FEHR PEERS

MEMORANDUM

Date: November 13, 2024

To: Kirk Bone, Marble Valley Company, LLC

From: David B. Robinson, Fehr & Peers

Subject: **US 50/Bass Lake Road Interchange – Interim Improvements**

RS12-3016

Fehr & Peers completed its evaluation to identify improvement phasing opportunities at the US 50/Bass Lake Road interchange. The purpose of the phasing evaluation is to identify interim improvements that could be constructed through the Caltrans encroachment permit process to accommodate initial development south of US 50 concurrent with programming for the reconstruction of the US 50/Bass Lake Road interchange.

This memorandum describes the interim improvements, identifies the equivalent dwelling units (EDUs) that the interim improvements would accommodate, and summarizes our evaluation methodology.

US 50/Bass Lake Road Interchange – Interim Improvements

Table 1 summarizes the US 50/Bass Lake Road interim interchange improvements, which are shown in **Figure 1**.

Table 1: US 50/Bass Lake Road Interchange – Interim Configuration

Intersection	Description	Note
1. Bass Lake Road/US 50 WB Ramps	Modify existing traffic signal. NB Approach – Provide a shared left/through lane and one through lane. SB Approach – Provide one right-turn lane and one through lane. WB Approach – Provide a two-lane off ramp with a shared left/through lane, and one right-turn lane at the intersection.	Caltrans may require ramp metering on the EB and WB on-ramps. Interim improvement will require coordinated signal operation and time-of-day signal timings. Traffic signal timing/coordination will be implemented at Caltrans discretion and will most likely be optimized to avoid impacts to US 50 and not performance on Bass Lake Road or intersections.
2. Bass Lake Road/US 50 EB Ramps	Install traffic signal control. NB Approach – Provide one through lane and a shared through/right-turn lane. SB Approach – Provide a shared left/through lane. EB Approach – Provide a one left-turn, a shared left/through lane, and one right-turn lane.	

Source: Fehr & Peers, 2024.

Operational Characteristics

The following describes the operational characteristics of the interchange, relative to the location of existing development and travel characteristics, planned growth, and the proposed interim improvements:

- Existing Development – Since most existing development is north of US 50, most travel through the interchange has an origin/destination to/from the north. Relative to an interchange that supports more balanced development (i.e., like El Dorado Hills Boulevard/Latrobe Road), the interchange is only partially utilized. Currently, the interchange ramp intersections operate acceptably at LOS C or better during the morning and evening peak hours. Without additional improvements, but with adjusted traffic signal timings, the interchange could support about 400 additional EDUs north or south of US 50, before vehicles queues would exceed available storage on the eastbound off-ramp.

- Distribution of Travel – About 80 percent of AM and PM peak hour travel has an origin or destination to/from the west on US 50. Consequently, only 20 percent of travel occurs to/from the east. Given the location of existing development, most vehicles during the AM peak hour do not travel through the interchange. This trend will continue, given the location of jobs, goods, and services to the west.

- Major Movement at Interchange – As a result of the distribution of travel, the major vehicle movements to/from the south will not conflict with the major movement to/from the north. The image to the right shows the Near-Term scenario AM and PM peak hour flow with the arrows sized relative to the vehicle flow.

- Through Travel – Unlike conditions at the US 50/El Dorado Hills Boulevard/Latrobe Road Interchange, the US 50/Bass Lake Road Interchange will not need to accommodate significant through travel. Consequently, the type and size of the interchange improvements needed to accommodate future growth (i.e., north or south of US 50) would be different.

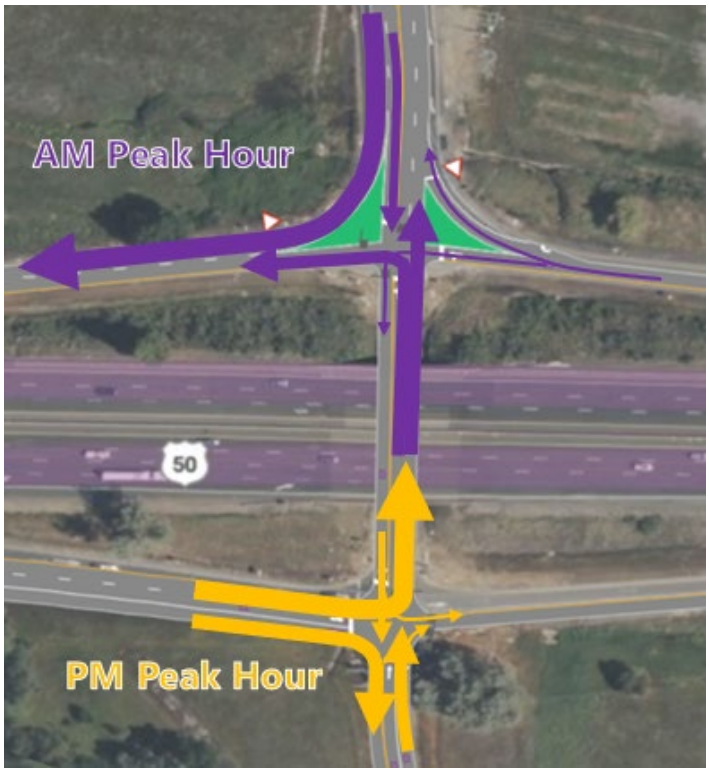
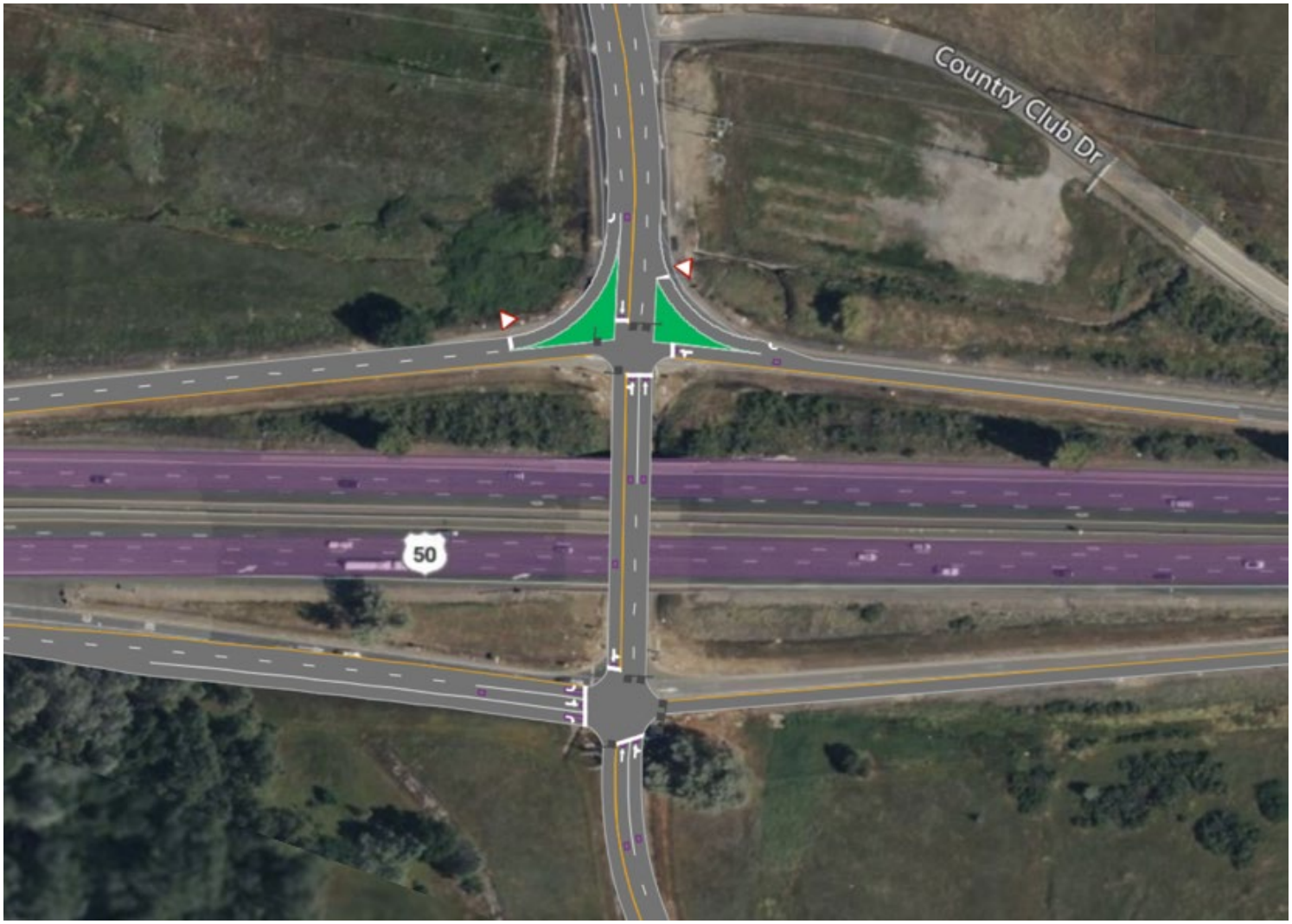


Figure 1 – US 50/Bass Lake Road Interim Interchange Configuration



Equivalent Dwelling Units

Table 2 summarizes the equivalent dwelling units (EDU) that would be accommodated with the US 50/Bass Lake Road Interchange interim improvements. The EDU calculation includes the following inputs:

- Peak Hour Traffic Volumes – AM and PM peak hour trips with an origin/destination south of US 50, calculated by summing the NBT, NBR, SBL, SBT, and EBR movements through the Bass Lake Road/US 50 EB Ramps intersection.
- Single Family Residential Trip Generation – AM and PM peak hour trip generation rates for single family detached residential land use from *Trip Generation*, 9th Edition (Institute of Transportation Engineers) as applied in the *Village of Marble Valley Specific Plan Transportation Impact Analysis* (March 2018).

The EDUs for AM and PM peak hour conditions are calculated by dividing the peak hour trips by the AM and PM peak hour single family trip generation rates.

As shown, the US 50/Bass Lake Road Interchange interim improvements would accommodate about 1,530 EDUs south of US 50 (i.e., the lower EDU of the AM and PM peak hour) in addition to the 400 EDUs that could be accommodated with the existing interchange. Similarly, the interim improvements would accommodate about 670 EDUs north of US 50.

While focused on identifying the EDUs that could be accommodated south of US 50, the analysis did include traffic from the Town and Country Villages project.

Table 2: Equivalent Dwelling Units

Facility	Measure	AM	PM
US 50/Bass Lake Road Interchange	Peak Hour Volume Accommodated by Interim Improvements (to/from the South)[1]	1,266	1,534
	Peak Hour Trip Generation Rate (Single Family Residential)[2]	0.75	1.00
	Equivalent Dwelling Units	1,688	1,534

[1]Calculated by summing the NBT, NBR, SBL, SBT, and EBR movements through the Bass Lake Road/US 50 EB Ramps intersection.

[2]Trip generation rates from Trip Generation, 9th Edition (Institute of Transportation Engineers) as applied in the *Village of Marble Valley Specific Plan Transportation Impact Analysis* (March 2018).

Source: Fehr & Peers, 2024.

Evaluation Methods

We used the following methods to develop the traffic volume forecasts, to conduct the intersection operations analysis, and to calculate the dwelling unit equivalents for the interim interchange configuration.

Near-Term Forecasts

We used the near-term forecasts (i.e., 2033 EPAP with Town & Country Village – El Dorado) developed for the local transportation analysis (LTA) prepared for the *Town and Country Village – El Dorado Bass Lake Hills* (April 15, 2024, Revised June 13, August 26, and September 12, 2024) as a starting point for interim improvement analysis, representing Near-Term No Project conditions, relative to development south of US 50. The near-term forecasts from the Town and Country Village LTA are included in **Attachment A**

Project Traffic

To develop the Near-Term With Project forecasts, we incrementally added traffic generated by development south of US 50 through the interchange, using the trip generation and distribution from the *Village of Marble Valley Specific Plan Transportation Impact Analysis* (March 2018). The distribution of project trips was based on the external trip distribution developed for the analysis of the Existing Plus Project analysis scenario. The trip distribution follows and is included in **Attachment B**:

- To/From the North – 7%
- To/From the East – 23%
- To/From the West – 61%

Table 3 summarizes the AM and PM peak hour intersection turning movement forecasts under Near-Term With Project conditions.

TABLE 3: AM & PM PEAK HOUR INTERSECTION TURNING MOVEMENT FORECASTS: NEAR-TERM CONDITIONS

Intersection	Approach	Movement	Existing Conditions (2023)		Near-Term					
					No Project[2]		Project		With Project[2]	
			AM	PM	AM	PM	AM	PM	AM	PM
US 50 WB Ramps/Bass Lake Road	NB	L	31	13	63	46	465	348	528	394
		T	373	667	545	861	71	111	616	972
		R								
	SB									
		T	180	85	267	163	108	92	375	255
		R	738	432	842	486	0	0	842	486
	EB	L								
		T								
		R								
	WB	L	6	6	13	12	106	165	119	177
		T	2	1	3	2	0	0	3	2
		R	110	150	145	229	2	0	147	229
US 50 EB Ramps/Bass Lake Road	NB	L								
		T[1]	36	11	132	86	632	534	668	545
		R[1]	5	6	13	6	140	152	145	158
	SB	L	177	83	222	141	5	0	227	141
		T[1]	9	8	58	34	258	283	267	291
		R								
	EB	L	368	669	476	821	0	0	476	821
		T	2	1	2	1	0	0	2	1
		R[1]	19	11	43	63	231	565	250	576
	WB	L								
		T								
		R								

[1]Project trips for these movements calculated based on the difference between Near-Term With Project and Existing Conditions since the Near-Term No Project forecast included some growth south of US 50.
[2]The Near-Term scenario forecasts include anticipated traffic from the Town and Country Villages project.
Fehr & Peers, 2024

Traffic Operations

We applied the procedures and methodologies contained in the Highway Capacity Manual; 7th Edition (Transportation Research Board, 2022) as implemented with the Synchro/SimTraffic 11 software to analyze AM and PM peak hour operation at the eastbound and westbound ramp terminal intersections at the US 50/Bass Lake Road Interchange.

The HCM methodology determines delay at signal-controlled intersections based on the weighted average control delay per vehicle at the intersection. The intersection analysis applies a 0.92 peak hour factor, heavy vehicles percentages by approach (i.e., ranging from 2 to 4 percent), and 5 pedestrian movements per intersection during both peak hours, traveling north/south on the east side of Bass Lake Road. SimTraffic, Synchro's micro-simulation module, was used to analyze interchange operations. The coordinated cycle length was 80 seconds during the AM peak hour and 75 seconds during the PM peak hour. The reported results are based on an average of 10 micro-simulation model runs.

Table 4 and **Table 5** summarize AM and PM peak hour intersection operations and maximum off-ramp vehicle queues, respectively, with the interim interchange configuration.

As shown, the interim interchange configuration would provide acceptable LOS D or better operation with the highest delay occurring in the AM peak hour at the eastbound off-ramp. In addition, maximum vehicle queues would be accommodated on the westbound and eastbound off-ramps without extending to US 50. Delay and LOS on the northbound approach to the Bass Lake Road/US 50 EB Ramps (Intersection 2), during the AM peak hour, limits the number of EDUs south of US 50 that the interim interchange configuration can accommodate. **Attachment C** includes the detailed operations analysis output.

Table 4: Intersection Level of Service & Delay – Near-Term with Interim Configuration

Intersection	Control	AM		PM	
		Delay	LOS	Delay	LOS
1. Bass Lake Road/US 50 WB Ramps	Signal	23	C	20	B
2. Bass Lake Road/US 50 EB Ramps	Signal	39	D	28	C

Source: Fehr & Peers, 2024.

Table 5: Off-Ramp Queuing – Near-Term with Interim Configuration

Intersection	Movement	Storage	Maximum Queue (Feet)	
			AM	PM
1. Bass Lake Road/US 50 WB Ramps	WBLT	1,250	175	400
	WBR	150	125	150
2. Bass Lake Road/US 50 EB Ramps	EBL	925	275	375
	EBLT	925	250	325
	EBR	425	175	325

Source: Fehr & Peers, 2024.

Attachment A

Near-Term Forecasts

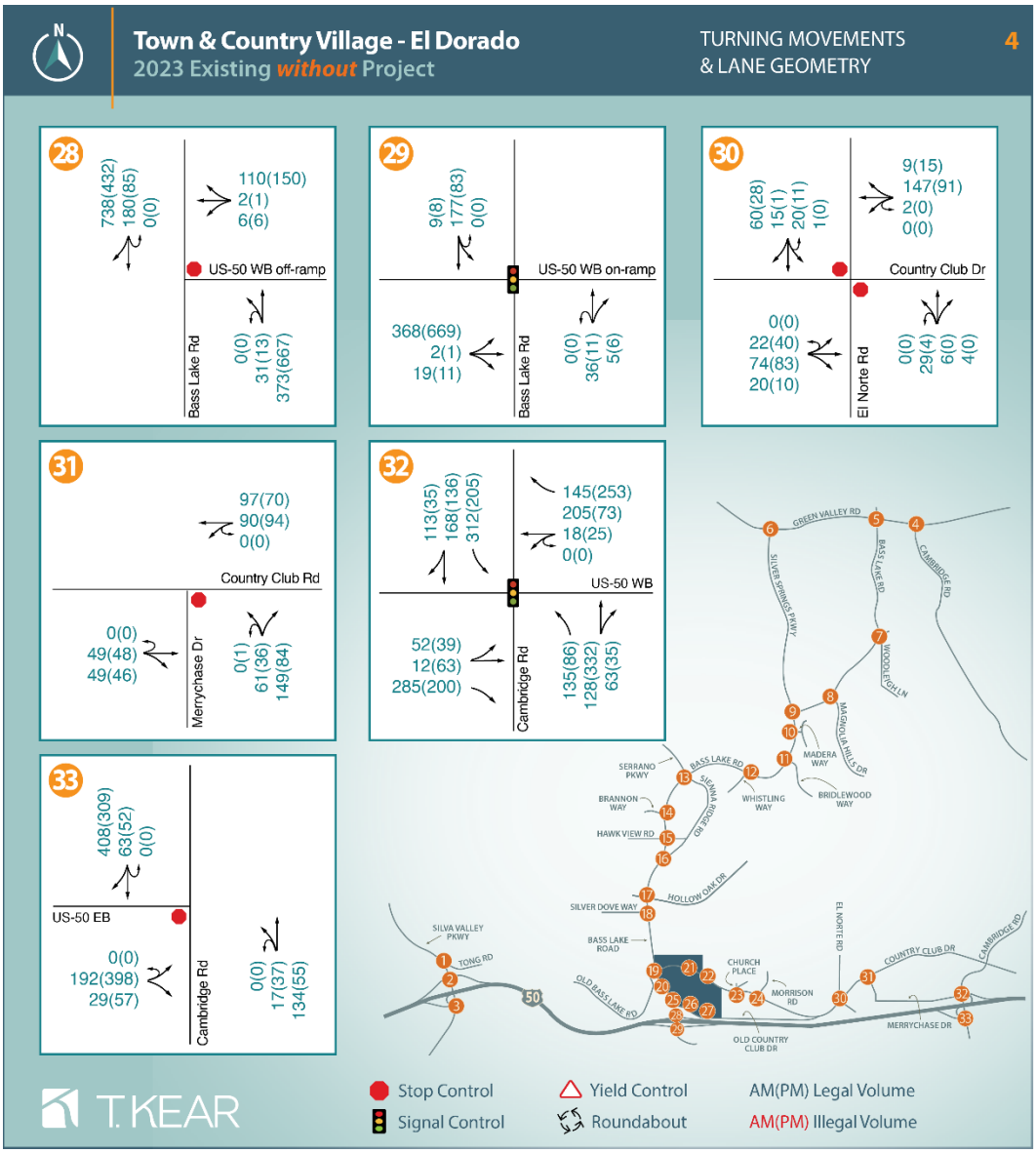


Figure 7. Existing 2023 conditions lane geometry and turning movements (continued)

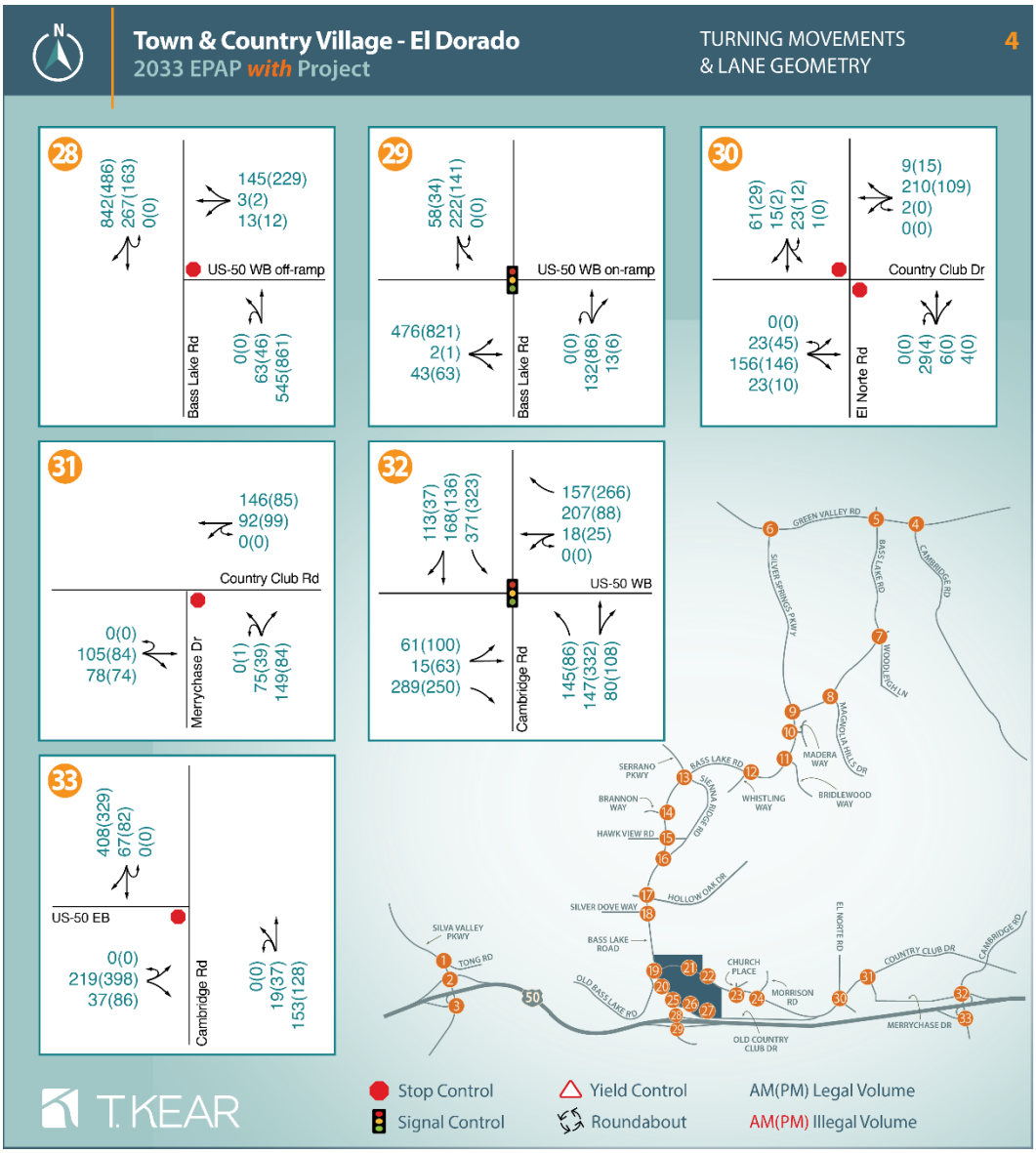


Figure 13. EPAP 2033 plus Project lane geometry and turning movements (continued)

Attachment B

Trip Distribution

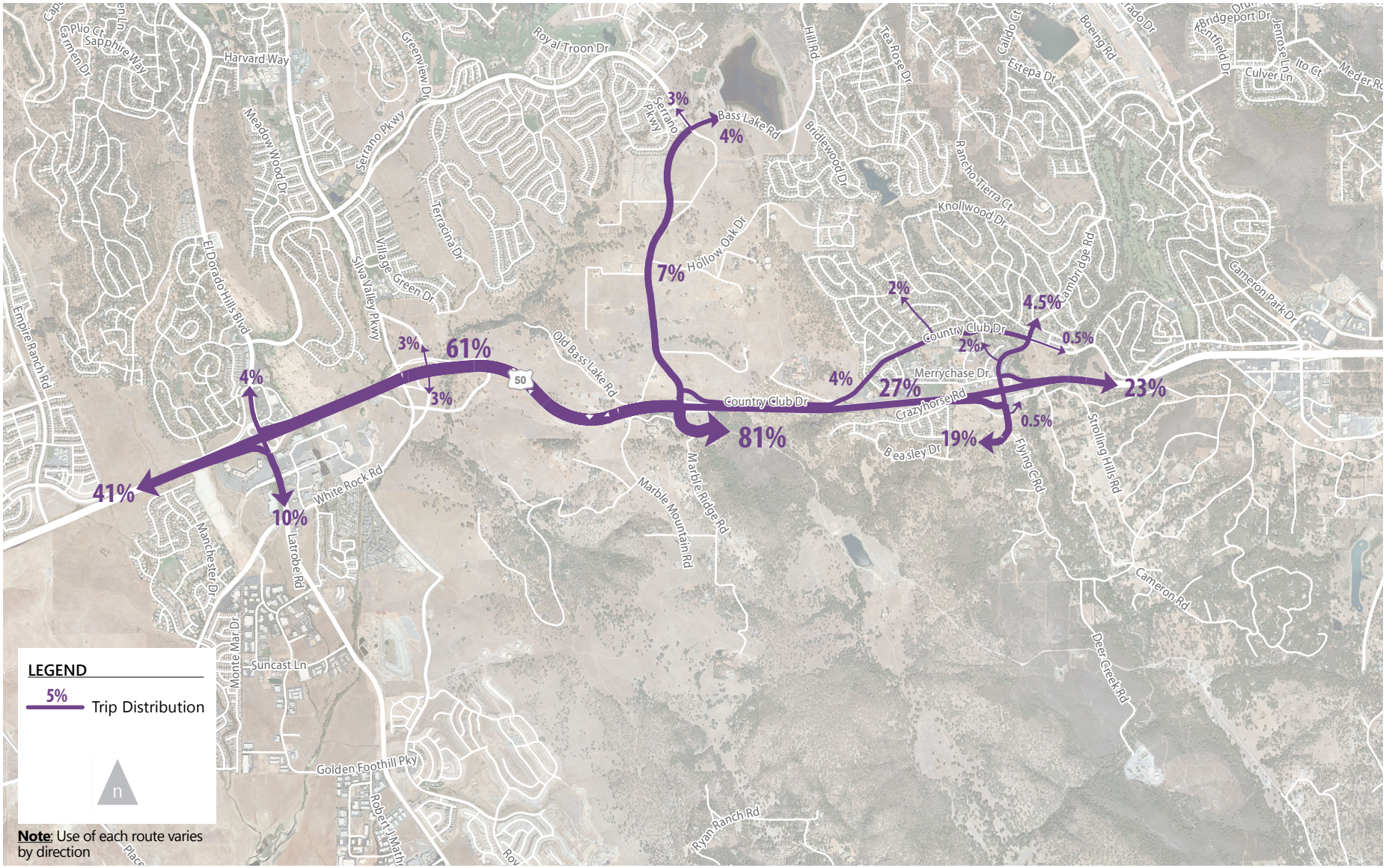


Figure 6.

Marble Valley Trip Distribution

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Document Path: N:\2012Projects\3016_MarbleValleyEIR\Graphics\GIS\MXD\January_2017\fig06_tripDist.mxd

Attachment C

Operations Analysis Output

Intersection 5 **Bass Lake Rd/US-50 WB Ramps** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	528	499	94.5%	33.8	1.5	C
	Through	616	642	104.3%	10.2	1.8	B
	Right Turn						
	Subtotal	1,144	1,141	99.8%	20.7	1.7	C
SB	Left Turn						
	Through	375	366	97.5%	57.2	28.0	E
	Right Turn	842	838	99.5%	11.1	12.2	B
	Subtotal	1,217	1,203	98.9%	25.8	18.2	C
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn	119	123	103.3%	30.4	3.1	C
	Through	3	3	90.0%	29.9	33.7	C
	Right Turn	147	144	97.8%	3.8	0.5	A
	Subtotal	269	269	100.1%	16.7	2.6	B
Total		2,630	2,614	99.4%	22.8	8.6	C

Intersection 6 **Bass Lake Rd-Marble Valley Pkwy/US-50 EB Ramps** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	668	657	98.3%	71.3	27.1	E
	Right Turn	145	143	98.9%	42.2	24.6	D
	Subtotal	813	800	98.4%	66.2	26.6	E
SB	Left Turn	227	226	99.5%	12.0	3.6	B
	Through	267	266	99.5%	13.1	2.7	B
	Right Turn						
	Subtotal	494	492	99.5%	12.5	2.8	B
EB	Left Turn	476	476	100.1%	35.5	6.7	D
	Through	2	2	90.0%	8.3	18.9	A
	Right Turn	250	255	102.0%	8.8	1.9	A
	Subtotal	728	733	100.7%	26.2	5.2	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,035	2,025	99.5%	39.1	10.6	D

Intersection 5 **Bass Lake Rd/US-50 WB Ramps** **Signal**

Direction	Lane Group	Storage (ft)	Average Queue (ft) Average	Average Queue (ft) Std. Dev.	95th Queue (ft) Average	95th Queue (ft) Std. Dev.	Maximum Queue (ft) Average	Maximum Queue (ft) Std. Dev.	Block Time Pocket	Block Time Upstream
WB	Left/Through	525	100	11	150	21	175	34	9%	0%
	Right Turn	100	25	9	75	33	125	41	0%	0%
NB	Left/Through	275	275	7	300	9	300	17	0%	9%
	Through	275	150	16	300	31	300	22	0%	0%
SB	Through	650	300	42	500	99	600	101	0%	2%
	Right Turn	650	75	46	300	179	550	230	0%	2%

Intersection 6 **Bass Lake Rd-Marble Valley Pkwy/US-50 EB Ramps** **Signal**

Direction	Lane Group	Storage (ft)	Average Queue (ft) Average	Average Queue (ft) Std. Dev.	95th Queue (ft) Average	95th Queue (ft) Std. Dev.	Maximum Queue (ft) Average	Maximum Queue (ft) Std. Dev.	Block Time Pocket	Block Time Upstream
EB	Left Turn	925	175	11	250	23	275	34	0%	0%
	Left/Through	925	150	14	225	22	250	39	0%	0%
	Right Turn	425	75	9	125	21	175	32	0%	0%
NB	Through	775	325	59	525	122	575	120	0%	0%
	Through/Right	775	275	57	475	113	500	112	0%	0%
SB	Left/Through	275	150	18	275	28	300	7	0%	1%

Intersection 5 **Bass Lake Rd/US-50 WB Ramps** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	394	381	96.7%	30.0	2.9	C
	Through	972	1,013	104.2%	12.1	2.1	B
	Right Turn						
	Subtotal	1,366	1,394	102.1%	16.9	2.3	B
SB	Left Turn						
	Through	255	250	98.0%	45.5	28.4	D
	Right Turn	486	492	101.2%	3.9	0.5	A
	Subtotal	741	742	100.1%	18.3	11.0	B
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn	177	174	98.0%	54.3	37.1	D
	Through	2	2	105.0%	27.8	55.7	C
	Right Turn	229	230	100.6%	16.7	23.4	B
	Subtotal	408	406	99.5%	33.1	31.6	C
Total		2,515	2,542	101.1%	20.0	6.2	B

Intersection 6 **Bass Lake Rd-Marble Valley Pkwy/US-50 EB Ramps** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	545	541	99.2%	46.4	7.9	D
	Right Turn	158	161	101.7%	19.3	6.7	B
	Subtotal	703	702	99.8%	40.7	7.3	D
SB	Left Turn	141	138	97.8%	24.2	10.3	C
	Through	291	289	99.4%	24.8	8.6	C
	Right Turn						
	Subtotal	432	427	98.9%	24.5	8.9	C
EB	Left Turn	821	840	102.3%	26.6	3.9	C
	Through	1	1	130.0%	0.3	0.9	A
	Right Turn	576	572	99.2%	16.2	3.3	B
	Subtotal	1,398	1,413	101.1%	22.4	3.0	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		2,533	2,542	100.3%	27.9	2.4	C

Intersection 5 **Bass Lake Rd/US-50 WB Ramps** **Signal**

Direction	Lane Group	Storage (ft)	Average Queue (ft) Average	Average Queue (ft) Std. Dev.	95th Queue (ft) Average	95th Queue (ft) Std. Dev.	Maximum Queue (ft) Average	Maximum Queue (ft) Std. Dev.	Block Time Pocket	Block Time Upstream
WB	Left/Through	525	150	39	300	96	400	97	27%	1%
	Right Turn	100	50	12	150	18	150	0	0%	0%
NB	Left/Through	275	250	8	300	8	300	6	0%	4%
	Through	275	175	15	275	22	300	25	0%	0%
SB	Through	650	175	32	250	80	300	110	0%	0%
	Right Turn	650	25	3	25	24	25	71	0%	0%

Intersection 6 **Bass Lake Rd-Marble Valley Pkwy/US-50 EB Ramps** **Signal**

Direction	Lane Group	Storage (ft)	Average Queue (ft) Average	Average Queue (ft) Std. Dev.	95th Queue (ft) Average	95th Queue (ft) Std. Dev.	Maximum Queue (ft) Average	Maximum Queue (ft) Std. Dev.	Block Time Pocket	Block Time Upstream
EB	Left Turn	925	250	14	325	35	375	64	0%	0%
	Left/Through	925	200	14	300	28	325	66	0%	0%
	Right Turn	425	175	19	275	34	325	37	0%	0%
NB	Through	775	250	27	350	48	400	67	0%	0%
	Through/Right	775	200	29	325	45	375	62	0%	0%
SB	Left/Through	275	200	25	300	24	300	4	0%	1%