volumes, Lane Geometry, and Controls

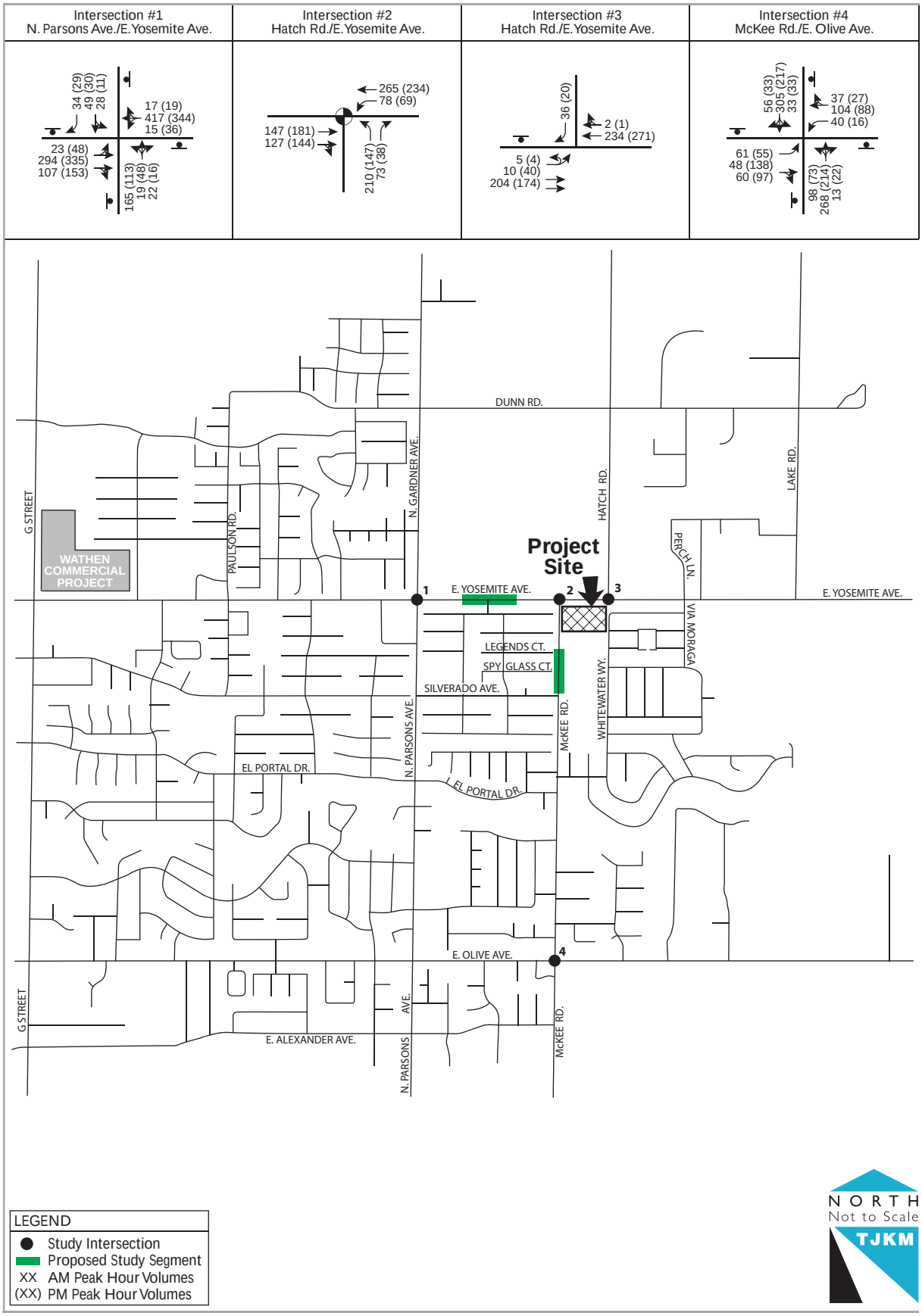


Figure 8

Existing plus Approved Level of Service Analysis

Table 7 and Table 8 below summarize the levels of service at the study intersections and the roadway segments respectively. The study intersection levels of service calculation results for this scenario are contained in Appendix E.

Table 7: Intersection Level of Service Analysis – Existing plus Approved Conditions

ID	*Intersection*	*Intersection Control*	*A.M. Peak Hour*		*P.M. Peak Hour*	
			Average Delay[2]	*LOS[1]*	*Average Delay*	*LOS*
1	Yosemite Avenue & Parsons Avenue	All -Way Stop	**53.4**	**F**	23.2	C
2	Yosemite Avenue & McKee Road	Signal	17.5	B	16.8	B
3	Yosemite Avenue & Hatch Road	Side-Street Stop	9.4	A	9.6	A
4	Olive Avenue & McKee Road	All -Way Stop	22.2	C	16.2	C

Notes: 1. LOS = Level of Service;
2. Average intersection delay expressed in seconds per vehicle for signalized intersections and all way stop controlled intersections. Total control delay for the worst movement is presented for stop controlled intersections.
Bold indicates deficient intersection operations.

Table 8: Roadway Segment Level of Service Analysis - Existing plus Approved Conditions

ID	*Limits*	*Lanes*	*24-hr Volume*	*LOS*
Yosemite Avenue	Between Parsons Avenue and Mckee Road	3	8,114	C
Mckee Road	Between Yosemite Avenue and Silverado Avenue	2	4,521	C

Notes: LOS = Level of Service per the city of Merced Vision 2030 General Plan Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type"

Traffic Signal Warrants

Based on TJKM's peak hour signal warrant analysis, the intersections of Yosemite Avenue and Parsons Avenue, and McKee Road and Olive Avenue satisfies the signal warrants. However, the intersection of McKee Road and Olive Avenue continues to operates at an acceptable Level of Service C during both peak hours. Therefore, a traffic signal is not recommended at this intersection. Though the intersection of Parsons Avenue and Yosemite Avenue meets the peak hour warrants, it is recommended to investigate a full set of warrants to reach a decision. Peak Hour Signal Warrant sheets are provided in Appendix J.

Existing plus Approved plus Project Level of Service Analysis

Table 9 and Table 10 below summarize the level of service at the study intersections and the roadway segments respectively. LOS worksheets are provided in Appendix F. Figure 9 shows the turning movement volumes for Existing plus Approved plus Project Conditions.

Table 9: Intersection Level of Service Analysis – Existing plus Approved plus Project Conditions

ID	Intersection	Peak Hour	Existing plus Approved Conditions		Existing plus Approved plus Project Conditions		Mitigated Conditions	
			Average Delay[2]	LOS[1]	Average Delay[2]	LOS[1]	Average Delay[2]	LOS[1]
1	Yosemite Avenue & Parsons Avenue	AM	**53.4**	**F**	**57.7**	**F**	18.2	C
		PM	23.2	C	31.3	D	16.2	C
2	Yosemite Avenue & McKee Road	AM	17.5	B	17.8	B		
		PM	16.8	B	17.8	B		
3	Yosemite Avenue & Hatch Road	AM	9.4	A	9.4	A		
		PM	9.6	A	9.7	A		
4	McKee Road & Olive Avenue	AM	22.2	C	22.8	C		
		PM	16.2	C	17.1	C		

Notes: 1. LOS = Level of Service;
2. Average intersection delay expressed in second per vehicle for signalized intersections and all way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop controlled intersections.
Bold indicates deficient intersection operations.

Table 10: Roadway Segment Level of Service Analysis - Existing plus Approved plus Project Conditions

ID	Limits	Lanes	24-hr Volume	LOS
Yosemite Avenue	Between Parsons Avenue and Mckee Road	3	8,975	C
Mckee Road	Between Yosemite Avenue and Silverado Avenue	2	4,866	D

Notes: LOS = Level of Service per the city of Merced Vision 2030 General Plan Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type"

Traffic Signal Warrants

Based on TJKM's peak hour signal warrant analysis, the intersections of Yosemite Avenue and Parsons Avenue, and McKee Road and Olive Avenue satisfies the signal warrants. However, the intersection of McKee Road and Olive Avenue continues to operates at an acceptable Level of Service C during both peak hours. Therefore, a traffic signal is not recommended at this intersection. Though the intersection of Parsons Avenue and Yosemite Avenue meets the peak hour warrants, it is recommended to investigate a full set of warrants to reach a decision. Peak Hour Signal Warrant sheets are provided in Appendix J.

Mitigation Measures

In order to improve the level of service at the intersection of Yosemite Avenue and Parsons Avenue, TJKM recommends the same lane modification as in existing plus project scenario.

TJKM
Transportation
Consultants

Existing plus Approved plus Project Conditions Traffic Volumes, Lane Geometry, and Controls

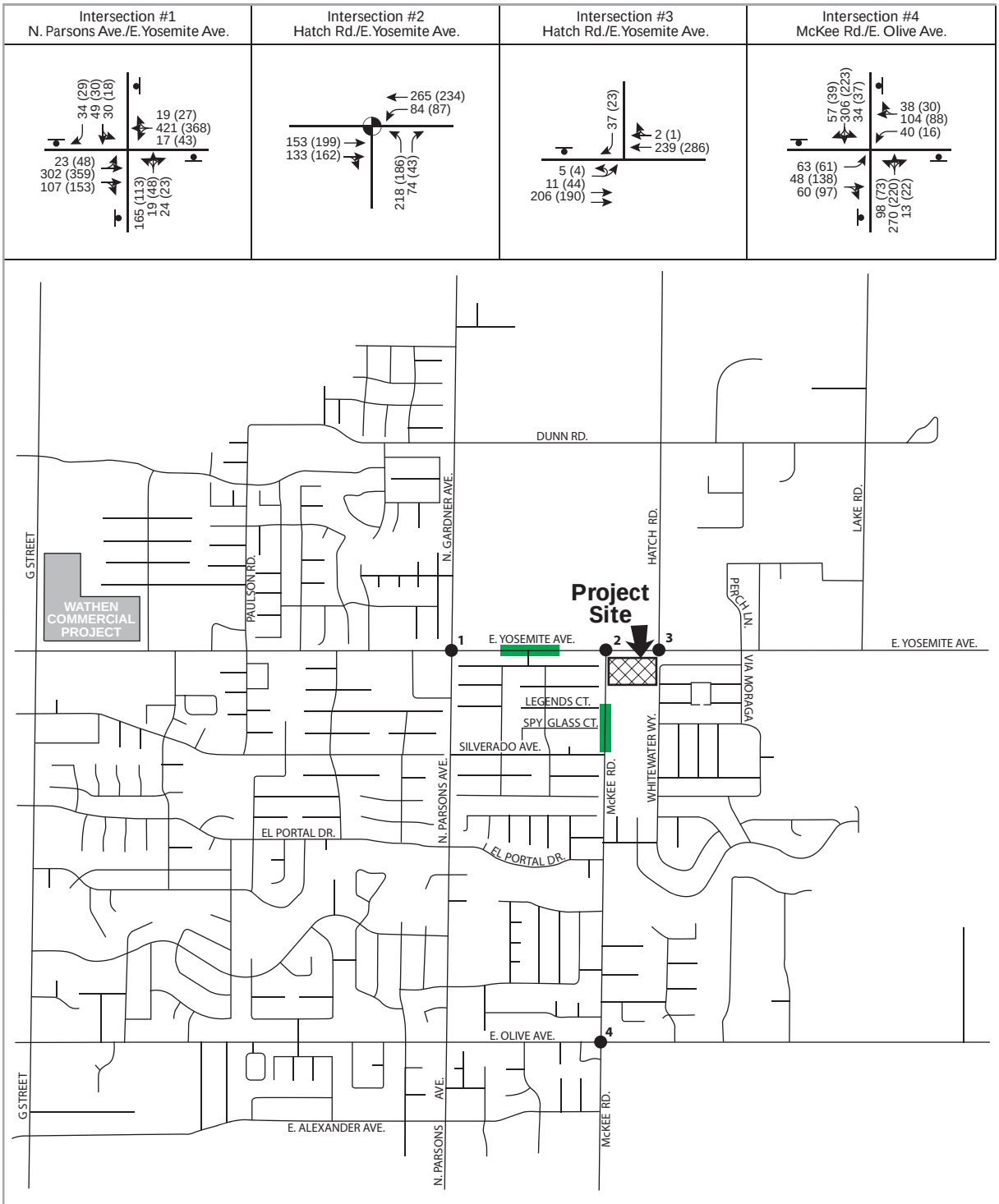


Figure 9

Cumulative Year 2035 No Project Conditions

Cumulative Year 2035 no project traffic volumes were obtained by using MCAG travel demand model along with the increment method between the Base Year 2010 and the Cumulative Year 2035. The model provided a percent growth per year based on the improvements identified in the area. The growth rate was applied to the existing volumes to calculate the peak hour turning movements for Year 2035 No Project Conditions. Figure 10 shows the turning movement volumes. Table 11 and 12 below summarizes the levels of service at the study intersections and roadway segments respectively. See Appendix G for the LOS worksheets and Appendix I for travel demand model runs.

Table 11: Intersection Level of Service Analysis – Cumulative Year 2035 No Project Conditions

ID	*Intersection*	*Intersection Control*	*A.M. Peak Hour*		*P.M. Peak Hour*	
			Average Delay[2]	*LOS*[1]	*Average Delay*	*LOS*
1	Yosemite Avenue & Parsons Avenue	All -Way Stop	**99.6**	**F**	**52.8**	**F**
2	Yosemite Avenue & McKee Road	Signal	19.2	B	17.7	B
3	Yosemite Avenue & Hatch Road	Side-Street Stop	9.5	A	9.5	A
4	Olive Avenue & McKee Road	All -Way Stop	**113.0**	**F**	**59.0**	**F**

Notes: 1. LOS = Level of Service;
2. Average intersection delay expressed in seconds per vehicle for signalized intersections and all way stop controlled intersections. Total control delay for the worst movement is presented for stop-controlled intersections.
Bold indicates deficient intersection operations.

Table 12: Roadway Segment Level of Service Analysis – Cumulative Year 2035 No Project Conditions

ID	*Limits*	*Lanes*	*24-hr Volume*	*LOS*
Yosemite Avenue	Between Parsons Avenue and Mckee Road	4[1]	10,522	C
McKee Road	Between Yosemite Avenue and Silverado Avenue	2	6,335	D

Notes: LOS = Level of Service per the city of Merced Vision 2030 General Plan Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type"
1. Based on Merced Vision 2030 General Plan, Yosemite Avenue between Parsons Avenue and McKee Road will be upgraded to two lanes in either direction.

Traffic Signal Warrants

Based on TJKM's peak hour warrant analysis, the intersections of Yosemite Avenue and Parsons Avenue, and McKee Road and Olive Avenue meets the signal warrants. It is worth noting that MUTCD states "satisfaction of a signal warrant or warrants shall not in itself require the installation of a "traffic signal"; Based on the impact criteria, it is recommended that prior to installation of a traffic signal, the remaining California MUTCD warrants as applicable be conducted.

Year 2035 No Project Conditions Traffic Volumes, Lane Geometry, and Controls

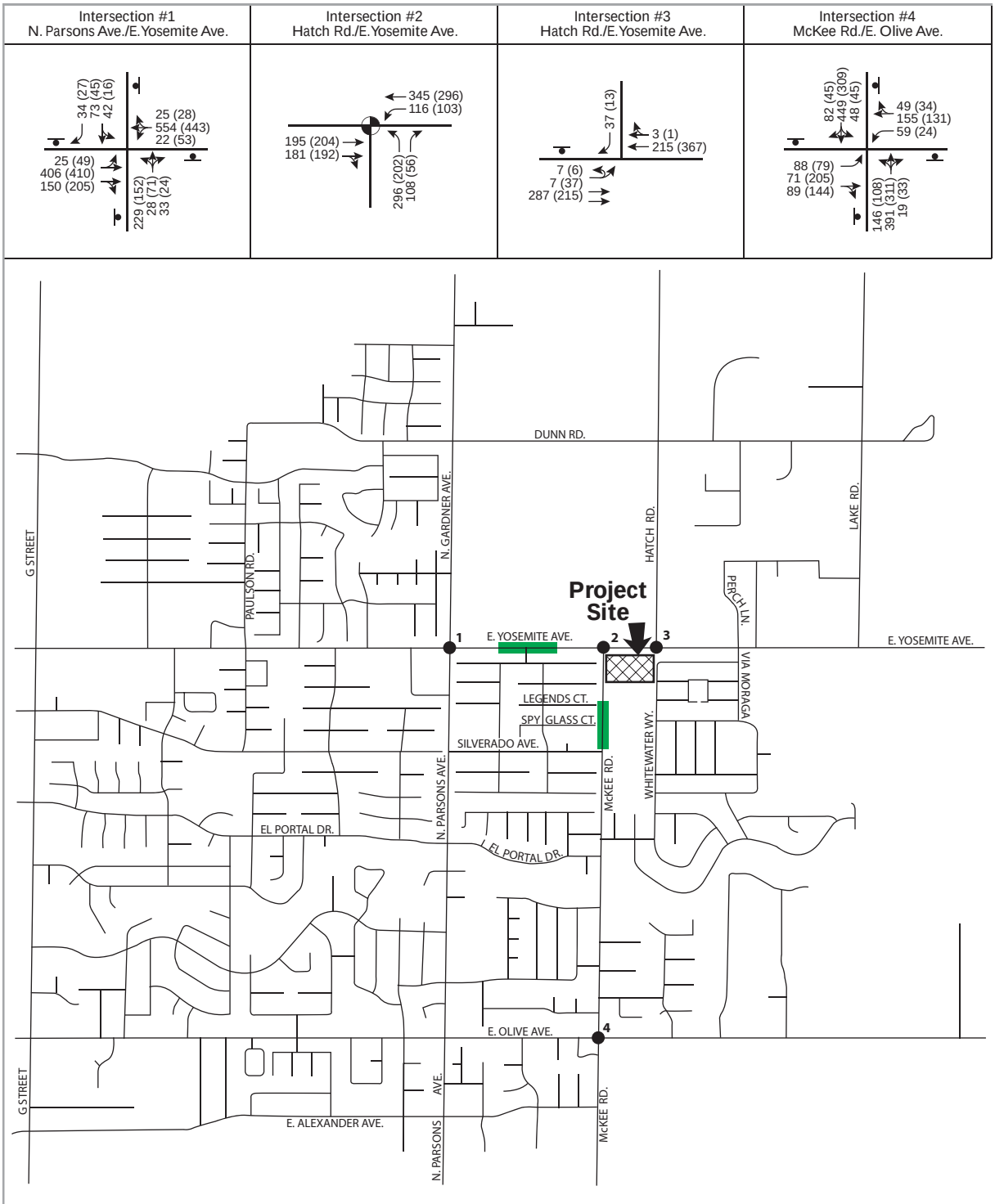


Figure 10

Cumulative Year 2035 plus Project Conditions

Cumulative Year 2035 Plus project traffic volumes were obtained by adding the project-generated trips No Project volumes to see the impacts of the project in Cumulative Year 2035. Figure 11 shows the turning movement volumes. Table 13 and 14 below summaries the level of service at the study intersections and roadway segments respectively. See Appendix H for the LOS worksheets.

Table 13: Intersection Level of Service Analysis – Cumulative Year 2035 plus Project Conditions

ID	*Intersection*	*Peak Hour*	*Cumulative 2035 No Project Conditions*		*Cumulative 2035 Plus Project Conditions*		*Mitigated Conditions*	
			Average Delay[2]	*LOS[1]*	*Average Delay[2]*	*LOS[1]*	*Average Delay[2]*	*LOS[1]*
1	Yosemite Avenue & Parsons Avenue	AM	**99.6**	**F**	**104.4**	**F**	27.0	D
		PM	**52.8**	**F**	**69.3**	**F**	24.9	C
2	Yosemite Avenue & McKee Road	AM	19.2	B	19.5	B		
		PM	17.7	B	19.3	B		
3	Yosemite Avenue & Hatch Road	AM	9.5	A	9.5	A		
		PM	9.5	A	9.6	A		
4	McKee Road & Olive Avenue	AM	**113.0**	**F**	**115.2**	**F**	22.7	C
		PM	**59.0**	**F**	**65.9**	**F**	20.4	C

Notes: 1. LOS = Level of Service;
2. Average intersection delay expressed in second per vehicle for signalized intersections and all way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop controlled intersections.
Bold indicates deficient intersection operations.

Table 14: Segment Level of Service Analysis - Cumulative Year 2035 plus Project Conditions Project Conditions

ID	*Limits*	*Lanes*	*24-hr Volume*	*LOS*
Yosemite Avenue	Between Parsons Avenue and Mckee Road	4[1]	11,382	C
Mckee Road	Between Yosemite Avenue and Silverado Avenue	2	6,679	D

Notes: LOS = Level of Service per the city of Merced Vision 2030 General Plan Transportation and Circulation Element Table 4.3 "Daily Roadway Segment Level of Service Thresholds by Roadway Type"
1. Based on Merced Vision 2030 General Plan, Yosemite Avenue between Parsons Avenue and McKee Road will be upgraded to two lanes in either direction.

Traffic Signal Warrants

Based on TJKM's peak hour warrant analysis, the intersections of Yosemite Avenue and Parsons Avenue, and McKee Road and Olive Avenue are recommended to be signalized under Cumulative Year 2035 plus Project traffic conditions. It is worth noting that MUTCD states "satisfaction of a signal warrant or warrants shall not in itself require the installation of a "traffic signal"; Based on the impact criteria, it is recommended that prior to installation of a traffic signal, the remaining California MUTCD warrants as applicable be conducted.

Mitigation Measures

In order to improve the level of service at the deficient intersections, TJKM recommends the following mitigation measures:

Yosemite Avenue and Parsons Avenue

Modify the westbound approach to accommodate an additional 100 ft. shared thru/right turn lane. In addition, re-stripe the existing shared left/thru/right lane to shared left/thru lane.

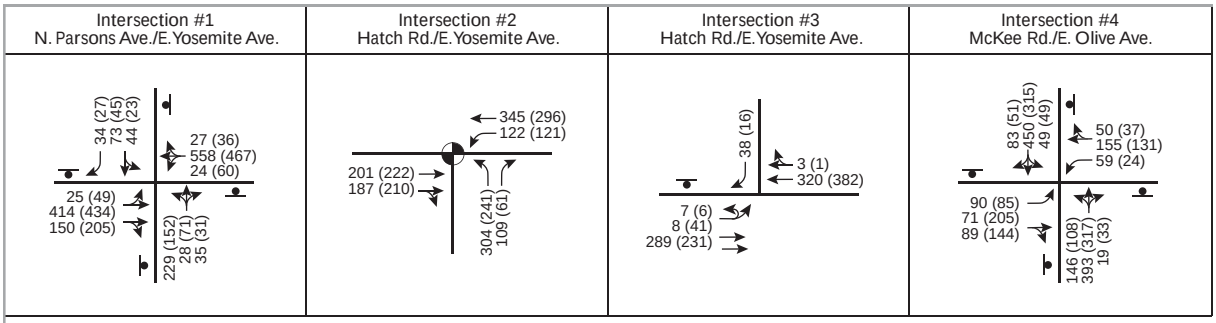
Olive Avenue and McKee Road

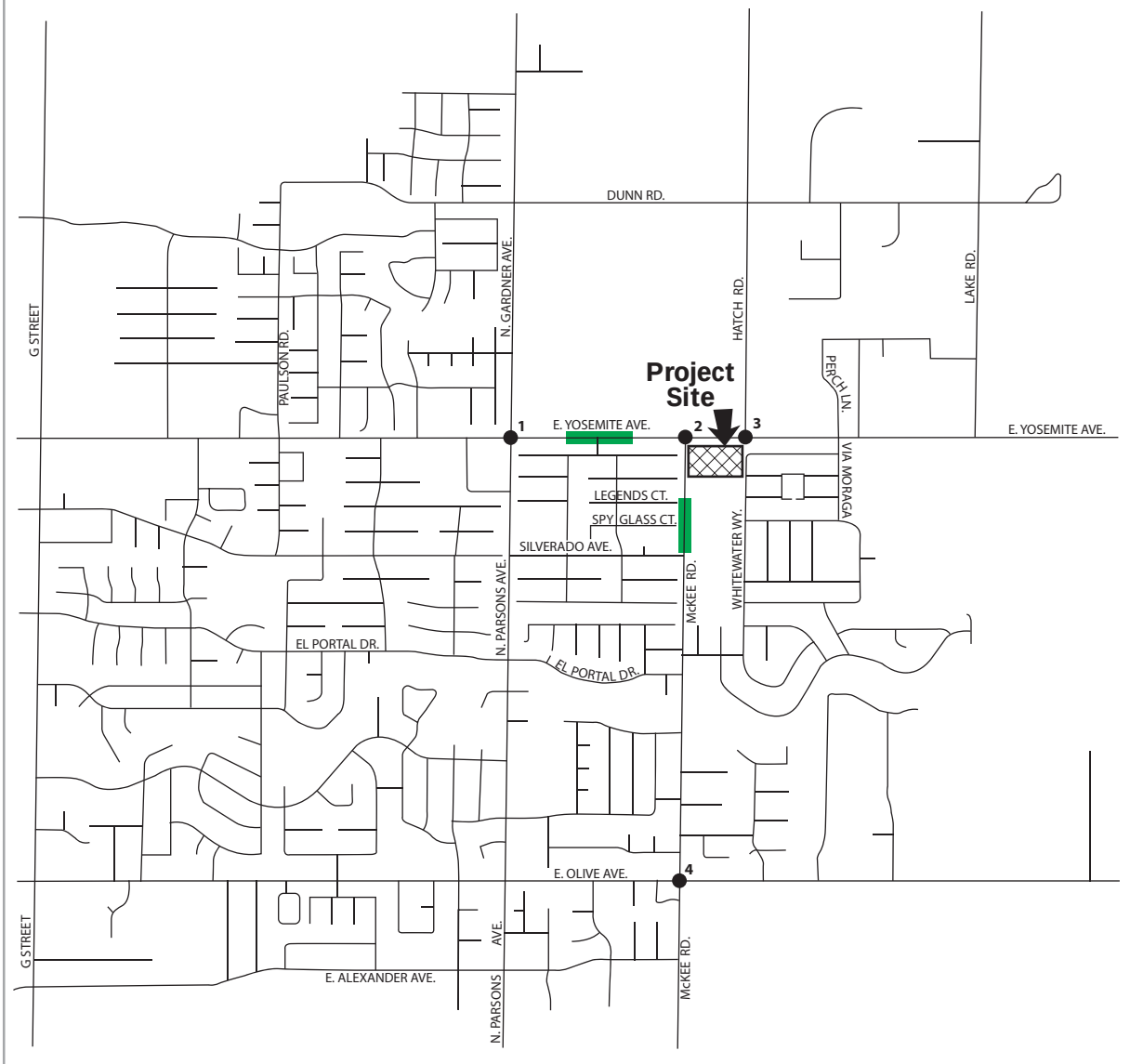
- Southbound Approach
  - Remove the adjacent on-street parking for 100 ft. on the southbound approach.
  - Re-stripe the approach as shared left/thru lane and shared right/thru lane.
  - Remove the adjacent on-street parking for 100 ft. on the southbound receiving lane and stripe it as a lane drop.
- Northbound Approach
  - Remove the adjacent on-street parking for 100 ft. on the northbound approach.
  - Re-stripe the approach as shared left/thru lane and shared right/thru lane.
  - Remove the adjacent on-street parking for 100 ft. on the northbound receiving lane and stripe it as a lane drop. Although this might not be feasible due to residential driveways.

If the proposed lane modification changes are not feasible, it is recommended to install a traffic signal to improve the level of service operations to acceptable levels.

TJKM
Transportation
Consultants

Year 2035 plus Project Conditions Traffic Volumes, Lane Geometry, and Controls





LEGEND

- Study Intersection
- Proposed Study Segment
- XX AM Peak Hour Volumes
- (XX) PM Peak Hour Volumes

NORTH
Not to Scale

TJKM

Figure 11

Queuing Analysis

Table 15 and 16 provides a queue length summary for left and right turn lanes at the study intersections under all study scenarios. Queuing analysis was completed using Synchro output information. Synchro provides both 50th and 95th percentile maximum queue lengths in feet. According to the Synchro manual, "the 50th percentile maximum queue is the maximum back of queue on a typical cycle and the 95th percentile queue is the maximum back of queue with 95th percentile volumes." The queues shown on Table 15 and 16 are the 95th percentile queue lengths for the respective lane movements.

Table 15: Queuing Analysis – Existing and Existing plus Approved Conditions

No	*Intersection*	*Existing Queue Storage Length (FT)*		*Peak Hour*	*Existing*	*Existing plus Project*	*Existing plus Approved*	*Existing plus Approved and Project*
1	Yosemite Avenue / Parsons Avenue	SBR	190	AM	40	40	40	60
				PM	40	40	60	60
2	Yosemite Avenue / McKee Road	NBR	120	AM	60	80	100	120
				PM	40	60	40	60
		WBL	160	AM	100	120	100	120
				PM	80	120	100	120
3	Yosemite Avenue / Hatch Road	EBL	150	AM	20	60	20	40
				PM	20	40	40	40
4	Olive Avenue / McKee Road	EBL	60	AM	40	60	60	60
				PM	40	60	60	60

Table 16: Queuing Analysis – Cumulative Conditions

No.	*Intersection Name*	*Existing Queue Storage Length (FT)*		*Peak Hour*	*Cumulative Year 2030 No Project*	*Cumulative Year 2030 Plus Project*
1	Yosemite Avenue / Parsons Avenue	SBR	190	AM	40	40
				PM	60	60
2	Yosemite Avenue / McKee Road	NBR	120	AM	120	120
				PM	40	60
		WBL	160	AM	120	140
				PM	120	120
3	Yosemite Avenue / Hatch Road	EBL	150	AM	20	40
				PM	40	40
4	Olive Avenue / McKee Road	EBL	60	AM	60	60
				PM	100	100

Based on the Synchro output files it is recommended that the storage capacity for the following be considered for the City's Year 2030 circulation network:

1. Intersection of Olive Avenue / McKee Road

   It is recommended to increase the eastbound left turn lane storage capacity from 60 to 100 feet. This would be require re-striping the eastbound left turn approach and reduction of the TWLT lane to the west of this intersection.

Weekday ADT Vs Sunday ADT

The weekday Average Daily Traffic (ADT) were compared with the Sunday ADT to determine whether an LOS analysis is required for the Sunday peak hour traffic volumes. As a result, it was determined that the Sunday ADT's were lower than the weekday ADT during a.m. peak hour and p.m. peak hour whereas Sunday ADT's were about the same during the midday peak. Therefore, in an effort to analyze the worst case scenario, only the weekday peak hour traffic volumes were analyzed. Table 17 summarizes the weekday ADT and Sunday ADT.

Table 17: Summary of ADT – Weekday vs Sunday

Roadway Segment	*Time of Day*	*ADT*		*Percent Difference*
		Weekend	*Weekday*	
Yosemite Avenue Between Parsons Avenue & McKee Road	A.M. - (7:00 a.m. - 9:00 a.m.)	242	1088	78%
	M.D. - (11:00 a.m. - 1:00 p.m.)	880	808	-9%
	P.M. - (4:00 p.m. - 6:00 p.m.)	605	1227	51%
McKee Road North of Silverado Avenue	A.M. - (7:00 a.m. - 9:00 a.m.)	152	690	78%
	M.D. - (11:00 a.m. - 1:00 p.m.)	470	477	1%
	P.M. - (4:00 p.m. - 6:00 p.m.)	359	733	51%

Project Site Circulation and Access

TJKM reviewed the project site plan to evaluate on-site circulation and access to the project. The proposed project's access will be via one full access driveway on McKee Road, one right-in and right-out driveway on Yosemite Avenue and one full access driveway on Whitewater Way for the single-family home subdivision to the east. A separate entrance only driveway is provided for service trucks on Yosemite Avenue at the northeast corner of the project site and an exit only driveway is provided onto McKee Road at the southwest corner of project site. The project also provides enough parking spaces based on size of development, this will result in adequate on-site circulation with minor to no delays to adjacent roadways.

Conclusions and Recommendations

TJKM has reached the following conclusions for the proposed commercial development at the southeast corner of Yosemite Avenue and McKee Road:

Existing Conditions

Under Existing conditions, the study intersections are operating at or better than the City of Merced's LOS threshold with the exception of the intersection of Yosemite Avenue and Parsons Avenue, which currently operates at LOS E.

Existing plus Project Conditions

Under Existing plus Project conditions, the study intersections are expected to operate at or better than the City of Merced's LOS threshold with the exception of the intersection of Yosemite Avenue and Parsons Avenue, which continues to operate at LOS E.

In order to improve the intersections operations, it is recommended to modify the westbound approach to accommodate an additional 100 ft. shared thru/right turn lane. In addition, re-stripe the existing shared left/thru/right lane to shared left/thru lane.

Existing plus Approved Conditions

Under Existing plus Approved conditions, the study intersections are expected to operate at or better than the City of Merced's LOS threshold with the exception of the intersection of Yosemite Avenue and Parsons Avenue, which is expected to operate at LOS F.

Existing plus Approved plus Project Conditions

Under Existing plus Approved plus Project conditions, the study intersections are expected to continue to operate at or better than the City of Merced's LOS threshold with the exception of the intersection of Yosemite Avenue and Parsons Avenue, which is expected to operate at LOS F.

In order to improve the intersections operations, same mitigation measures are recommended as in Existing plus project conditions.

Cumulative Year 2035 No Project Conditions

Under Cumulative Year 2035 No Project conditions, the study intersections are projected to operate at or better than the City of Merced's LOS threshold with the exception of the following intersections:

- Yosemite Avenue and Parsons Avenue, which is projected to operate at LOS F.
- Olive Avenue and McKee Road, which is projected to operate at LOS F.

Cumulative Year 2035 plus Project Conditions

Under Cumulative Year 2035 plus Project conditions, the study intersections are expected to continue to operate at or better than the City of Merced's LOS threshold with the exception of the following intersections:

- Yosemite Avenue and Parsons Avenue, which is projected to operate at LOS F.
- Olive Avenue and McKee Road, which is projected to operate at LOS F.

In order to improve the intersections operations, same mitigation measures are recommended as in Existing plus project conditions.

Yosemite Avenue and Parsons Avenue

The same mitigation measures are recommended as in Existing plus Project Conditions.

Olive Avenue and McKee Road

- Southbound Approach
  - Remove the adjacent on-street parking for 100 ft. on the southbound approach.
  - Re-stripe the approach as shared left/thru lane and shared right/thru lane.
  - Remove the adjacent on-street parking for 100 ft. on the southbound receiving lane and stripe it as a lane drop.
- Northbound Approach
  - Remove the adjacent on-street parking for 100 ft. on the northbound approach.
  - Re-stripe the approach as shared left/thru lane and shared right/thru lane.
  - Remove the adjacent on-street parking for 100 ft. on the northbound receiving lane and stripe it as a lane drop. Although this might not be feasible due to residential driveways.

If the proposed lane modification changes are not feasible, it is recommended to install a traffic signal to improve the level of service operations to acceptable levels.