Appendix F
Trip Generation & Operations Analysis

Hexagon Transportation Consultants, Inc.

Memorandum

To: Caroline Weston, David J. Powers, Inc.

From: Robert Del Rio, T.E.
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Date: September 4, 2018

Subject: Shoe Palace Distribution Facility Trip Generation and Operations Analysis

Hexagon Transportation Consultants, Inc. has completed a trip generation and operations analysis for the proposed expansion of the existing Shoe Palace Corporation office and distribution facility in Morgan Hill, California. The existing Shoe Palace facility, located at 755 Jarvis Drive, consists of a 258,122-square-foot (s.f.) building that includes warehouse, distribution, and office space within a 30.16-acre site.

The project as proposed consists of the construction of a 503,400-s.f. building consisting of warehouse, distribution, and office space on the property adjacent and behind the existing facility building, which includes part of the 30.16-acre site and a 7.9-acre site. Adjustment of the property line for the two parcels also is being proposed, resulting in the existing facility being located within one parcel and the new facility within the second adjusted parcel. The proposed facility expansion will result in operations similar to the existing operations.

The project site location and the surrounding study area are shown on Figure 1. The project site plan is shown on Figure 2

Scope of Study

The purpose of the trip generation and operations analysis is to evaluate the magnitude of traffic that would be added to the roadway system due to the proposed project and to determine whether a comprehensive traffic study is required for the proposed project. The analysis consists of an evaluation of trip generation and peak-hour intersection level of service analysis at intersections in the immediate vicinity of the project site, at which the project is projected to add more than 10 trips per lane. In addition, per CMP guidelines, an evaluation to document that the proposed project would not add traffic equal to at least one percent of capacity of any freeway segments area was completed. Traffic conditions were evaluated for the following scenarios:

Existing Conditions. Existing conditions were represented by existing peak-hour traffic volumes on the existing roadway network. Existing traffic volumes were obtained from peak-hour turning-movement counts conducted in May 2018.

Existing Plus Project Conditions. Existing plus project peak-hour traffic volumes were estimated by adding to the existing traffic volumes the additional traffic that would be generated by the proposed project. Existing plus project conditions were evaluated relative to existing conditions in order to determine the effects of the proposed project on existing traffic conditions.

Year 2025 Cumulative Conditions. Year 2025 Cumulative conditions represent future traffic volumes on the future transportation network. Year 2025 Cumulative conditions include traffic growth projected to occur in the Year 2025 without the proposed project.

Year 2025 Cumulative with Project Conditions. Year 2025 Cumulative with project consists of Year 2025 Cumulative traffic conditions with the addition of project traffic.

Project Trip Generation Estimates

The magnitude of traffic produced by a new development is typically estimated by applying the size of the project to the applicable trip generation rates contained in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*. However, trip rates based on driveway counts collected at the existing buildings were used in this analysis since the proposed project consists of the expansion of the existing facility and will include the same type of operations as are currently occurring on-site. Additionally, trip rates based on driveway counts at the project site are also more reflective of the expected mode of travel of employees and trucks associated with the proposed expanded facility. Therefore, the trip generation of the proposed project was estimated utilizing trip generation rates developed based on driveway counts completed at the existing project site in July 2018.

Since truck trips estimated to be generated by the project are minimal and comprise of only 8 trips or 4% of the total traffic during each of the peak, it was assumed in the analysis that truck trips would have the same characteristics as passenger vehicle trips.

Based on the rates from the driveway counts, it is estimated that the proposed project will generate 205 trips (164 inbound and 41 outbound) during the AM peak hour and 195 trips (18 inbound and 177 outbound) during the PM peak hour. The trip generation estimates for proposed project are presented in Table 1.

The above project trips were assigned to the roadway network based on traffic patterns in the study area and on the locations of complementary land uses. Figures 1 and 3 shows the project trip distribution and the assignment of project trips at the study intersections, respectively.

Year 2025 Project Trip Generation Estimates

Peak hour project trips associated with the adopted General Plan land uses for the project site are included within the 2035 General Plan forecasts and the developed Year 2025 Cumulative traffic volumes. However, the land uses assumed for the project site as part of the General Plan are general in nature (73,000 s.f. of industrial space and 8,000 s.f. of office space). The proposed project now provides for a site specific development plan with defined land use types. Therefore, the development of Year 2025 with Project Cumulative traffic volumes involved adjusting the Year 2025 cumulative traffic volumes to reflect the proposed development plan.

Hexagon prepared trip estimates for the project site land uses included in the City's traffic model and the proposed development plan. The land uses of the proposed development plan are of greater intensity than those assumed in the General Plan. When compared with the land uses included in the City's current General Plan, the proposed development plan would result in an additional 161 AM peak hour trips and 156 PM peak hour trips at the project site. The net new project trip generation under Year 2035 General Plan conditions are presented in Table 2.

Intersection Level of Service Analysis

Traffic conditions at the study intersections were analyzed for the weekday AM and PM peak hours of traffic. The weekday AM peak hour of traffic generally falls within the 7:00 to 9:00 AM period and the weekday PM peak hour is typically in the 4:00 to 6:00 PM period. It is during these times that the most congested traffic conditions occur on a typical weekday.

Signalized Intersection Analysis

The City of Morgan Hill level of service methodology is TRAFFIX, which is based on the 2000 *Highway Capacity Manual* (HCM) method for signalized intersections. TRAFFIX evaluates signalized intersections operations based on average delay time for all vehicles at the intersection. Since TRAFFIX is also the CMP-designated intersections level of service methodology, the City of Morgan Hill methodology employs the CMP defaults values for the analysis parameters, which include adjusted saturation flow rates to reflect conditions in Santa Clara County. All intersections within the City of Morgan Hill are required to meet the City's LOS standard of LOS D, with the exception of the following:

- **LOS F** for Downtown intersections and segments including at Main/Monterey, along Monterey Road between Main and Fifth Street, and along Depot Street at First through Fifth Street;

- **LOS E** for the following intersections and freeway zones:
  - Main Avenue and Del Monte Avenue
  - Main Avenue and Depot Street
  - Dunne Avenue and Del Monte Avenue
  - Dunne Avenue and Monterey Avenue
  - Dunne Avenue and Church Street
  - Dunne Avenue and Depot Street
  - Cochrane Road and Monterey Road
  - Tennant Avenue and Monterey Road
  - Tennant Avenue and Butterfield Boulevard
  - Cochrane Road Freeway Zone: from Madrone Parkway/Cochrane Plaza to Cochrane Road/DePaul Drive
  - Dunne Avenue Freeway Zone: from Walnut Grove Drive/East Dunne Avenue to Condit Road/East Dunne Avenue
  - Tennant Avenue Freeway Zone: from Butterfield Boulevard/Tennant Avenue to Condit Road/Tennant Avenue

According to the City of Morgan Hill level of service guidelines, a development is said to create a significant adverse impact on traffic conditions at a signalized intersection if for either peak hour:

1. The level of service at the intersection degrades from an acceptable level (LOS D or LOS E as identified above) under existing conditions to an unacceptable level (LOS E or F) under project conditions, <u>or</u>

2. The level of service at the intersection is an unacceptable level (LOS E or F as identified above) under existing conditions and the addition of project trips causes the average critical delay to increase by four (4) or more seconds *and* the volume-to-capacity ratio (V/C) to increase by 0.01.

An exception to this rule applies when the addition of project traffic reduces the amount of average delay for critical movements (i.e., the change in average delay for critical movements is negative). In this case, the threshold of significance is an increase in the critical V/C value by 0.01 or more.

Unsignalized Intersection Analysis

The methodology used to determine the level of service for unsignalized intersections is also TRAFFIX and the *2000 HCM* methodology for unsignalized intersection analysis. This method is applicable for both two-way and all-way stop-controlled intersections. For the analysis of stop-controlled intersections, the *2000 HCM* methodology evaluates intersection operations on the basis of average control delay time for all vehicles on the stop-controlled approaches. For the purpose of reporting level of service for one- and two- way stop-controlled intersections, the delay and corresponding level of service for the stop-controlled minor street approach with the highest delay is reported. For all-way stop-controlled intersections, the reported average delay and corresponding level of service is the average for all approaches at the intersection. The City uses a minimum acceptable level of service standard of LOS D for unsignalized intersections, in accordance with its adopted threshold of significance in its Guidelines for Preparation of Transportation Impact Reports.

Signal Warrants

The level of service analysis at unsignalized intersections is supplemented with an assessment of the need for signalization of the intersection. The need for signalization of unsignalized intersections is assessed based on the Peak Hour Volume Warrant (Warrant 3) described in the *California Manual on Uniform Traffic Control Devices for Streets and Highways (CA MUTCD)*, Part 4, Highway Traffic Signals, 2010. This method makes no evaluation of intersection level of service, but simply provides an indication whether vehicular peak hour traffic volumes are, or would be, sufficient to justify installation of a traffic signal. The decision to install a traffic signal should not be based purely on the warrants alone. Instead, the installation of a signal should be considered and further analysis performed when one or more of the warrants are met. Additionally, engineering judgment is exercised on a case-by-case basis to evaluate the effect a traffic signal will have on certain types of accidents and traffic conditions at the subject intersection as well as at adjacent intersections. Intersections that meet the peak hour warrant are subject to further analysis before determining that a traffic signal is necessary. Other options such as traffic control devices, signage, or geometric changes may be preferable based on existing field conditions.

Definition of Significant Unsignalized Intersection Impacts

Unsignalized intersections within the City of Morgan Hill have a minimum operating level of LOS D. According to the City of Morgan Hill level of service guidelines, a development is said to have a significant adverse impact on traffic conditions at an unsignalized intersection if for either peak hour the addition of project traffic causes the worst approach delay to degrade to LOS E or F ***and*** the traffic volumes at the intersection are sufficiently high to satisfy the peak hour volume warrant.

Level of Service Results

The results of intersection level of service analysis under Year 2025 Cumulative conditions show that the unsignalized study intersection of Sutter Boulevard and Cochrane Plaza which is projected to operate at an acceptable LOS D under Year 2025 Cumulative conditions would degrade to unacceptable LOS E with the addition of traffic from the proposed project during the PM peak hour.

However, peak-hour traffic signal warrant checks indicate that the Sutter Boulevard and Cochrane Plaza intersection would not have traffic volumes under Year 2025 Cumulative without and with project conditions that meet thresholds that warrant signalization. Therefore, based on the City's impact criteria, the proposed project would not result in a cumulatively significant impact at the Sutter Boulevard and Cochrane Plaza intersection.

The results of the intersection level of service analysis also show that the remaining study intersections currently operate at an acceptable LOS D or better and the addition of project traffic

would not result in the degradation of the study intersections' level of service to unacceptable levels during the AM and PM peak hours (See Table 3). Therefore, the project would not have a significant impact at the remaining study intersections.

Freeway Segment Capacity Evaluation

Per CMP technical guidelines, freeway segment level of service analysis shall be conducted on all segments to which the project is projected to add one percent or more to the segment capacity. Since the project is not projected to add one percent to any freeway segments in the area, freeway analysis for the CMP was not required. The percentage of traffic projected to be added by the project to freeway segments in the project area is summarized in Table 4.

Transit, Pedestrian and Bicycle Analysis

The project site is not directly served by any transit services. However, three VTA bus routes run along Cochrane Road with bus stops near the intersection of Sutter Boulevard and Cochrane Road, which is approximately ½ mile away from the project site. A typical mode split in Morgan Hill would be a three percent transit share. Assuming up to three percent transit mode share for the project equates to no more than six transit riders during each of the peak hours. The transit ridership demands of the proposed project can be accommodated by the existing transit facilities.

Jarvis Drive and Serene Drive do not have sidewalks in the vicinity of the project site. However, California vehicle codes allow pedestrians to walk on-street on the left-hand side of the roadway along edge of traveled way facing on-coming traffic when there is no sidewalk available. Jarvis Drive and Serene Drive have low traffic volumes, but pedestrians must be extremely cautious when walking on-street. These two roadways would provide a connection for pedestrians between the project site and other surrounding land uses in the area.

There are several bike lanes and bike paths in the vicinity of the project site. Bike lanes also are provided along the entire lengths of Cochrane Road, Butterfield Boulevard, and Sutter Boulevard. It is expected that bicycle trips would comprise no more than one percent of the total project-generated trips. Thus, the project could potentially generate no more than two new bicycle trips during each of the peak hours. The demand generated by the proposed project could be accommodated by the existing bicycle facilities in the vicinity of the project site.

Traffic Study Requirements

The need for the preparation of a comprehensive traffic impact analysis for a particular development is based on its estimated trip generation and its effect on surrounding transportation facilities. The City of Morgan Hill requires the completion of a full traffic impact analysis if one of the following criteria are met:

1. Generates 100 or more net new peak hour trips; except that projects located in the 14-block Downtown Core area are exempt from this requirement. Net new peak hour trips are defined as the number of trips generated by the proposed development minus trips generated by existing development on the project site. (This threshold is consistent with the Valley Transportation Authority (VTA) policy.)

2. Adds 50 to 99 net new peak hour trips to the roadway system where nearby intersections are currently operating at or below the City's LOS standard, or projected to operate at or below the City's LOS standard with traffic added by approved developments; except that projects located

in the 14-block Downtown Core area are exempt from this requirement. Adjacent or nearby intersections are defined as intersections to which the proposed development or proposed land use change adds 10 or more vehicle peak hour trips per lane.

3. Creates a transportation issue that City staff requests to have analyzed.

The proposed project will result in the addition of 205 AM peak hour trips and 195 PM peak hour trips to the roadway system under existing plus project conditions.

However, a review of intersection levels of service at the selected study intersections indicates that all study intersections are currently operating at acceptable conditions during each of the peak hours. The addition of project traffic at each of the study intersections would not result in a significant impact based on the City's impact criteria. Additionally, the freeway segment analysis indicates that the project is not projected to add one percent to any freeway segments in the area.

Therefore, the evaluation of trip generation and intersection operations concludes that the proposed project will not result in significant impacts to intersections or freeway segments in the project area. However, City staff ultimately determines the need for traffic studies for new development.

Figure 1
Site Location, Study Intersections, and Project Trip Distribution

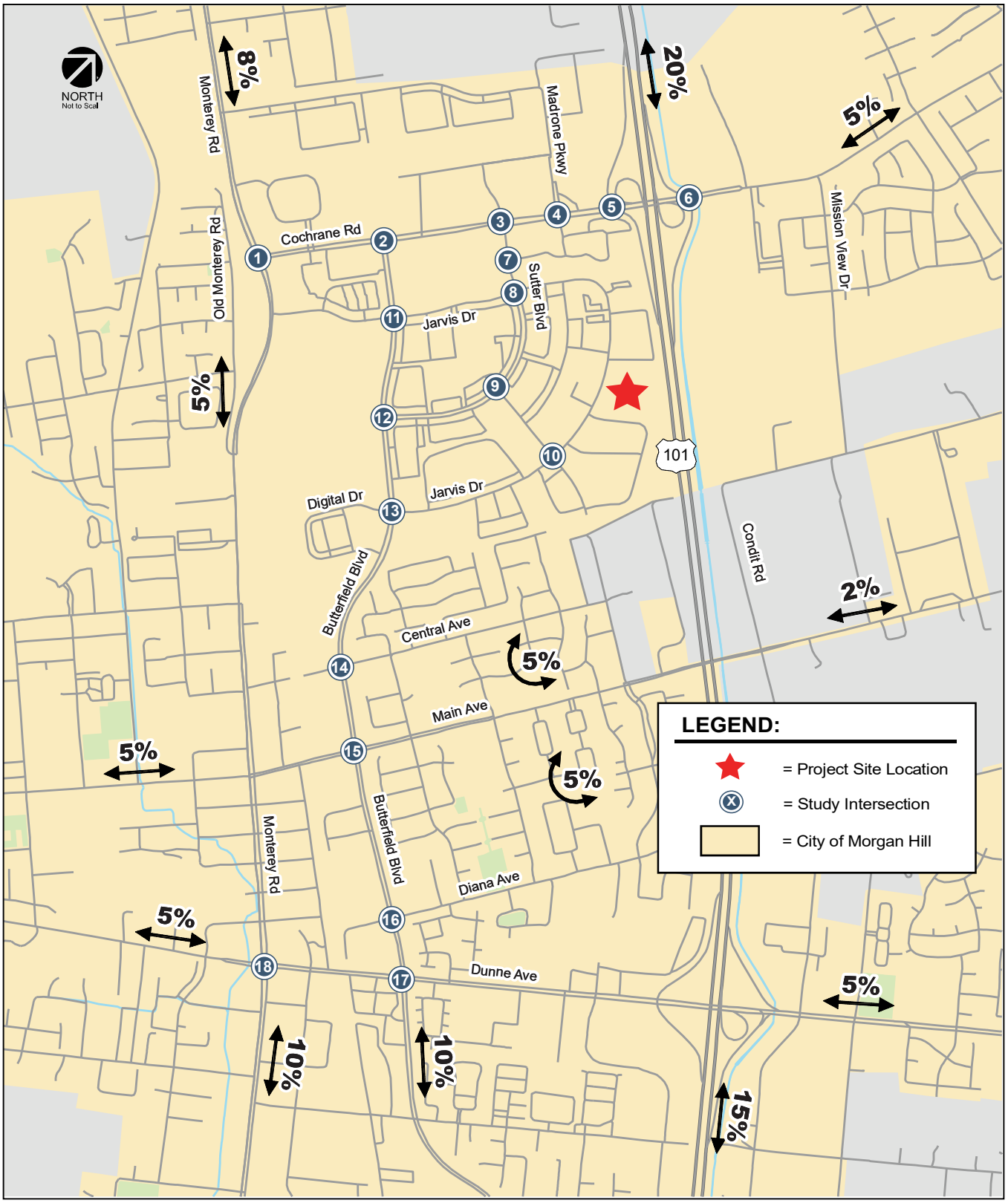

Figure 2
Site Plan

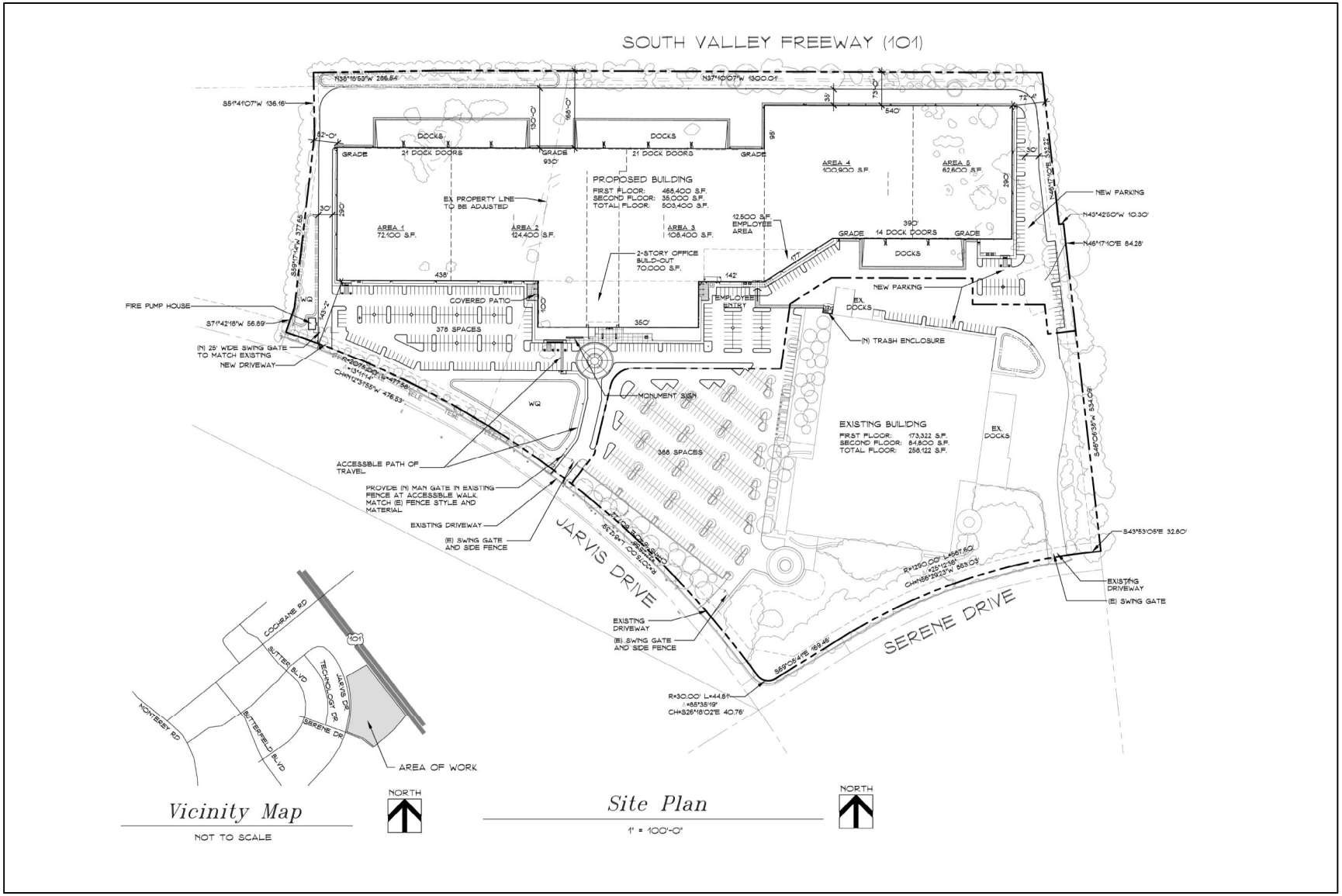

Table 1
Project Trip Generation Estimates

Land Use	Vehicle Classification	Size	AM Peak Hour Rate	AM Peak Hour Split In	AM Peak Hour Split Out	AM Peak Hour Trip In	AM Peak Hour Trip Out	AM Peak Hour Trip Total	PM Peak Hour Rate	PM Peak Hour Split In	PM Peak Hour Split Out	PM Peak Hour Trip In	PM Peak Hour Trip Out	PM Peak Hour Trip Total
Trip Generation Counts														
Existing Shoe Palace Facility[1]	Passenger Vehicles	258,122 Square Feet	0.391	83%	17%	84	17	101	0.372	7%	93%	7	89	96
	Trucks	258,122 Square Feet	0.015	0%	100%	0	4	4	0.015	50%	50%	2	2	4
	All Vehicles	258,122 Square Feet	0.407	80%	20%	**84**	**21**	**105**	0.387	9%	91%	**9**	**91**	**100**
Estimate of Project Traffic Based on Trip Generation Counts														
Proposed Shoe Palace Expansion[1]	Passenger Vehicles	503,400 Square Feet	0.391	83%	17%	164	33	197	0.372	7%	93%	14	173	187
	Trucks	503,400 Square Feet	0.015	0%	100%	0	8	8	0.015	50%	50%	4	4	8
	All Vehicles	503,400 Square Feet	0.407	80%	20%	**164**	**41**	**205**	0.387	9%	91%	**18**	**177**	**195**

[1]Driveway counts of the existing Shoe Palace facility were collected on July 26, 2018.

Table 2
General Plan Project Trip Generation Estimates

Land Use	ITE Land Use Code[2]	Size	AM Peak Hour Rate	AM Peak Hour Split In	AM Peak Hour Split Out	AM Peak Hour Trip In	AM Peak Hour Trip Out	AM Peak Hour Trip Total	PM Peak Hour Rate	PM Peak Hour Split In	PM Peak Hour Split Out	PM Peak Hour Trip In	PM Peak Hour Trip Out	PM Peak Hour Trip Total
Proposed Land Use														
Proposed Shoe Palace Expansion[1]	--	503,400 Square Feet	0.407	80%	20%	164	41	205	0.387	9%	91%	18	177	195
Approved Land Uses														
General Light Industrial	110	73,000 Square Feet	0.484	88%	12%	31	4	35	0.407	13%	87%	4	26	30
General Office Building	710	8,000 Square Feet	1.160	86%	14%	8	1	9	1.150	16%	84%	1	8	9
Sub-Total						39	5	44				5	34	39
Net Change (Proposed - Approved Uses)						**125**	**36**	**161**				**13**	**143**	**156**

[1]Driveway counts of the existing Shoe Palace facility were collected on July 26, 2018.
[2]ITE Trip Generation Manual, 10th Edition 2017

Figure 3
Project Trip Assignment

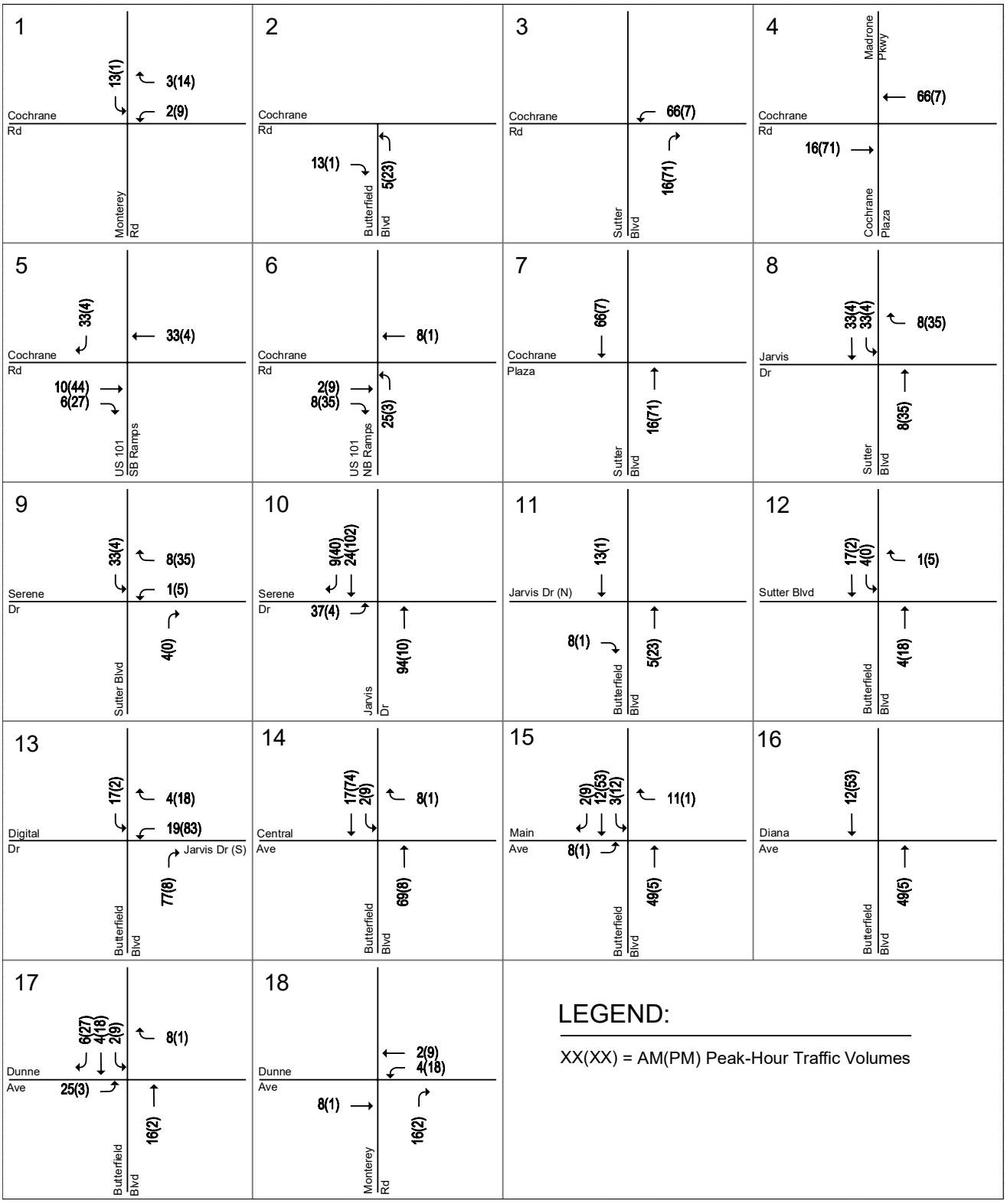

Table 3
Intersection Level of Service Summary

Int. #	Intersection	Intersection Control	LOS Standard	Peak Hour	Count Date	Existing Delay[1]	Existing LOS	Existing Plus Project Delay[1]	Existing Plus Project LOS	Existing Plus Project Incr. In Crit. Delay	Existing Plus Project Incr. In Crit. V/C	Cumulative Delay[1]	Cumulative LOS	Cumulative Plus Project Delay[1]	Cumulative Plus Project LOS	Cumulative Plus Project Incr. In Crit. Delay	Cumulative Plus Project Incr. In Crit. V/C
1	Monterey Road and Cochrane Road	Signal	E	AM	05/08/18	28.1	C	28.3	C	0.2	0.005	26.8	C	26.9	C	0.1	0.002
				PM	05/08/18	24.0	C	24.2	C	0.2	0.003	27.1	C	27.2	C	0.2	0.003
2	Butterfield Boulevard and Cochrane Road	Signal	D	AM	05/08/18	12.8	B	12.8	B	0.0	0.002	21.1	C	21.1	C	0.0	0.005
				PM	05/08/18	14.7	B	14.8	B	0.2	0.008	27.6	C	27.8	C	0.6	0.001
3	Sutter Boulevard and Cochrane Road	Signal	D	AM	05/08/18	17.6	B	17.9	B	0.7	0.026	17.1	B	17.4	B	0.0	0.000
				PM	05/08/18	18.3	B	19.9	B	0.1	0.003	19.8	B	21.9	C	3.7	0.205
4	Madrone Parkway/Cochrane Plaza and Cochrane Road	Signal	E	AM	05/08/18	19.1	B	18.9	B	-3.3	0.013	18.5	B	18.5	B	0.0	0.016
				PM	05/08/18	31.4	C	31.1	C	-0.4	0.014	29.3	C	29.1	C	-0.2	0.011
5	US 101 Southbound Ramps and Cochrane Road	Signal	E	AM	05/08/18	12.8	B	13.0	B	0.1	0.013	14.0	B	14.2	B	0.2	0.011
				PM	05/08/18	16.5	B	16.5	B	0.2	0.014	19.7	B	19.9	B	0.5	0.011
6	US 101 Northbound Ramps and Cochrane Road	Signal	E	AM	05/08/18	8.6	A	8.8	A	0.2	0.009	10.3	B	10.4	B	0.1	0.006
				PM	05/08/18	11.3	B	11.2	B	0.0	0.004	12.1	B	12.1	B	0.0	0.003
7	Sutter Boulevard and Cochrane Plaza	Two-Way Stop	D	AM	05/08/18	13.7	B	14.4	B	N/A	N/A	15.5	C	16.3	C	N/A	N/A
				PM	05/08/18	23.0	C	27.5	D	N/A	N/A	30.5	D	**36.5**	**E**	N/A	N/A
8	Sutter Boulevard and Jarvis Drive	Two-Way Stop	D	AM	05/08/18	16.1	C	18.5	C	N/A	N/A	18.1	C	20.7	C	N/A	N/A
				PM	05/08/18	19.7	C	21.8	C	N/A	N/A	29.7	D	34.2	D	N/A	N/A
9	Sutter Boulevard and Serene Drive	Two-Way Stop	D	AM	07/26/18	9.2	A	9.4	A	N/A	N/A	11.3	B	11.8	B	N/A	N/A
				PM	07/26/18	12.7	B	13.1	B	N/A	N/A	15.1	C	15.5	C	N/A	N/A
10	Jarvis Drive and Serene Drive	Two-Way Stop	D	AM	07/26/18	10.0	B	10.9	B	N/A	N/A	11.8	B	13.1	B	N/A	N/A
				PM	07/26/18	9.7	A	10.6	B	N/A	N/A	12.4	B	14.0	B	N/A	N/A
11	Butterfield Boulevard and Jarvis Drive (N)	Two-Way Stop	D	AM	05/08/18	11.9	B	11.9	B	N/A	N/A	13.4	B	13.5	B	N/A	N/A
				PM	05/08/18	12.1	B	12.1	B	N/A	N/A	13.4	B	13.4	B	N/A	N/A
12	Butterfield Boulevard and Sutter Boulevard	Signal	D	AM	05/08/18	6.7	A	6.7	A	0.1	0.004	16.5	B	16.5	B	0.1	0.003
				PM	05/08/18	15.6	B	15.7	B	0.0	0.001	27.4	C	27.4	C	0.0	0.000
13	Butterfield Boulevard and Jarvis Drive (S)/Digital Drive	Signal	D	AM	05/08/18	4.5	A	4.8	A	0.4	0.035	4.6	A	4.8	A	0.3	0.029
				PM	05/08/18	7.0	A	8.8	A	2.2	0.053	6.7	A	8.3	A	1.9	0.043
14	Butterfield Boulevard and Central Avenue	Signal	D	AM	05/08/18	10.4	B	10.5	B	0.1	0.024	10.5	B	10.5	B	0.1	0.019
				PM	05/08/18	4.0	A	4.0	A	0.0	0.021	4.1	A	4.2	A	0.1	0.018
15	Butterfield Boulevard and Main Avenue	Signal	D	AM	05/08/18	27.6	C	27.8	C	0.0	0.017	30.3	C	30.6	C	0.5	0.017
				PM	05/08/18	29.8	C	29.9	C	-0.1	0.016	33.0	C	33.2	C	0.2	0.013
16	Butterfield Boulevard and Diana Avenue	Signal	D	AM	05/08/18	32.3	C	37.8	D	7.4	0.016	42.2	D	47.7	D	7.9	0.013
				PM	05/08/18	27.7	C	32.0	C	6.3	0.018	46.2	D	52.7	D	9.6	0.014
17	Butterfield Boulevard and Dunne Avenue	Signal	D	AM	05/08/18	38.3	D	39.2	D	1.6	0.025	41.7	D	42.6	D	1.9	0.022
				PM	05/08/18	35.3	D	35.3	D	0.2	0.007	37.7	D	37.8	D	0.2	0.006
18	Monterey Road and Dunne Avenue	Signal	E	AM	05/08/18	28.9	C	29.0	C	0.0	0.001	30.4	C	30.4	C	0.1	0.001
				PM	05/08/18	31.4	C	31.6	C	0.3	0.006	34.7	C	34.9	C	0.3	0.005

[1]The reported delay and corresponding level of service for signalized intersections represents the average delay for all approaches at the intersection.
The reported delay and corresponding level of service for two-way stop-controlled intersections are based on the stop-controlled approach with the highest delay.
Bold indicates unacceptable level of service.

Table 4
Freeway Segment Capacity

					Capacity				Project Trip			
					Mixed-Flow Lane		HOV Lane		Mixed-Flow Lane		HOV Lane	
#	Freeway	Segment	Direction	Peak Hour	# of Lanes[1]	Capacity (vph)	# of Lanes[1]	Capacity (vph)	Volume	% of Capacity	Volume	% of Capacity
1	US 101	from East Dunne Avenue to Cochrane Road	NB	AM	3	6,900	--	--	25	0.36	--	--
			NB	PM	3	6,900	--	--	3	0.04	--	--
2	US 101	from Cochrane Road to Burnett Avenue (Lane Drop)	NB	AM	3	6,900	1	1,650	6	0.09	2	0.12
			NB	PM	3	6,900	1	1,650	30	0.43	5	0.30
3	US 101	from Burnett Avenue (Lane Drop) to Cochrane Road	SB	AM	3	6,900	--	--	33	0.48	--	--
			SB	PM	3	6,900	--	--	4	0.06	--	--
4	US 101	from Cochrane Road to East Dunne Avenue	SB	AM	3	6,900	--	--	6	0.09	--	--
			SB	PM	3	6,900	--	--	27	0.39	--	--

[1] Source: Santa Clara Valley Transportation Authority Congestion Management Program Monitoring Study, 2016.