



October 12, 2017

Mr. Ralph Garcia
Senior Transportation Engineer
City of Sunnyvale
456 W. Olive Avenue
P.O. Box 3707
Sunnyvale, CA 94008-3707

RE: *LOS Results and Intersection Impacts for the Civic Center in Sunnyvale, CA*

Dear Mr. Garcia:

The City of Sunnyvale is seeking to reconstruct and expand the existing Civic Center which includes the City Hall buildings, Public Safety Headquarters, and the Library located along Olive Avenue in Sunnyvale, CA.

After discussions with the City of Sunnyvale (City), this memorandum evaluated the intersection level of service (LOS) results and impacts. The following discusses the methodology, analysis, and results of the comparison.

BACKGROUND

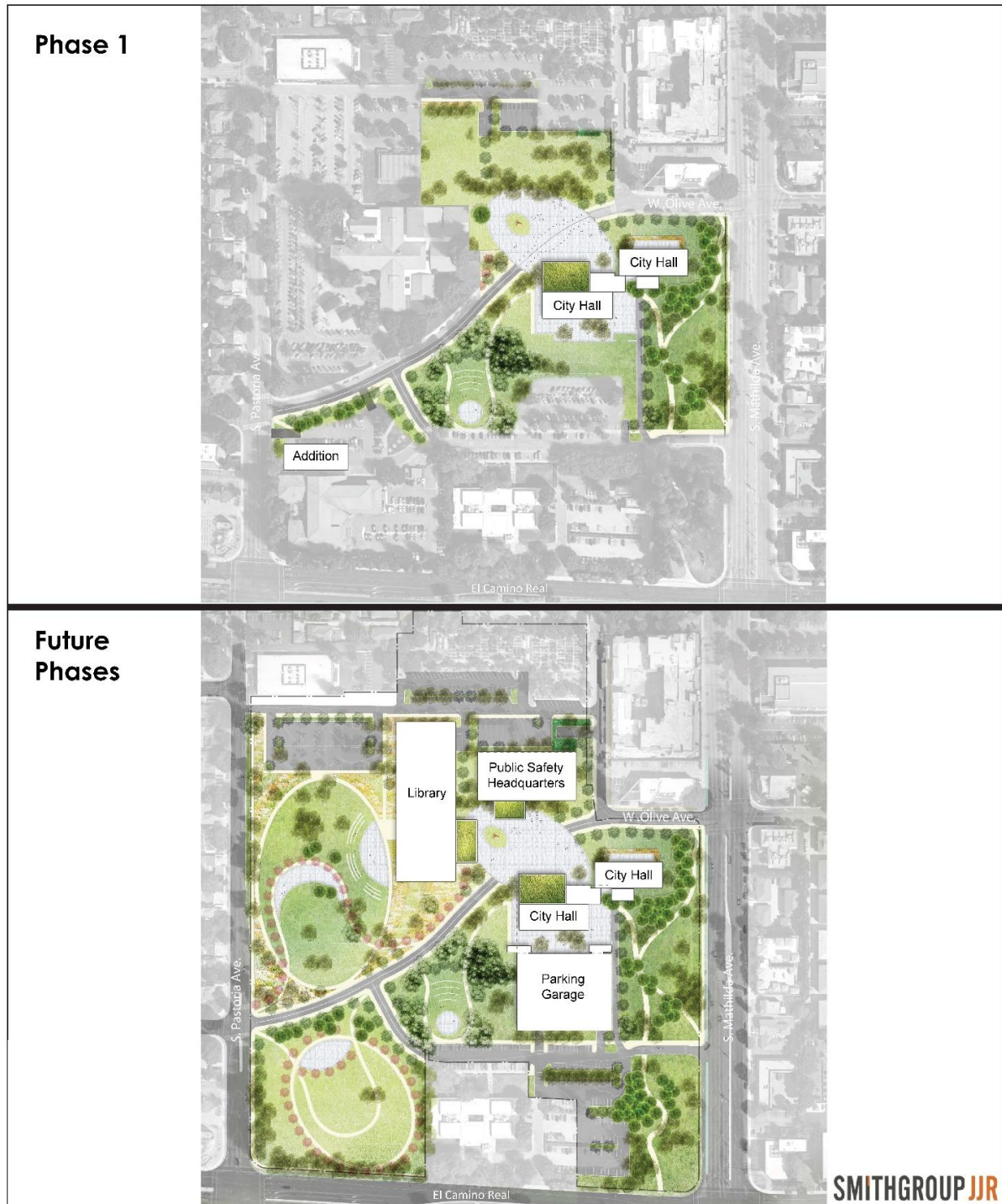
The proposed Civic Center is to be located on the northwest corner of the Mathilda Avenue/El Camino Real intersection, as shown in **Figure 1**. The existing City Hall buildings are 96,200 square feet and include the City Hall, Sunnyvale Office Center, South Annex, and City Hall Annex. The proposed new City Hall would be a maximum of 109,000 square feet (increase of 12,800 square feet). The existing Public Safety Headquarters is 41,000 square feet and the proposed building would be 65,000 square feet (increase of 24,000 square feet). The existing Library is 60,900 square feet and the proposed library would be 120,000 square feet (increase of 59,100 square feet). The City is considering two project options with different layouts for the buildings and parking structures, as shown in **Figures 2 and 3**. The second project option would close Olive Street in the middle of the project site, between Charles Street and Pastoria Avenue, which would affect the circulation of the proposed project traffic and the background traffic.

Figure 1 – Project Location



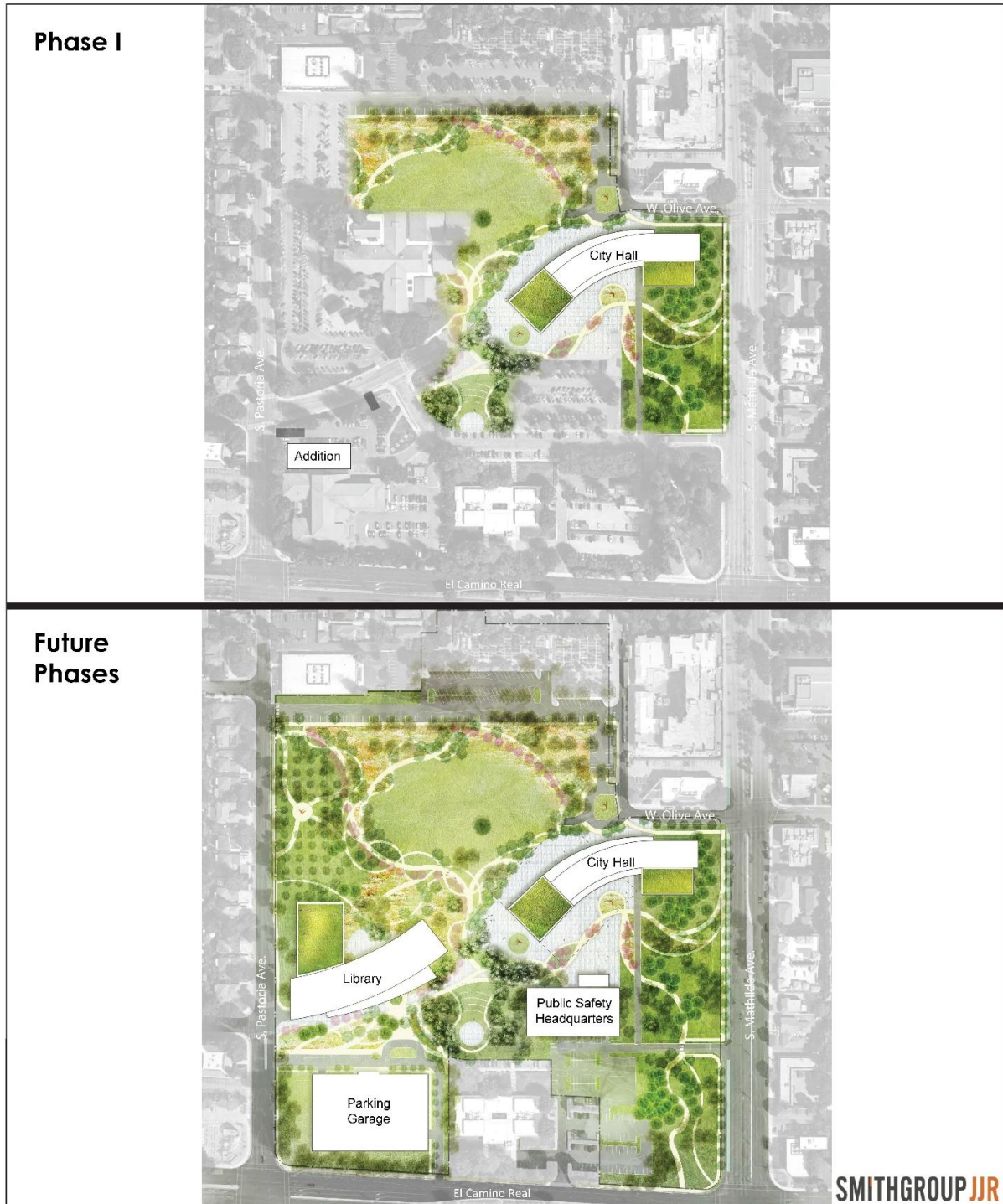
Source: City of Sunnyvale

Figure 2 – Project Option #1



Source: City of Sunnyvale

Figure 3 – Project Option #2



Source: City of Sunnyvale

Analysis Scenarios

To determine the potential project impacts, multiple scenarios were analyzed in the AM and PM peak hours:

- Existing Conditions – Based on the peak hour traffic counts provided by the City from November 2015, December 2016, and May 2017 and existing roadway geometry and traffic control.
- Existing Plus Project Option #1 Traffic Conditions – Based on current traffic counts, existing roadway geometry and traffic control, plus traffic generated by the full buildout of Option #1.
- Existing Plus Project Option #2 Traffic Conditions – Based on current traffic counts, existing roadway geometry and traffic control, plus traffic generated by the full buildout of Option #2.
- Existing + Background Traffic Conditions – Based on existing traffic volumes and traffic added by approved projects that the City has good reason to believe will be contributing traffic to the study area. The roadway network will include existing conditions plus programmed (i.e. funded) roadway projects to be in place by this analysis year.
- Existing + Background + Project Option #1 Traffic Conditions – Based on existing traffic volumes, traffic added by approved projects as referenced above, and traffic generated by the full buildout of Option #1. The scenario includes roadway projects programmed to be in place by this analysis year.
- Existing + Background + Project Option #2 Traffic Conditions – Based on existing traffic volumes, traffic added by approved projects as referenced above, and traffic generated by the full buildout of Option #2. The scenario includes roadway projects programmed to be in place by this analysis year.
- Cumulative (2025) Conditions without the Project – Based on existing traffic volumes and traffic added by approved and pending projects, as well as a 1.5 percent growth rate to all roadways. The roadway network will include existing conditions plus programmed (i.e. funded) roadway projects to be in place by this analysis year.
- Cumulative (2025) Conditions Plus Project Option #1 – Based on Cumulative (2025) volumes and traffic generated by the full buildout of Option #1.
- Cumulative (2025) Conditions Plus Project Option #2 – Based on Cumulative (2025) volumes and traffic generated by the full buildout of Option #2.

Level of Service Standards

Analysis of significant environmental impacts at intersections and freeway segments is based on the concept of level of service (LOS). The LOS of an intersection is a qualitative measure used to describe operational conditions. LOS ranges from A (best), which represents minimal delay, to F (worst), which represents heavy delay and a facility that is operating at or near its functional capacity.

Levels of service for this study were determined using methods defined in the *Highway Capacity Manual, 2000* (HCM) and appropriate traffic analysis software.

The HCM includes procedures for analyzing side-street stop-controlled (SSSC), all-way stop-controlled (AWSC), and signalized intersections. The SSSC procedure defines LOS as a function of average control delay for each minor street approach movement and major street left-turns. Conversely, the AWSC and signalized intersection procedures define LOS as a function of average control delay for the intersection as a whole. VTA has specific delay threshold values for each LOS that is more detailed than that of the HCM. Pluses and minuses are added to the HCM ranges to further designate the LOS for signalized intersections. **Table 1** relates the operational characteristics associated with each LOS category for signalized intersections¹

Table 2 relates the operational characteristics associated with each LOS category for unsignalized intersections².

Table 1 - Signalized Intersection Level of Service Definitions

Level of Service	Description	Signalized (Avg. control delay per vehicle sec/veh.)
A	Free flow with no delays. Users are virtually unaffected by others in the traffic stream	delay \leq 10.0
B+	Stable traffic. Traffic flows smoothly with few delays.	10.0 < delay \leq 12.0
B		12.0 < delay \leq 18.0
B-		18.0 < delay \leq 20.0
C+	Stable flow but the operation of individual users becomes affected by other vehicles. Modest delays.	20.0 < delay \leq 23.0
C		23.0 < delay \leq 32.0
C-		32.0 < delay \leq 35.0
D+	Approaching unstable flow. Operation of individual users becomes significantly affected by other vehicles. Delays may be more than one cycle during peak hours.	35.0 < delay \leq 39.0
D		39.0 < delay \leq 51.0
D-		51.0 < delay \leq 55.0
E+	Unstable flow with operating conditions at or near the capacity level. Long delays and vehicle queuing.	55.0 < delay \leq 60.0
E		60.0 < delay \leq 75.0
E-		75.0 < delay \leq 80.0
F	Forced or breakdown flow that causes reduced capacity. Stop and go traffic conditions. Excessive long delays and vehicle queuing.	delay > 80

¹ VTA Congestion Management Program, Traffic Level of Service Analysis Guidelines, June 2003.

² Transportation Research Board, *Highway Capacity Manual 2000*, National Research Council, 2000

Table 2 - Unsignalized Intersection Level of Service Definitions

Level of Service	Description	Unsignalized (Avg. control delay per vehicle sec/veh.)
A	Free flow with no delays. Users are virtually unaffected by others in the traffic stream	≤ 10
B	Stable traffic. Traffic flows smoothly with few delays.	$> 10 - 15$
C	Stable flow but the operation of individual users becomes affected by other vehicles. Modest delays.	$> 15 - 25$
D	Approaching unstable flow. Operation of individual users becomes significantly affected by other vehicles. Delays may be more than one cycle during peak hours.	$> 25 - 35$
E	Unstable flow with operating conditions at or near the capacity level. Long delays and vehicle queuing.	$> 35 - 50$
F	Forced or breakdown flow that causes reduced capacity. Stop and go traffic conditions. Excessive long delays and vehicle queuing.	> 50

Project impacts were determined by comparing conditions with the proposed project to those without the proposed project. Significant impacts for signalized and unsignalized intersections are created when traffic from the proposed project causes the LOS to fall below a specific threshold. For unsignalized intersections, a deficient LOS suggests recommendations for improvements to the type of traffic control, such as signalization. A peak hour signal warrant was evaluated to determine if the intersection met the volume requirements for a traffic signal.

Consistent with the significance impact criteria documented in the *Transportation Impact Analysis Guidelines*³, VTA accepts a minimum level of service of LOS E for a County intersection or Congestion Management Program (CMP) intersection. The City utilizes the same VTA LOS standards for all intersections on regionally significant roadways such as El Camino Real. Therefore, the following conditions would result in a significant impact at a CMP intersection or regionally significant roadway intersection:

1. If the intersection operates at an acceptable LOS (i.e. LOS A, B, C, D, or E) without the project and degrades to an unacceptable LOS (i.e. LOS F) with the project, then it is a significant impact.

³ *Transportation Impact Analysis Guidelines*, Santa Clara Valley Transportation Authority Guidelines, October 2014.

2. If the intersection operates at an unacceptable LOS (i.e. LOS F) without the project and the project increases the average control delay for the critical movements by four (4) or more seconds and increases the critical volume to capacity (v/c) by 0.01 or more, then it is a significant impact.
 - a. If the addition of project traffic reduces the amount of average control delay for a critical movement (i.e. negative change in delay) and the project increases the v/c by 0.01 or more, then it is a significant impact.

Mitigation for intersections with a significant impact must improve the LOS back to without Project conditions or better.

The LOS standard for City of Sunnyvale intersections is LOS D except for City of Sunnyvale intersections that are designated as regionally significant, which allows for a minimum level of service of LOS E. Therefore, the following conditions would result in a significant impact at a City intersection:

1. If the intersection operates at an acceptable LOS (i.e. LOS A, B, C, or D) without the project and degrades to an unacceptable LOS (i.e. LOS E, or F) with the project, then it is a significant impact.
2. If the intersection operates at an unacceptable LOS (i.e. LOS E, or F) without the project and the project increases the critical-movement delay of four (4) or more seconds and increased the critical volume to capacity (v/c) by 0.01 or more, then it is a significant impact.

The City of Sunnyvale does not have an officially adopted significance criterion for unsignalized intersections. Based on previously approved traffic studies, significant impacts are defined to occur when:

1. The addition of project traffic causes the average intersection delay for all-way stop controlled intersections or the worst movement/approach for side-street stop-controlled intersections to degrade to LOS E or LOS F for regionally significant roadways, respectively.
2. The intersection satisfies any traffic signal warrant from the MUTCD.

Mitigation for intersections with a significant impact must improve the LOS back to without Project Conditions or better.

Analysis Methodology

The study intersections were modeled in Traffix software using Highway Capacity Manual (HCM) 2000 methodology for the AM and PM peak periods, consistent with VTA methodology. The LOS were reported for each study intersection.

EXISTING CONDITIONS

The existing conditions for the study intersections were evaluated in Traffix using the existing volumes and lane geometry. **Table 3** shows the existing LOS and delay for each of the study intersections. The LOS calculations are attached.

Table 3 – Existing LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Existing							
					AM Peak				PM Peak			
					LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Crit. Delay
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	C	23.5	0.500	19.7	C+	23.0	0.565	26.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	C	25.9	0.393	27.7	B-	19.0	0.421	9.5
3	Mathilda Avenue/Ross Drive	E	City	Signal	C+	20.4	0.383	16.1	C+	20.2	0.446	13.8
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	24.2	0.506	24.9	C	30.1	0.455	24.4
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	A	8.5	0.534	9.1	B	13.8	0.384	9.5
6	Mathilda Avenue/Maude Avenue	E	City	Signal	D	41.4	0.657	39.0	D	48.5	0.660	47.6
7	Mathilda Avenue/Indio Way	E	City	Signal	C	30.2	0.636	28.8	C	26.3	0.724	27.4
8	Mathilda Avenue/California Avenue	E	City	Signal	C	23.8	0.482	12.4	C	31.1	0.747	30.2
9	Mathilda Avenue/Washington Avenue	E	City	Signal	C	31.9	0.690	32.8	C-	32.8	0.709	27.8
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B	13.1	0.465	12.7	B-	18.6	0.568	18.4
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B	15.7	0.438	11.5	B-	19.4	0.492	15.8
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B-	18.9	0.624	15.3	B-	18.1	0.530	14.2
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	D-	53.3	0.780	55.9	D	49.1	0.743	50.4
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D+	37.7	0.393	34.8	D	44.2	0.595	44.4
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	23.8	0.528	22.3	C	31.6	0.525	30.5
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	D	41.3	0.784	35.7	D	45.7	0.751	48.0
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	D	48.3	0.789	46.6	D	49.1	0.756	47.6
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.1	0.282	13.5	B	13.4	0.326	13.8
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.5	0.234	9.0	B+	10.4	0.288	9.9
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	A	9.7	0.314	9.7	B	10.2	0.323	10.2
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D+	38.3	0.526	35.7	D+	38.0	0.605	38.0
22	Charles Street/W Iowa Avenue	D	City	SSSC	A	10.0	0.022	2.7	B	10.9	0.041	2.7
23	Mary Avenue/W Olive Avenue	D	City	SSSC	D	33.8	0.175	2.5	E	41.5	0.260	2.6
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.8	0.652	41.3	D	44.6	0.736	44.3
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	A	9.4	0.540	6.9	A	8.4	0.473	7.2
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C+	22.8	0.615	18.0	C	23.7	0.569	22.7
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	D+	39.0	0.796	39.2	D	40.8	0.811	46.1

¹ The average control delay is reported for signalized and ASWC intersections. The delay for the worst movement is reported for SSSC intersections.
Note: Locations operating unacceptably are in **bold**.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (PM peak hour only)

TRIP GENERATION AND DISTRIBUTION

The trip generation, as shown in the *Initial Coordination and Trip Assumptions for the Civic Center in Sunnyvale, CA* memorandum dated October 3, 2017, showed two separate methodologies for determining the estimated number of project trips. One method used the Institute of Transportation Engineers (ITE) Trip Generation Manual to estimate the project trips. The second method used traffic counts of existing trips to the Sunnyvale Civic Center. AM peak hour and PM peak hour counts were collected on Tuesday, 5/9/2017, Wednesday, 5/10/2017, and Tuesday, 5/23/2017, and an average of the three days was used. Upon further review of the trip generation rates in the ITE Trip Generation Manual, the assumed land use of a government building has much different in and out splits in the AM peak hour and in the PM peak hour. Therefore, it was determined that the existing counts were a better representation of future trips generated. **Table 4** shows the trip generation for the proposed land use expansions using site counts. The proposed project will generate an estimated 120 AM peak hour trips and 255 PM peak hour trips.

The project trip distribution for the proposed project is shown in **Figure 4**. The trip distribution for the government land uses was determined based on discussions with City staff. The trip distribution for the library is similar but assumes more trips coming from within the City of Sunnyvale.

Table 4 – Trip Generation Summary (Site Counts)

TIME PERIOD		LAND USE	Trips		
			In	Out	Total
AM Peak	Existing	City Hall (96.2 KSF)	194	44	238
		Public Safety Headquarters (41 KSF)	31	23	54
		Library (60.9 KSF)	39	20	59
		Total Existing Trips	264	87	351
	Project	City Hall (109 KSF)	220	50	270
		Public Safety Headquarters (65 KSF)	49	36	85
		Library (120 KSF)	77	39	116
		Total Proposed Trips	346	126	471
		Net New Trips	82	39	120
PM Peak	Existing	City Hall (96.2 KSF)	53	163	216
		Public Safety Headquarters (41 KSF)	21	50	71
		Library (60.9 KSF)	94	97	191
		Total Existing Trips	168	310	478
	Project	City Hall (109 KSF)	60	185	245
		Public Safety Headquarters (65 KSF)	33	79	112
		Library (120 KSF)	185	191	376
		Total Proposed Trips	278	455	733
		Net New Trips	110	145	255

Figure 4 – Project Trip Distribution

It should be noted that a significant proportion of the trips go to and come from Mathilda Avenue to the north. These trips are going to or coming from Central Expressway, US-101, SR-237, and Moffett Park. There are approximately 223 vehicles in the AM peak hour and 303 vehicles in the PM peak hour to/from the north.

EXISTING PLUS PROJECT CONDITIONS

Existing Plus Project – Option 1

Existing Plus Project (Option 1) volumes were generated by adding the project trips based on the trip generation and trip distribution assumptions at the study intersections with West Olive Avenue as an access way to the proposed project site. **Table 5** shows the Existing Plus Project (Option 1) LOS and delay for each of the study intersections. The LOS calculations are attached.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

This is a significant impact in the AM peak hour because the project increases the LOS from an acceptable LOS D to an unacceptable LOS E.

Table 5 – Existing Plus Project (Option 1) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Existing								Existing + Project (Option 1)											
					AM Peak				PM Peak				AM Peak						PM Peak					
					LOS	Delay (sec) ¹	v/c ratio	Critical Delay (sec)	LOS	Delay (sec) ¹	v/c ratio	Critical Delay	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	C	23.5	0.500	19.7	C+	23.0	0.565	26.0	C	23.6	0.500	0.000	19.6	-0.1	C+	22.9	0.565	0.000	25.9	-0.1
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	C	25.9	0.393	27.7	B-	19.0	0.421	9.5	C	25.9	0.394	0.001	27.7	0.0	B-	19.0	0.424	0.003	9.4	-0.1
3	Mathilda Avenue/Ross Drive	E	City	Signal	C+	20.4	0.383	16.1	C+	20.2	0.446	13.8	C+	20.4	0.384	0.001	16.1	0.0	C+	20.1	0.449	0.003	13.8	0.0
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	24.2	0.506	24.9	C	30.1	0.455	24.4	C	24.1	0.508	0.002	24.8	-0.1	C	29.9	0.459	0.004	24.3	-0.1
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	A	8.5	0.534	9.1	B	13.8	0.384	9.5	A	8.5	0.536	0.002	9.1	0.0	B	14.4	0.396	0.012	20.6	11.1
6	Mathilda Avenue/Maude Avenue	E	City	Signal	D	41.4	0.657	39.0	D	48.5	0.660	47.6	D	41.4	0.659	0.002	39.0	0.0	D	49.1	0.650	-0.010	55.2	7.6
7	Mathilda Avenue/Indio Way	E	City	Signal	C	30.2	0.636	28.8	C	26.3	0.724	27.4	C	30.1	0.638	0.002	28.7	-0.1	C	26.4	0.732	0.008	27.7	0.3
8	Mathilda Avenue/California Avenue	E	City	Signal	C	23.8	0.482	12.4	C	31.1	0.747	30.2	C	23.7	0.485	0.003	12.3	-0.1	C	31.3	0.756	0.009	30.5	0.3
9	Mathilda Avenue/Washington Avenue	E	City	Signal	C	31.9	0.690	32.8	C-	32.8	0.709	27.8	C	31.7	0.693	0.003	32.8	0.0	C-	32.7	0.716	0.007	27.8	0.0
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B	13.1	0.465	12.7	B-	18.6	0.568	18.4	B	13.3	0.470	0.005	13.1	0.4	B-	18.6	0.579	0.011	18.7	0.3
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B	15.7	0.438	11.5	B-	19.4	0.492	15.8	B	17.1	0.448	0.010	13.2	1.7	C+	21.4	0.511	0.019	15.7	-0.1
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B-	18.9	0.624	15.3	B-	18.1	0.530	14.2	B-	19.6	0.629	0.005	15.6	0.3	C+	20.4	0.568	0.038	18.8	4.6
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	D-	53.3	0.780	55.9	D	49.1	0.743	50.4	D-	53.9	0.790	0.010	56.6	0.7	D	48.9	0.741	-0.002	49.9	-0.5
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D+	37.7	0.393	34.8	D	44.2	0.595	44.4	D+	37.6	0.394	0.001	34.7	-0.1	D	44.0	0.597	0.002	44.4	0.0
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	23.8	0.528	22.3	C	31.6	0.525	30.5	C	23.7	0.531	0.003	22.3	0.0	C	31.4	0.530	0.005	30.5	0.0
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	D	41.3	0.784	35.7	D	45.7	0.751	48.0	D	41.5	0.787	0.003	35.7	0.0	D	45.8	0.759	0.008	48.3	0.3
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	D	48.3	0.789	46.6	D	49.1	0.756	47.6	D	48.3	0.793	0.004	46.7	0.1	D	49.0	0.763	0.007	47.7	0.1
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.1	0.282	13.5	B	13.4	0.326	13.8	B	13.1	0.282	0.000	13.5	0.0	B	13.4	0.326	0.000	13.8	0.0
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.5	0.234	9.0	B+	10.4	0.288	9.9	A	9.5	0.234	0.000	9.0	0.0	B+	10.4	0.288	0.000	9.9	0.0
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	A	9.7	0.314	9.7	B	10.2	0.323	10.2	A	9.8	0.319	0.005	9.8	0.1	B	10.3	0.334	0.011	10.3	0.1
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D+	38.3	0.526	35.7	D+	38.0	0.605	38.0	D+	38.3	0.528	0.002	35.7	0.0	D+	38.1	0.609	0.004	38.3	0.3
22	Charles Street/W Iowa Avenue	D	City	SSSC	A	10.0	0.022	2.7	B	10.9	0.041	2.7	B	10.8	0.040	0.018	4.0	1.3	B	13.0	0.090	0.049	4.8	2.1
23	Mary Avenue/W Olive Avenue	D	City	SSSC	D	33.8	0.175	2.5	E	41.5	0.260	2.6	E	35.3	0.195	0.020	2.6	0.1	E	43.9	0.263	0.003	3.0	0.4
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.8	0.652	41.3	D	44.6	0.736	44.3	D	43.0	0.656	0.004	41.5	0.2	D	45.2	0.747	0.011	45.0	0.7
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	A	9.4	0.540	6.9	A	8.4	0.473	7.2	A	9.4	0.544	0.004	6.9	0.0	A	8.3	0.480	0.007	7.1	-0.1
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C+	22.8	0.615	18.0	C	23.7	0.569	22.7	C+	22.7	0.619	0.004	18.0	0.0	C	23.5	0.576	0.007	22.6	-0.1
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	D+	39.0	0.796	39.2	D	40.8	0.811	46.1	D	39.2	0.801	0.005	39.3	0.1	D	41.0	0.820	0.009	46.5	0.4

¹ The average control delay is reported for signalized and AWSC intersections. The delay for the worst movement is reported for SSSC intersections.

Note: Locations operating unacceptably are in **bold** and impacts are highlighted.

Existing Plus Project – Option 2

Existing Plus Project (Option 2) volumes were generated by adding the project trips based on the trip generation and trip distribution assumptions at the study intersections with no access to the proposed project site through West Olive Avenue. **Table 6** shows the Existing Plus Project (Option 2) LOS and delay for each of the study intersections. The LOS calculations are attached.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

This is a significant impact in the AM peak hour because the project increases the LOS from an acceptable LOS D to an unacceptable LOS E.

Table 6 – Existing Plus Project (Option 2) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Existing								Existing + Project (Option 2)											
					AM Peak				PM Peak				AM Peak						PM Peak					
					LOS	Delay (sec) ¹	v/c ratio	Critical Delay (sec)	LOS	Delay (sec) ¹	v/c ratio	Critical Delay (sec)	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	C	23.5	0.500	19.7	C+	23.0	0.565	26.0	C	23.6	0.500	0.000	19.6	-0.1	C+	22.9	0.565	0.000	25.9	-0.1
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	C	25.9	0.393	27.7	B-	19.0	0.421	9.5	C	25.9	0.394	0.001	27.7	0.0	B-	19.0	0.424	0.003	9.4	-0.1
3	Mathilda Avenue/Ross Drive	E	City	Signal	C+	20.4	0.383	16.1	C+	20.2	0.446	13.8	C+	20.4	0.384	0.001	16.1	0.0	C+	20.1	0.449	0.003	13.8	0.0
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	24.2	0.506	24.9	C	30.1	0.455	24.4	C	24.1	0.508	0.002	24.8	-0.1	C	29.9	0.459	0.004	24.3	-0.1
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	A	8.5	0.534	9.1	B	13.8	0.384	9.5	A	8.5	0.536	0.002	9.1	0.0	B	14.4	0.396	0.012	20.6	11.1
6	Mathilda Avenue/Maude Avenue	E	City	Signal	D	41.4	0.657	39.0	D	48.5	0.660	47.6	D	41.4	0.659	0.002	39.0	0.0	D	49.1	0.650	-0.010	55.2	7.6
7	Mathilda Avenue/Indio Way	E	City	Signal	C	30.2	0.636	28.8	C	26.3	0.724	27.4	C	30.1	0.638	0.002	28.7	-0.1	C	26.4	0.732	0.008	27.7	0.3
8	Mathilda Avenue/California Avenue	E	City	Signal	C	23.8	0.482	12.4	C	31.1	0.747	30.2	C	23.7	0.485	0.003	12.3	-0.1	C	31.3	0.756	0.009	30.5	0.3
9	Mathilda Avenue/Washington Avenue	E	City	Signal	C	31.9	0.690	32.8	C-	32.8	0.709	27.8	C	31.7	0.693	0.003	32.8	0.0	C-	32.7	0.716	0.007	27.8	0.0
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B	13.1	0.465	12.7	B-	18.6	0.568	18.4	B	13.4	0.470	0.005	13.2	0.5	B-	19.7	0.589	0.021	20.0	1.6
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B	15.7	0.438	11.5	B-	19.4	0.492	15.8	B	16.8	0.446	0.008	12.9	1.4	C+	21.8	0.514	0.022	16.2	0.4
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B-	18.9	0.624	15.3	B-	18.1	0.530	14.2	B-	19.9	0.628	0.004	15.6	0.3	B	17.9	0.540	0.010	15.5	1.3
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	D-	53.3	0.780	55.9	D	49.1	0.743	50.4	D-	53.5	0.788	0.008	56.3	0.4	D	49.1	0.740	-0.003	50.2	-0.2
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D+	37.7	0.393	34.8	D	44.2	0.595	44.4	D+	37.6	0.394	0.001	34.7	-0.1	D	44.0	0.597	0.002	44.4	0.0
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	23.8	0.528	22.3	C	31.6	0.525	30.5	C	23.9	0.522	-0.006	22.4	0.1	C	31.7	0.522	-0.003	30.6	0.1
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	D	41.3	0.784	35.7	D	45.7	0.751	48.0	D	41.3	0.778	-0.006	35.7	0.0	D	45.7	0.748	-0.003	48.0	0.0
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	D	48.3	0.789	46.6	D	49.1	0.756	47.6	D	48.3	0.783	-0.006	46.6	0.0	D	49.1	0.753	-0.003	47.6	0.0
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.1	0.282	13.5	B	13.4	0.326	13.8	B	13.1	0.282	0.000	13.5	0.0	B	13.4	0.326	0.000	13.8	0.0
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.5	0.234	9.0	B+	10.4	0.288	9.9	B+	10.0	0.248	0.014	10.1	1.1	B+	11.4	0.321	0.033	12.0	2.1
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	A	9.7	0.314	9.7	B	10.2	0.323	10.2	B	10.1	0.349	0.035	10.1	0.4	B	10.6	0.395	0.072	10.6	0.4
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D+	38.3	0.526	35.7	D+	38.0	0.605	38.0	D	39.2	0.554	0.028	37.1	1.4	D	39.2	0.621	0.016	39.1	1.1
22	Charles Street/W Iowa Avenue	D	City	SSSC	A	10.0	0.022	2.7	B	10.9	0.041	2.7	B	10.2	0.032	0.010	2.7	0.0	B	12.1	0.072	0.031	2.9	0.2
23	Mary Avenue/W Olive Avenue	D	City	SSSC	D	33.8	0.175	2.5	E	41.5	0.260	2.6	E	35.3	0.195	0.020	2.6	0.1	E	43.9	0.263	0.003	3.0	0.4
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.8	0.652	41.3	D	44.6	0.736	44.3	D	43.0	0.656	0.004	41.5	0.2	D	45.2	0.747	0.011	45.0	0.7
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	A	9.4	0.540	6.9	A	8.4	0.473	7.2	A	9.4	0.534	-0.006	7.0	0.1	A	8.4	0.471	-0.002	7.2	0.0
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C+	22.8	0.615	18.0	C	23.7	0.569	22.7	C+	22.9	0.609	-0.006	18.0	0.0	C	23.7	0.566	-0.003	22.8	0.1
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	D+	39.0	0.796	39.2	D	40.8	0.811	46.1	D+	38.9	0.790	-0.006	39.1	-0.1	D	40.8	0.808	-0.003	46.1	0.0

¹ The average control delay is reported for signalized and AWSC intersections. The delay for the worst movement is reported for SSSC intersections.
Note: Locations operating unacceptably are in **bold** and impacts are highlighted.

EXISTING PLUS BACKGROUND CONDITIONS

To achieve Existing Plus Background traffic conditions, traffic volumes from approved but not yet constructed projects were incorporated according to the information provided by the City (dated September 2017).

Table 7 shows the Existing Plus Approved LOS and delay for each of the study intersections. The LOS calculations are attached.

Table 7 – Existing Plus Background LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Background							
					AM Peak				PM Peak			
					LOS	Delay (sec) ¹	w/c ratio	Crit. Delay	LOS	Delay (sec) ¹	w/c ratio	Crit. Delay
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	A	0.0	0.000	0.0	A	0.0	0.000	0.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	D+	37.0	0.515	38.8	C	23.5	0.484	12.3
3	Mathilda Avenue/Ross Drive	E	City	Signal	C	25.7	0.428	20.8	C	25.0	0.500	16.2
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	26.2	0.574	24.9	C-	32.2	0.555	25.4
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	A	8.3	0.618	9.5	B	13.3	0.464	19.2
6	Mathilda Avenue/Maude Avenue	E	City	Signal	D	49.1	0.828	67.7	D-	55.0	0.800	57.1
7	Mathilda Avenue/Indio Way	E	City	Signal	D+	38.7	0.771	39.2	C-	34.1	0.856	37.8
8	Mathilda Avenue/California Avenue	E	City	Signal	C	27.4	0.647	20.3	C-	34.7	0.840	34.8
9	Mathilda Avenue/Washington Avenue	E	City	Signal	D+	38.3	0.827	40.2	D+	38.4	0.810	34.2
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B	15.0	0.668	14.9	B-	18.2	0.619	17.0
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B	17.9	0.622	13.6	B-	18.3	0.533	11.8
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B	16.7	0.624	11.2	C+	20.4	0.587	15.3
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	E+	57.1	0.796	59.4	E+	57.3	0.836	61.4
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.1	0.427	36.6	D	48.9	0.712	52.5
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	26.8	0.583	26.1	C-	33.3	0.569	32.7
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	D	46.3	0.848	42.6	D	49.3	0.790	51.1
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	D-	52.9	0.838	52.2	D-	53.5	0.806	52.4
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.6	0.333	13.9	B	14.2	0.411	14.6
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.1	0.280	9.2	B+	10.6	0.346	10.6
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	B	10.9	0.372	10.9	B	12.5	0.434	12.5
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.2	0.524	38.7	D	42.3	0.628	43.0
22	Charles Street/W Iowa Avenue	D	City	SSSC	B	10.1	0.023	2.5	B	11.2	0.043	2.5
23	Mary Avenue/W Olive Avenue	D	City	SSSC	F	77.3	0.307	4.4	F	89.3	0.394	4.6
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D	50.1	0.732	50.3	D-	52.2	0.784	51.6
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	B	12.7	0.600	10.8	B+	10.4	0.521	9.6
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C	26.4	0.671	23.0	C	25.7	0.612	25.4
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	D	47.8	0.930	53.0	D	50.4	0.924	57.3

¹ The average control delay is reported for signalized and ASWC intersections. The delay for the worst movement is reported for SSSC intersections.

Note: Locations operating unacceptably are in **bold**.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

EXISTING PLUS BACKGROUND PLUS PROJECT CONDITIONS

Existing Plus Background Plus Project – Option 1

Existing Plus Background Plus Project (Option 1) volumes were generated by adding the project trips to the Existing Plus Background volumes. **Table 8** shows the Existing Plus Background Plus Project LOS and delay for each of the study intersections. The LOS calculations are attached.

Table 8 – Existing Plus Background Plus Project (Option 1) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Background								Background + Project (Option 1)											
					AM Peak				PM Peak				AM Peak						PM Peak					
					LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	A	0.0	0.000	0.0	A	0.0	0.000	0.0	A	0.0	0.000	0.000	0.0	0.0	A	0.00	0.000	0.000	0.0	0.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	D+	37.0	0.515	38.8	C	23.5	0.484	12.3	D+	37.0	0.516	0.001	38.8	0.0	C	23.50	0.487	0.003	12.3	0.0
3	Mathilda Avenue/Ross Drive	E	City	Signal	C	25.7	0.428	20.8	C	25.0	0.500	16.2	C	25.7	0.429	0.001	20.8	0.0	C	24.90	0.503	0.003	16.2	0.0
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	26.2	0.574	24.9	C-	32.2	0.555	25.4	C	26.2	0.575	0.001	24.9	0.0	C-	32.00	0.559	0.004	25.3	-0.1
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	A	8.3	0.618	9.5	B	13.3	0.464	19.2	A	8.2	0.620	0.002	9.5	0.0	B	13.20	0.471	0.007	19.0	-0.2
6	Mathilda Avenue/Maude Avenue	E	City	Signal	D	49.1	0.828	67.7	D-	55.0	0.800	57.1	D	49.1	0.828	0.000	67.7	0.0	E+	55.10	0.804	0.004	57.2	0.1
7	Mathilda Avenue/Indio Way	E	City	Signal	D+	38.7	0.771	39.2	C-	34.1	0.856	37.8	D+	38.6	0.774	0.003	39.3	0.1	C-	34.40	0.864	0.008	38.4	0.6
8	Mathilda Avenue/California Avenue	E	City	Signal	C	27.4	0.647	20.3	C-	34.7	0.840	34.8	C	27.3	0.650	0.003	20.3	0.0	D+	35.00	0.849	0.009	35.4	0.6
9	Mathilda Avenue/Washington Avenue	E	City	Signal	D+	38.3	0.827	40.2	D+	38.4	0.810	34.2	D+	38.1	0.830	0.003	40.3	0.1	D+	38.40	0.818	0.008	34.4	0.2
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B	15.0	0.668	14.9	B-	18.2	0.619	17.0	B	15.3	0.673	0.005	15.3	0.4	B-	18.30	0.630	0.011	17.3	0.3
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B	17.9	0.622	13.6	B-	18.3	0.533	11.8	B-	19.5	0.632	0.010	15.2	1.6	C+	22.60	0.589	0.056	17.1	5.3
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B	16.7	0.624	11.2	C+	20.4	0.587	15.3	B	16.9	0.633	0.009	11.5	0.3	C+	21.30	0.609	0.022	16.9	1.6
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	E+	57.1	0.796	59.4	E+	57.3	0.836	61.4	E+	57.7	0.806	0.010	60.2	0.8	E+	57.20	0.835	-0.001	61.1	-0.3
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.1	0.427	36.6	D	48.9	0.712	52.5	D	42.0	0.428	0.001	36.5	-0.1	D	48.80	0.714	0.002	52.5	0.0
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	26.8	0.583	26.1	C-	33.3	0.569	32.7	C	26.7	0.587	0.004	26.0	-0.1	C-	33.10	0.576	0.007	32.6	-0.1
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	D	46.3	0.848	42.6	D	49.3	0.790	51.1	D	46.3	0.853	0.005	42.7	0.1	D	49.30	0.797	0.007	51.2	0.1
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	D-	52.9	0.838	52.2	D-	53.5	0.806	52.4	D-	52.9	0.843	0.005	52.3	0.1	D-	53.60	0.813	0.007	52.5	0.1
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.6	0.333	13.9	B	14.2	0.411	14.6	B	13.6	0.333	0.000	13.9	0.0	B	14.20	0.411	0.000	14.6	0.0
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.1	0.280	9.2	B+	10.6	0.346	10.6	A	9.1	0.280	0.000	9.2	0.0	B+	10.60	0.346	0.000	10.6	0.0
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	B	10.9	0.372	10.9	B	12.5	0.434	12.5	B	10.9	0.374	0.002	10.9	0.0	B	12.70	0.440	0.006	12.7	0.2
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.2	0.524	38.7	D	42.3	0.628	43.0	D	42.4	0.525	0.001	39.0	0.3	D	42.60	0.630	0.002	43.2	0.2
22	Charles Street/W Iowa Avenue	D	City	SSSC	B	10.1	0.023	2.5	B	11.2	0.043	2.5	B	11.4	0.055	0.032	4.3	1.8	B	14.10	0.130	0.087	5.0	2.5
23	Mary Avenue/W Olive Avenue	D	City	SSSC	F	77.3	0.307	4.4	F	89.3	0.394	4.6	F	84.1	0.343	0.036	4.7	0.3	F	92.80	0.400	0.006	5.5	0.9
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D	50.1	0.732	50.3	D-	52.2	0.784	51.6	D	50.2	0.737	0.005	50.6	0.3	D-	52.80	0.794	0.010	52.4	0.8
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	B	12.7	0.600	10.8	B+	10.4	0.521	9.6	B	12.6	0.605	0.005	10.8	0.0	B+	10.40	0.528	0.007	9.5	-0.1
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C	26.4	0.671	23.0	C	25.7	0.612	25.4	C	26.3	0.675	0.004	23.0	0.0	C	25.60	0.618	0.006	25.3	-0.1
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	D	47.8	0.930	53.0	D	50.4	0.924	57.3	D	48.2	0.934	0.004	53.5	0.5	D	51.00	0.931	0.007	58.1	0.8

¹ The average control delay is reported for signalized and ASWC intersections. The delay for the worst movement is reported for SSSC intersections.

Note: Locations operating unacceptably are in **bold** and impacts are highlighted.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

This is a significant impact in the AM peak hour because the intersection operates at an unacceptable LOS F and the project increases the v/c by more than 0.01.

Existing Plus Background Plus Project – Option 2

Existing Plus Background Plus Project (Option 2) volumes were generated by adding the project trips to the Existing Plus Background volumes. **Table 9** shows the Existing Plus Background Plus Project LOS and delay for each of the study intersections. The LOS calculations are attached.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

This is a significant impact in the AM peak hour because the intersection operates at an unacceptable LOS F and the project increases the v/c by more than 0.01.

Table 9 – Existing Plus Background Plus Project (Option 2) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Background								Background + Project (Option 2)											
					AM Peak				PM Peak				AM Peak						PM Peak					
					LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	A	0.00	0.000	0	A	0.0	0.000	0.0	A	0.0	0.000	0.000	0.0	0.0	A	0.0	0.000	0.000	0.0	0.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	D+	37.0	0.515	38.8	C	23.5	0.484	12.3	D+	37.0	0.516	0.001	38.8	0.0	C	23.5	0.487	0.003	12.3	0.0
3	Mathilda Avenue/Ross Drive	E	City	Signal	C	25.7	0.428	20.8	C	25.0	0.500	16.2	C	25.7	0.429	0.001	20.8	0.0	C	24.9	0.503	0.003	16.2	0.0
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	26.2	0.574	24.9	C-	32.2	0.555	25.4	C	26.2	0.575	0.001	24.9	0.0	C-	32.0	0.559	0.004	25.3	-0.1
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	A	8.3	0.618	9.5	B	13.3	0.464	19.2	A	8.2	0.620	0.002	9.5	0.0	B	13.2	0.471	0.007	19.0	-0.2
6	Mathilda Avenue/Maude Avenue	E	City	Signal	D	49.1	0.828	67.7	D-	55.0	0.800	57.1	D	49.1	0.828	0.000	67.7	0.0	E+	55.1	0.804	0.004	57.2	0.1
7	Mathilda Avenue/Indio Way	E	City	Signal	D+	38.7	0.771	39.2	C-	34.1	0.856	37.8	D+	38.7	0.774	0.003	39.3	0.1	C-	34.5	0.864	0.008	38.5	0.7
8	Mathilda Avenue/California Avenue	E	City	Signal	C	27.4	0.647	20.3	C-	34.7	0.840	34.8	C	27.3	0.650	0.003	20.3	0.0	D+	35.0	0.849	0.009	35.4	0.6
9	Mathilda Avenue/Washington Avenue	E	City	Signal	D+	38.3	0.827	40.2	D+	38.4	0.810	34.2	D+	38.1	0.830	0.003	40.3	0.1	D+	38.4	0.818	0.008	34.4	0.2
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B	15.0	0.668	14.9	B-	18.2	0.619	17.0	B	15.2	0.673	0.005	15.2	0.3	B-	18.8	0.635	0.016	17.9	0.9
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B	17.9	0.622	13.6	B-	18.3	0.533	11.8	B-	19.0	0.632	0.010	15.2	1.6	C+	22.8	0.589	0.056	18.0	6.2
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B	16.7	0.624	11.2	C+	20.4	0.587	15.3	C+	20.8	0.660	0.036	14.3	3.1	C+	22.6	0.611	0.024	18.3	3.0
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	E+	57.1	0.796	59.4	E+	57.3	0.836	61.4	E+	58.7	0.835	0.039	62.2	2.8	E+	59.4	0.873	0.037	64.2	2.8
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.1	0.427	36.6	D	48.9	0.712	52.5	D	42.0	0.428	0.001	36.5	-0.1	D	48.8	0.714	0.002	52.5	0.0
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	26.8	0.583	26.1	C-	33.3	0.569	32.7	C	26.7	0.586	0.003	26.1	0.0	C-	33.1	0.574	0.005	32.6	-0.1
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	D	46.3	0.848	42.6	D	49.3	0.790	51.1	D	46.3	0.852	0.004	42.7	0.1	D	49.3	0.795	0.005	51.2	0.1
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	D-	52.9	0.838	52.2	D-	53.5	0.806	52.4	D-	52.9	0.842	0.004	52.3	0.1	D-	53.6	0.811	0.005	52.5	0.1
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.6	0.333	13.9	B	14.2	0.411	14.6	B	13.6	0.333	0.000	13.9	0.0	B	14.2	0.411	0.000	14.6	0.0
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.1	0.280	9.2	B+	10.6	0.346	10.6	A	9.6	0.281	0.001	9.9	0.7	B+	11.4	0.374	0.028	12.0	1.4
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	B	10.9	0.372	10.9	B	12.5	0.434	12.5	B	10.4	0.359	-0.013	10.4	-0.5	B	11.2	0.423	-0.011	11.2	-1.3
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.2	0.524	38.7	D	42.3	0.628	43.0	D	46.0	0.600	0.076	44.6	5.9	D	46.1	0.705	0.077	48.7	5.7
22	Charles Street/W Iowa Avenue	D	City	SSSC	B	10.1	0.023	2.5	B	11.2	0.043	2.5	B	10.7	0.033	0.010	2.9	0.4	B	12.7	0.059	0.016	2.8	0.3
23	Mary Avenue/W Olive Avenue	D	City	SSSC	F	77.3	0.307	4.4	F	89.3	0.394	4.6	F	84.1	0.343	0.036	4.7	0.3	F	92.8	0.400	0.006	5.5	0.9
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D	50.1	0.732	50.3	D-	52.2	0.784	51.6	D	50.2	0.737	0.005	50.6	0.3	D-	52.8	0.794	0.010	52.4	0.8
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	B	12.7	0.600	10.8	B+	10.4	0.521	9.6	B	12.6	0.604	0.004	10.8	0.0	B+	10.4	0.526	0.005	9.5	-0.1
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C	26.4	0.671	23.0	C	25.7	0.612	25.4	C	26.4	0.674	0.003	23.0	0.0	C	25.6	0.617	0.005	25.3	-0.1
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	D	47.8	0.930	53.0	D	50.4	0.924	57.3	D	48.1	0.933	0.003	53.4	0.4	D	50.8	0.929	0.005	57.9	0.6

¹ The average control delay is reported for signalized and ASWC intersections. The delay for the worst movement is reported for SSSC intersections.

Note: Locations operating unacceptably are in **bold** and impacts are highlighted.

CUMULATIVE (2025) CONDITIONS

To achieve Cumulative (2025) traffic conditions, traffic volumes from approved and pending projects were incorporated according to the information provided by the City (dated September 2017). In addition, a 1.5 percent annual growth rate was added to the existing volumes. **Table 10** shows the Cumulative (Future) LOS and delay for each of the study intersections. The LOS calculations are attached.

Table 10 – Cumulative (2025) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Cumulative (2025)							
					AM Peak				PM Peak			
					LOS	Delay (sec) ¹	w/c ratio	Crit. Delay	LOS	Delay (sec) ¹	w/c ratio	Crit. Delay
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	A	0.0	0.000	0.0	A	0.0	0.000	0.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	D+	38.4	0.575	40.3	C	24.7	0.546	13.6
3	Mathilda Avenue/Ross Drive	E	City	Signal	C	26.4	0.473	21.1	C	26.1	0.561	17.3
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	27.4	0.646	26.6	C-	33.1	0.618	26.4
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	B	13.9	0.734	16.7	C	23.3	0.628	31.7
6	Mathilda Avenue/Maude Avenue	E	City	Signal	E+	56.5	0.929	80.4	E	61.1	0.904	65.1
7	Mathilda Avenue/Indio Way	E	City	Signal	D	42.9	0.860	45.9	D	43.4	0.969	51.2
8	Mathilda Avenue/California Avenue	E	City	Signal	C	30.3	0.732	23.9	D	42.9	0.955	47.3
9	Mathilda Avenue/Washington Avenue	E	City	Signal	D	46.0	0.935	50.3	D	46.7	0.922	45.8
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B-	18.5	0.795	19.8	C+	21.0	0.713	20.4
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B-	19.3	0.705	15.6	B-	19.4	0.613	16.2
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B-	18.1	0.707	12.8	C+	21.3	0.663	16.5
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	E	62.3	0.894	66.3	E	64.9	0.949	73.3
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.0	0.467	35.6	D-	52.1	0.806	56.8
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	27.1	0.649	26.7	D+	35.4	0.645	35.0
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	E+	55.6	0.959	55.6	E+	55.9	0.893	58.7
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	E	60.1	0.944	63.2	E+	59.2	0.907	60.0
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.9	0.382	14.3	B	14.8	0.476	15.2
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.3	0.319	9.5	B+	10.8	0.404	10.9
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	B	12.1	0.451	12.1	B	14.4	0.526	14.4
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D	43.3	0.592	40.2	D	44.1	0.715	45.8
22	Charles Street/W Iowa Avenue	D	City	SSSC	B	10.4	0.027	2.4	B	11.7	0.051	2.6
23	Mary Avenue/W Olive Avenue	D	City	SSSC	F	206.6	0.574	10.1	F	274.7	0.711	13.8
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D-	53.4	0.828	55.0	E+	57.7	0.888	58.9
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	B	13.1	0.673	11.6	B+	10.8	0.585	10.1
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C	28.1	0.752	25.3	C	27.3	0.687	27.5
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	E	62.5	1.036	77.1	E	65.9	1.030	80.8

¹ The average control delay is reported for signalized and ASWC intersections. The delay for the worst movement is reported for SSSC intersections.
Note: Locations operating unacceptably are in **bold**.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

CUMULATIVE (2025) PLUS PROJECT CONDITIONS

Cumulative (2025) Plus Project – Option 1

Cumulative (2025) Plus Project (Option 1) volumes were generated by adding the project trips to the Cumulative (2025) volumes. **Table 11** shows the Cumulative (2025) Plus Project LOS and delay for each of the study intersections. The LOS calculations are attached.

Table 11 – Cumulative (2025) Plus Project (Option 1) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Cumulative (2025)								Cumulative (2025) + Project (Option 1)											
					AM Peak				PM Peak				AM Peak						PM Peak					
					LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	A	0.0	0.000	0.0	A	0.0	0.000	0.0	A	0.0	0.000	0.000	0.0	0.0	A	0.0	0.000	0.000	0.0	0.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	D+	38.4	0.575	40.3	C	24.7	0.546	13.6	D+	38.4	0.575	0.000	40.3	0.0	C	24.8	0.549	0.003	13.5	-0.1
3	Mathilda Avenue/Ross Drive	E	City	Signal	C	26.4	0.473	21.1	C	26.1	0.561	17.3	C	26.4	0.474	0.001	21.1	0.0	C	26.1	0.564	0.003	17.3	0.0
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	27.4	0.646	26.6	C-	33.1	0.618	26.4	C	27.4	0.648	0.002	26.6	0.0	C-	33.0	0.622	0.004	26.3	-0.1
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	B	13.9	0.734	16.7	C	23.3	0.628	31.7	B	13.8	0.736	0.002	16.7	0.0	C	23.1	0.636	0.008	31.5	-0.2
6	Mathilda Avenue/Maude Avenue	E	City	Signal	E+	56.5	0.929	80.4	E	61.1	0.904	65.1	E+	56.5	0.929	0.000	80.4	0.0	E	61.4	0.908	0.004	65.4	0.3
7	Mathilda Avenue/Indio Way	E	City	Signal	D	42.9	0.860	45.9	D	43.4	0.969	51.2	D	43.0	0.862	0.002	46.0	0.1	D	44.5	0.977	0.008	53.0	1.8
8	Mathilda Avenue/California Avenue	E	City	Signal	C	30.3	0.732	23.9	D	42.9	0.955	47.3	C	30.2	0.735	0.003	23.9	0.0	D	43.9	0.965	0.010	49.0	1.7
9	Mathilda Avenue/Washington Avenue	E	City	Signal	D	46.0	0.935	50.3	D	46.7	0.922	45.8	D	46.0	0.938	0.003	50.6	0.3	D	47.2	0.929	0.007	46.8	1.0
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B-	18.5	0.795	19.8	C+	21.0	0.713	20.4	B-	18.8	0.800	0.005	20.3	0.5	C+	21.2	0.723	0.010	20.9	0.5
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B-	19.3	0.705	15.6	B-	19.4	0.613	16.2	C+	20.9	0.715	0.010	17.2	1.6	C	23.3	0.659	0.046	18.3	2.1
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B-	18.1	0.707	12.8	C+	21.3	0.663	16.5	B-	18.1	0.713	0.006	12.7	-0.1	C+	22.5	0.688	0.025	18.7	2.2
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	E	62.3	0.894	66.3	E	64.9	0.949	73.3	E	63.3	0.904	0.010	67.7	1.4	E	64.7	0.949	0.000	73.0	-0.3
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.0	0.467	35.6	D-	52.1	0.806	56.8	D	42.0	0.468	0.001	35.5	-0.1	D-	52.1	0.808	0.002	56.8	0.0
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	27.1	0.649	26.7	D+	35.4	0.645	35.0	C	27.0	0.654	0.005	26.7	0.0	D+	35.3	0.651	0.006	35.0	0.0
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	E+	55.6	0.959	55.6	E+	55.9	0.893	58.7	E+	56.1	0.963	0.004	56.3	0.7	E+	56.1	0.899	0.006	59.1	0.4
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	E	60.1	0.944	63.2	E+	59.2	0.907	60.0	E	60.4	0.948	0.004	63.7	0.5	E+	59.5	0.913	0.006	60.5	0.5
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.9	0.382	14.3	B	14.8	0.476	15.2	B	13.9	0.382	0.000	14.3	0.0	B	14.8	0.476	0.000	15.2	0.0
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.3	0.319	9.5	B+	10.8	0.404	10.9	A	9.3	0.319	0.000	9.5	0.0	B+	10.8	0.404	0.000	10.9	0.0
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	B	12.1	0.451	12.1	B	14.4	0.526	14.4	B	12.1	0.453	0.002	12.1	0.0	B	14.6	0.532	0.006	14.6	0.2
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D	43.3	0.592	40.2	D	44.1	0.715	45.8	D	43.4	0.593	0.001	40.4	0.2	D	44.5	0.717	0.002	46.0	0.2
22	Charles Street/W Iowa Avenue	D	City	SSSC	B	10.4	0.027	2.4	B	11.7	0.051	2.6	B	11.7	0.058	0.031	4.2	1.8	C	15.0	0.136	0.085	5.0	2.4
23	Mary Avenue/W Olive Avenue	D	City	SSSC	F	206.6	0.574	10.1	F	274.7	0.711	13.8	F	230.0	0.635	0.061	11.1	1.0	F	389.0	0.829	0.118	18.7	4.9
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D-	53.4	0.828	55.0	E+	57.7	0.888	58.9	D-	53.6	0.831	0.003	55.3	0.3	E+	58.7	0.898	0.010	60.2	1.3
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	B	13.1	0.673	11.6	B+	10.8	0.585	10.1	B	13.1	0.677	0.004	11.6	0.0	B+	10.8	0.591	0.006	10.1	0.0
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C	28.1	0.752	25.3	C	27.3	0.687	27.5	C	28.1	0.756	0.004	25.3	0.0	C	27.2	0.694	0.007	27.4	-0.1
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	E	62.5	1.036	77.1	E	65.9	1.030	80.8	E	63.3	1.041	0.005	78.4	1.3	E	67.1	1.037	0.007	82.6	1.8

¹ The average control delay is reported for signalized and AWSC intersections. The delay for the worst movement is reported for SSSC intersections.

Note: Locations operating unacceptably are in **bold** and impacts are highlighted.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

This is a significant impact in the AM and PM peak hours because the intersection operates at an unacceptable LOS F and the project increases the v/c by more than 0.01.

Cumulative (2025) Plus Project – Option 2

Cumulative (2025) Plus Project (Option 2) volumes were generated by adding the project trips to the Cumulative (2025) volumes. **Table 12** shows the Cumulative (2025) Plus Project LOS and delay for each of the study intersections. The LOS calculations are attached.

All study intersections meet the acceptable LOS requirements during the AM and PM peak hours except for:

- Int #23 – Mary Avenue/W Olive Avenue (AM and PM peak hours)

This is a significant impact in the AM and PM peak hours because the intersection operates at an unacceptable LOS F and the project increases the v/c by more than 0.01.

Table 12 – Cumulative (2025) Plus Project (Option 2) LOS Summary

#	Intersection	LOS Criteria	Jurisdiction	Control	Cumulative (2025)								Cumulative (2025) + Project (Option 2)											
					AM Peak				PM Peak				AM Peak						PM Peak					
					LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Crit. Delay	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var	LOS	Delay (sec) ¹	v/c ratio	Var	Critical Delay (sec)	Var
1	Mathilda Avenue/WB SR-237 Ramps	E	City	Signal	A	0.0	0.000	0.0	A	0.0	0.000	0.0	A	0.0	0.000	0.000	0.0	0.0	A	0.0	0.000	0.000	0.0	0.0
2	Mathilda Avenue/EB SR-237 Ramps	E	City	Signal	D+	38.4	0.575	40.3	C	24.7	0.546	13.6	D+	38.4	0.575	0.000	40.3	0.0	C	24.8	0.549	0.003	13.5	-0.1
3	Mathilda Avenue/Ross Drive	E	City	Signal	C	26.4	0.473	21.1	C	26.1	0.561	17.3	C	26.4	0.474	0.001	21.1	0.0	C	26.1	0.564	0.003	17.3	0.0
4	Mathilda Avenue/Ahwanee Avenue	E	City	Signal	C	27.4	0.646	26.6	C-	33.1	0.618	26.4	C	27.4	0.648	0.002	26.6	0.0	C-	33.0	0.622	0.004	26.3	-0.1
5	Mathilda Avenue/San Aleso Avenue	E	City	Signal	B	13.9	0.734	16.7	C	23.3	0.628	31.7	B	13.8	0.736	0.002	16.7	0.0	C	23.1	0.636	0.008	31.5	-0.2
6	Mathilda Avenue/Maude Avenue	E	City	Signal	E+	56.5	0.929	80.4	E	61.1	0.904	65.1	E+	56.5	0.929	0.000	80.4	0.0	E	61.4	0.908	0.004	65.4	0.3
7	Mathilda Avenue/Indio Way	E	City	Signal	D	42.9	0.860	45.9	D	43.4	0.969	51.2	D	43.0	0.862	0.002	46.0	0.1	D	44.6	0.977	0.008	53.1	1.9
8	Mathilda Avenue/California Avenue	E	City	Signal	C	30.3	0.732	23.9	D	42.9	0.955	47.3	C	30.2	0.735	0.003	23.9	0.0	D	43.9	0.965	0.010	49.0	1.7
9	Mathilda Avenue/Washington Avenue	E	City	Signal	D	46.0	0.935	50.3	D	46.7	0.922	45.8	D	46.0	0.938	0.003	50.6	0.3	D	47.2	0.929	0.007	46.8	1.0
10	Mathilda Avenue/McKinley Avenue	E	City	Signal	B-	18.5	0.795	19.8	C+	21.0	0.713	20.4	B-	18.7	0.799	0.004	20.2	0.4	C+	21.7	0.728	0.015	21.5	1.1
11	Mathilda Avenue/Iowa Avenue	E	City	Signal	B-	19.3	0.705	15.6	B-	19.4	0.613	16.2	C+	20.5	0.715	0.010	17.2	1.6	C	23.5	0.660	0.047	19.2	3.0
12	Mathilda Avenue/Olive Avenue	E	City	Signal	B-	18.1	0.707	12.8	C+	21.3	0.663	16.5	C+	22.1	0.745	0.038	16.1	3.3	C	25.2	0.705	0.042	22.0	5.5
13	Mathilda Avenue/El Camino Real	E	City / Caltrans	Signal	E	62.3	0.894	66.3	E	64.9	0.949	73.3	E	66.1	0.939	0.045	72.5	6.2	E	72.2	0.999	0.050	84.9	11.6
14	Sunnyvale Avenue/El Camino Real	E	City / Caltrans	Signal	D	42.0	0.467	35.6	D-	52.1	0.806	56.8	D	42.0	0.468	0.001	35.5	-0.1	D-	52.1	0.808	0.002	56.8	0.0
15	Mathilda Avenue/Sunnyvale-Saratoga Road-Talisman Drive	E	City / Caltrans	Signal	C	27.1	0.649	26.7	D+	35.4	0.645	35.0	C	27.0	0.653	0.004	26.7	0.0	D+	35.3	0.650	0.005	35.0	0.0
16	Sunnyvale-Saratoga Road/Remington Drive	E	City	Signal	E+	55.6	0.959	55.6	E+	55.9	0.893	58.7	E+	56.0	0.962	0.003	56.1	0.5	E+	56.1	0.898	0.005	59.0	0.3
17	Sunnyvale-Saratoga Road/Fremont Avenue	E	City	Signal	E	60.1	0.944	63.2	E+	59.2	0.907	60.0	E	60.3	0.947	0.003	63.6	0.4	E+	59.4	0.912	0.005	60.4	0.4
18	S Pastoria Avenue/W Washington Avenue	D	City	Signal	B	13.9	0.382	14.3	B	14.8	0.476	15.2	B	13.9	0.382	0.000	14.3	0.0	B	14.8	0.476	0.000	15.2	0.0
19	S Pastoria Avenue/W Iowa Avenue	D	City	Signal	A	9.3	0.319	9.5	B+	10.8	0.404	10.9	A	9.7	0.320	0.001	10.1	0.6	B+	11.6	0.430	0.026	12.1	1.2
20	S Pastoria Avenue/W Olive Avenue	D	City	ASWC	B	12.1	0.451	12.1	B	14.4	0.526	14.4	B	11.3	0.421	-0.030	11.3	-0.8	B	12.4	0.492	-0.034	12.4	-2.0
21	Hollenbeck Avenue/El Camino Real	E	City / Caltrans	Signal	D	43.3	0.592	40.2	D	44.1	0.715	45.8	D	47.6	0.671	0.079	46.9	6.7	D	46.2	0.747	0.032	48.1	2.3
22	Charles Street/W Iowa Avenue	D	City	SSSC	B	10.4	0.027	2.4	B	11.7	0.051	2.6	B	11.1	0.038	0.011	2.8	0.4	B	13.4	0.067	0.016	2.9	0.3
23	Mary Avenue/W Olive Avenue	D	City	SSSC	F	206.6	0.574	10.1	F	274.7	0.711	13.8	F	230.0	0.635	0.061	11.1	1.0	F	389.0	0.829	0.118	18.7	4.9
24	Mary Avenue/El Camino Real	E	City / Caltrans	Signal	D-	53.4	0.828	55.0	E+	57.7	0.888	58.9	D-	53.6	0.831	0.003	55.3	0.3	E+	58.7	0.898	0.010	60.2	1.3
25	Sunnyvale-Saratoga Road/Cheyenne Drive-Connemara Way	E	City	Signal	B	13.1	0.673	11.6	B+	10.8	0.585	10.1	B	13.1	0.676	0.003	11.6	0.0	B+	10.8	0.590	0.005	10.1	0.0
26	Sunnyvale-Saratoga Road/Alberta Avenue-Harwick Way	E	City	Signal	C	28.1	0.752	25.3	C	27.3	0.687	27.5	C	28.1	0.755	0.003	25.3	0.0	C	27.2	0.692	0.005	27.4	-0.1
27	Sunnyvale-Saratoga Road-De Anza Boulevard/Homestead Road	E	City	Signal	E	62.5	1.036	77.1	E	65.9	1.030	80.8	E	63.1	1.040	0.004	78.1	1.0	E	66.8	1.035	0.005	82.2	1.4

¹ The average control delay is reported for signalized and AWSC intersections. The delay for the worst movement is reported for SSSC intersections.

Note: Locations operating unacceptably are in **bold** and impacts are highlighted.

SUPPLEMENTAL SYNCHRO QUEUING EVALUATION

A Synchro evaluation for the intersections and driveways adjacent to the proposed Civic Center was conducted. This evaluation includes the intersections of Mathilda Avenue/Olive Avenue, Mathilda Avenue/El Camino Real, and Mathilda Avenue/Pastoria Avenue. The Synchro evaluation is better suited than Traffix to analyze closely spaced intersections and their interactions.

Southbound Queues at Mathilda Avenue/El Camino Real

There is particular interest along Mathilda Avenue in Option #2 as many motorists will be exiting the mid-block driveway (All America Way) along Mathilda Avenue, just north of El Camino Real, and making a southbound U-turn movement to head northbound on Mathilda Avenue (due to the raised median on Mathilda Avenue). It should be noted that the LOS results for the Synchro model were checked against the Traffix model and they have similar results, but are not exactly the same. Since Synchro accounts for the distance between adjacent intersections and has more detailed input parameters for signal timing, the results will vary.

Table 13 shows the expected queues for the southbound approach at the intersection of Mathilda Avenue/El Camino Real.

Table 13 – Synchro Queuing Summary

#	Intersection	Scenario	Movement					
			SBL Queue (feet)		SBT Queue (feet)		SBR Queue (feet)	
			AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
13	Mathilda Avenue/ El Camino Real	Storage Length	435		855		315	
		Existing Plus Project Option #1	174	492	139	841	209	160
		Existing Plus Project Option #2	156	395	133	792	203	199
		Existing Plus Background Plus Project Option #1	207	504	153	881	168	124
		Existing Plus Background Plus Project Option #2	189	400	152	859	189	174
		Cumulative Plus Project Option #1	231	490	167	919	188	119
		Cumulative Plus Project Option #2	213	380	167	855	210	175

Note: The distance from the intersection of El Camino Real/Mathilda Avenue to All America Way is 315 feet.

Queue lengths shown in bold represent queues that exceed the available storage.

The queues for the southbound approach show that it would be difficult for vehicles to exit the All America Way driveway and move over to the southbound left turn lane. The 95th percentile southbound left turn queue at Mathilda Avenue/El Camino Real exceeds the 315-foot distance between All America Way and El Camino Real for all project scenarios in the PM peak hour. In addition, the 95th percentile southbound through queue at Mathilda Avenue/El Camino Real extends at least 792 feet back from El Camino Real, which would block vehicles exiting the All America Way driveway from getting into the southbound left turn lanes. Therefore, it is recommended that the layout be adjusted to allow for outbound trips to go northbound on Mathilda Avenue.

In addition, a SimTraffic analysis was completed to confirm these conclusions regarding the southbound queues at the intersection of El Camino Real/Mathilda Avenue. The SimTraffic analysis showed that the 95th percentile southbound left turn queues will be 300 feet, the southbound through queues will be 343 feet, and the southbound right turn queues will be 321 feet for the Existing Plus Project Option #2 PM peak hour. Since these queues would exceed the 315 feet between All America Way and El Camino Real, vehicles would not be able to exit the All America Way driveway and enter into the southbound left turn lane at Mathilda Avenue/El Camino Real. Since this scenario should have less volumes than the Existing Plus Background and Cumulative volumes, it is assumed that these same issues would occur in those scenarios.

Westbound Queues at Pastoria Avenue/El Camino Real

There is also interest along El Camino Real in Option #2 as motorists can exit the mid-block driveway along Mathilda Avenue, just east of the proposed southwest parking garage, and making a westbound U-turn movement to head eastbound on El Camino Real (due to the raised median on El Camino Real).

Table 14 shows the expected queues for the westbound approach at the intersection of Pastoria Avenue/El Camino Real.

Table 14 – Synchro Queuing Summary

#	Intersection	Scenario	Movement			
			WBL Queue (feet)		WBT Queue (feet)	
			AM Peak	PM Peak	AM Peak	PM Peak
21	Pastoria Avenue/ El Camino Real	Storage Length	290 and 335		1,045	
		Existing Plus Project Option #1	106	272	526	375
		Existing Plus Project Option #2	106	272	543	400
		Existing Plus Background Plus Project Option #1	108	274	552	391
		Existing Plus Background Plus Project Option #2	108	274	677	495
		Cumulative Plus Project Option #1	119	324	707	460
		Cumulative Plus Project Option #2	119	324	826	598

Note: The distance from the intersection of El Camino Real/Pastoria Avenue to the mid-block driveway is 350 feet.

Queue lengths shown in bold represent queues that exceed the available storage.

The queues for the westbound approach show that it would be difficult for vehicles to exit the mid-block driveway and move over to the westbound left turn lane. The 95th percentile westbound left turn queue at Pastoria Avenue/El Camino Real essentially uses the entire 290-foot and 335-foot left turn lane storage pockets in the PM peak hour for all scenarios. In addition, the 95th percentile westbound through queue at Pastoria Avenue/El Camino Real extends at least 375 feet back from Pastoria Avenue, which would block vehicles exiting the mid-block driveway from getting into the westbound left turn lanes. Therefore, vehicles exiting this parking garage should be encouraged to use the driveway on Pastoria Avenue to go eastbound on El Camino Real.

In addition, a SimTraffic analysis was completed to confirm these conclusions regarding the southbound queues at the intersection of El Camino Real/Pastoria Avenue. The SimTraffic analysis showed that the 95th percentile westbound left turn queues will be 224 feet and the westbound through queues will be 267 feet for the Existing Plus Project Option #2 PM peak hour. Although these queues are less than the 350 feet between the mid-block driveway and Pastoria Avenue/El Camino Real, it would still be very difficult for vehicles to cross the three westbound through lanes from the mid-block driveway and enter into the westbound left turn lane at Pastoria Avenue/El Camino Real that has a 224-foot queue. Since this scenario should have less volumes than the Existing Plus Background and Cumulative volumes, it is assumed that these same issues would occur in those scenarios.

SITE CIRCULATION AND ACCESS

The site circulation and access was reviewed for each of the two options. For Option #1, the key difference is that Olive Avenue would remain unchanged from the existing conditions. This is beneficial to the site access and circulation because it allows for vehicles to enter and exit the project site from the signalized intersection of W Olive Avenue/Mathilda Avenue. Since a high proportion of project trips will be going to or coming from Mathilda Avenue to the north, a signal control is needed to make the left turn onto northbound Mathilda Avenue. The intersection of W Olive Avenue/Mathilda Avenue also provides sufficient time for vehicles that are destined for eastbound El Camino Real in the PM peak hour. As shown in the Synchro and SimTraffic analysis, it is difficult for vehicles to get to the southbound left turn lane at the intersection of Mathilda Avenue/El Camino Real from just the mid-block driveway at All America Way.

For Option #2, the major difference is the removal of Olive Avenue between Pastoria Avenue and Charles Street. This change from the existing conditions has made it difficult for vehicles exiting the project site to go northbound on Mathilda Avenue and eastbound on El Camino Real in the PM peak hour. Since the proposed layout for Option #2 restricts access to the intersection of W Olive Avenue/Mathilda Avenue, vehicles have to exit at mid-block driveways and make U-turns to get to their final destinations. Below is a list that summarizes the key circulation issues:

- 1) Vehicles cannot exit the mid-block driveway at All America Way and go northbound on Mathilda Avenue or eastbound on El Camino Real. In addition to the long queues, the high speeds and high volumes make it difficult for vehicles to find an acceptable gap to cross three lanes to enter into the left turn lane.
- 2) Vehicles cannot exit the mid-block driveway on El Camino Real (near the southwest parking garage) and go eastbound on El Camino Real or to Mathilda Avenue. In addition to the long queues, the high speeds and high volumes make it difficult for vehicles to find an acceptable gap to cross three lanes to enter into the left turn lane.
- 3) The driveway on Pastoria Avenue between the Library and the southwest parking garage is offset from the intersection of Pastoria Avenue/W Olive Avenue. This may result in sight distance issues for the driveway. There also exists a raised median on Pastoria Avenue just south of W Olive Avenue that would prevent vehicles from accessing this driveway.
- 4) Access to the parking garage underneath City Hall is provided at the intersection of W Olive Avenue/Charles Street. This access is beneficial because it allows access to Mathilda Avenue at the signalized intersection of Mathilda Avenue/W Olive Avenue.

SUMMARY OF IMPACTS AND MITIGATIONS

The proposed project is expected to generate significant impacts at the study intersections in multiple scenarios. **Table 14** summarizes the significant impacts.

Table 14 – Impact Summary

#	Intersection	Scenario
#23	Mary Avenue / W Olive Avenue	Existing Plus Project Option #1 - AM Peak
		Existing Plus Project Option #2 - AM Peak
		Existing Plus Background Plus Project Option #1 - AM Peak
		Existing Plus Background Plus Project Option #2 - AM Peak
		Cumulative Plus Project Option #1 - AM and PM Peaks
		Cumulative Plus Project Option #1 - AM and PM Peaks

The intersection of Mary Avenue/W Olive Avenue is significantly impacted in each project scenario for the AM peak hour and impacted in the Cumulative Plus Project Options #1 and #2 for the PM peak hour. The intersection does not meet the signal warrant for any scenario. The main issue for this intersection is that the eastbound and westbound approaches are one lane and there are vehicles that want to make a left turn or through movement across Mary Avenue. Mary Avenue has a high volume going northbound and southbound, making it difficult for drivers to find an acceptable gap. Therefore, the recommended mitigation is to restrict left turns and through movements during the peak hours. This significantly reduces the side-street delay to an acceptable LOS C in the Cumulative Plus Project condition in the PM peak hour (i.e. the most congested scenario). It should be noted that motorists can use the adjacent signalized intersections of Mary Avenue/El Camino Real and Mary Avenue/W Iowa Avenue to make the needed left turn movements.

CONCLUSIONS

The preliminary results of the traffic evaluation demonstrated that the proposed project would result in significant impacts at the intersection of Mary Avenue/W Olive Avenue. This can be mitigated by restricting the westbound and eastbound approaches on Olive Ave to be right turns only during the AM and PM peak periods.

The preliminary Synchro analysis showed that the southbound queues at the intersection of El Camino Real/Mathilda Avenue would block vehicles exiting the All America Way driveway from entering the southbound left turn lane at El Camino Real/Mathilda Avenue. This would then restrict vehicles from going northbound on Mathilda Avenue since Olive Avenue is partially closed.

The preliminary Synchro analysis also showed that the westbound queues at the intersection of El Camino Real/Pastoria Avenue would block vehicles exiting the mid-block driveway from entering the westbound left turn lane at El Camino Real/Pastoria Avenue.

The key site circulation and access issues for Option #2 are:

- 1) Vehicles cannot exit the mid-block driveway at All America Way and go northbound on Mathilda Avenue or eastbound on El Camino Real. In addition to the long queues, the high speeds and high volumes make it difficult for vehicles to find an acceptable gap to cross three lanes to enter into the left turn lane.
- 2) Vehicles cannot exit the mid-block driveway on El Camino Real (near the southwest parking garage) and go eastbound on El Camino Real or to Mathilda Avenue. In addition to the long queues, the high speeds and high volumes make it difficult for vehicles to find an acceptable gap to cross three lanes to enter into the left turn lane.
- 3) The driveway on Pastoria Avenue between the Library and the southwest parking garage is offset from the intersection of Pastoria Avenue/W Olive Avenue. This may result in sight distance issues for the driveway. There also exists a raised median on Pastoria Avenue just south of W Olive Avenue that would prevent vehicles from accessing this driveway.
- 4) Access to the parking garage underneath City Hall is provided at the intersection of W Olive Avenue/Charles Street. This access is beneficial because it allows access to Mathilda Avenue at the signalized intersection of Mathilda Avenue/W Olive Avenue.

Sincerely,



Ben Huie, P.E.
California Professional Engineer #C76682

Attachments:
LOS Outputs