APPENDIX G

Traffic Impact Analysis

FEHR PEERS

Memorandum

Date: August 30, 2023

To: Rima Ghannam, Sertior

From: Ian Barnes, PE and Katy Cole, PE, Fehr & Peers

Subject: Peer Review of the Final Transportation Impact Study (TIS) for the Montaldo Apartments Project

WC23-3996

The following technical memorandum summarizes Fehr & Peers's peer review of the *Final Transportation Impact Study (TIS) for the Montaldo Apartments Project* (W-Trans, July 27, 2023). This Final TIS report covers the CEQA Transportation section analysis for the proposed Montaldo Apartments project, including a review of VMT and multimodal transportation impacts. The report also includes a review of intersection Level of Service for three intersections near the project site.

As part of the peer review, an initial set of questions was submitted to W-Trans for clarification (**Attachment A**). Subsequently, W-Trans provided responses as part of a technical memorandum (**Attachment B**) and updated the report to the Final TIS reviewed in this memorandum. The following subsections summarize our final peer review of the Final TIS.

CEQA Vehicle-Miles Traveled (VMT) Analysis

Analyzing the project's VMT is required under CEQA Guidelines §15064.3. The Final TIS evaluates residential VMT per resident as the CEQA metric and establishes a VMT CEQA threshold of significance of 15 percent below the Citywide average residential VMT per resident. The VMT metric and CEQA threshold of significance are generally consistent with the approach recommended by the Governor's Office of Planning and Research (OPR) in their 2018 *Technical Advisory on Evaluating Transportation Impacts in CEQA (Technical Advisory).*

The VMT analysis methodology includes use of the Sonoma County Transportation Authority (SCTA) travel demand model to determine both the Citywide average VMT per resident and the VMT per resident of the residential uses in the Traffic Analysis Zone (TAZ) that the project is located in (TAZ 829). The project's VMT/resident is inferred as the VMT/resident of TAZ it is located in. Further reductions, as estimated based on CAPCOA methodologies as applied in the SCTA VMT mitigation tool, for project design (residential density) and operational elements (affordable housing) are used to reduce the TAZ 829 average residential VMT per resident to

estimate the final residential VMT per resident for the project. The use of the SCTA model to analyze the CEQA threshold of significance value (Citywide average) is generally consistent with the *Technical Advisory*, and the use of a TAZ in the model to estimate VMT for a proposed project is also generally consistent with the *Technical Advisory* provided the TAZ is (1) where the project is located, and (2) is of substantially similar uses.

We reviewed the reductions based on the CAPCOA methodologies to ensure that VMT reductions are not double-counted and do not exceed reasonably foreseeable reductions given the proposed parking supply for the site, available transit resources, and proximity to compatible land uses versus neighboring similar uses already included in the TAZ.

The VMT analysis section of the Final TIS notes that the Citywide average VMT as estimated in the SCTA model is 28.94 VMT per resident; thus the standard of significance is 24.60 VMT per resident (15 percent below the Citywide average). The VMT per resident of TAZ 829 is 26.84 VMT per resident. The TAZ 829 VMT/resident (26.84) is greater than the threshold (24.60), meaning that the project VMT would need to be further reduced by 8.3 percent to result in a less-than-significant impact.

The first adjustment made to the project's VMT per resident (as inferred from TAZ 829) was to estimate the VMT reduction associated with the integration of affordable housing (approximately 25 percent of the units will be affordable) into the project. The analysis used data from the CAPCOA methodologies as calculated in the SCTA VMT mitigation tool to result in a 7.2 percent reduction in project VMT. Fehr & Peers generally agrees with this reduction percentage based on the CAPCOA methodologies given the vast majority of the housing in TAZ 829 is market rate housing.

The second adjustment made to the VMT metric for TAZ 829 was to estimate the VMT reduction associated with the project's increased residential density relative to other housing in TAZ 829. The CAPCOA handbook specifically notes that this reduction may be subject to double counting of VMT reductions when model-produced VMT metrics are used, and thus caution should be taken when using this particular VMT reduction calculation. The Final TIS notes that the calculation was performed twice – once using the project's proposed density of 23.3 units per acre and another calculation using half of the proposed density as a conservative assumption (11.7 units per acre). Using the more lower density assumption, a VMT reduction of 6.2 percent was estimated using the SCTA VMT mitigation tool. Using the more higher proposed density assumption, the maximum 30 percent reduction was output from the calculator; this high level of reduction typically requires constraining parking supply and high-frequency transit to support. Because the project proposes to supply parking to meet the City's code and nearby transit services are not high-frequency (as defined in the Public Resources Code), the maximum 30 percent reduction should not be used for CEQA purposes as supporting transportation options are not available.

As noted previously, an 8.3 percent reduction in the project's VMT (versus the TAZ 829 value) would be required to result in a less-than-significant impact. The affordable housing VMT reduction was estimated at 7.2 percent. Thus, the density reduction would only need to result in a 1.1 percent reduction in project VMT to result in a less-than-significant impact. Based on the 6.2 percent reduction calculated based on the lower density increase assumpton (versus other residential areas in TAZ 829), and considering supporting transportation uses, a further 1.1 percent reduction appears to be reasonable. Therefore, Fehr & Peers agrees with the finding of a less-than-significant impact for CEQA Transportation section VMT impacts.

CEQA Multimodal Analysis

The Final TIS for project studied the following multimodal elements:

- Pedestrian system
- Bicycle system
- Public transit system
- Emergency vehicle access
- Safety issues (sight distance)

Pedestrian System

The pedestrian system analysis documents existing and planned pedestrian facilities, safety data for pedestrians, and the determination of CEQA impacts for pedestrian facilities. The analysis concludes that the project-sponsored construction of sidewalks along the project's SR 12 frontage would provide for adequate pedestrian access to nearby compatible land uses. Fehr & Peers generally agrees with this conclusion, and thus the CEQA Transportation impacts to the pedestrian system would be less-than-significant because the project would not preclude future pedestrian facilities or disrupt existing pedestrian facilities.

Bicycle System

The bicycle system analysis documents existing and planned bicycle facilities, safety data for bicyclists, and the determination of CEQA impacts for bicyclists. The analysis concludes that bicycle access for the project is sufficient. Fehr & Peers generally agrees with this conclusion, and thus the CEQA Transportation impacts to the bicycle system would be less-than-significant because the project would not preclude future bicycle facilities or disrupt existing bicycle facilities.

Public Transit System

The public transit system analysis documents existing transit services, and the location of nearby stops. The analysis concludes that transit stops are within acceptable walking distance, provided the project completes the sidewalk network along the project frontage, and that additional transit ridership would be accommodated over multiple routes. Fehr & Peers generally agrees with these findings, and thus the CEQA Transportation impacts to the public transit system would be less-than-significant.

Emergency Vehicle Access

The Final TIS discusses emergency access within the context of the site design. The analysis notes that driveways and aisles would be at least 22 feet wide and would meet City of Sonoma standards. Provided that standards are in fact met, Fehr & Peers generally agrees with the emergency access discussion in the Final TIS. Note that the final TIS nor Fehr & Peers provided an assessment beyond reviewing driveway design standards.

Safety Issues (Sight Distance)

The Final TIS discusses sight distance with regards to corner sight distance and vision triangles. While Fehr & Peers does not guarantee the accuracy of W-Trans's work, we agree with the process and methodology employed. Provided the analysis was done accurately, we concur with the final TIS that that sight distance meets the Caltrans Highway Design Manual standards. Thus, the finding would be less-than-significant because the project would not introduce new hazards or incompatible uses to the transportation system.

Intersection Levels of Service

The Final TIS includes analysis of three study intersections – SR 12/Verano Avenue, SR 12/West Spain Street, and SR 12/West Napa Street-Riverside Drive. The analysis included study of Existing, Existing plus Project, Future (Year 2040), and Future plus Project Conditions. Based on the trip generation estimated for the project (prepared by W-Trans), the findings that traffic operations would remain acceptable with respect to the City's Level of Service standards appears to be reasonable. Fehr & Peers concurs with the analysis of the project's effect on the operations of the circulation system.

This concludes our peer review of the *Final Transportation Impact Study for the Montaldo Apartments Project* (July 27, 2023) conducted by W-Trans. Please call Ian Barnes at (707) 582-0039 if you have any questions.

Attachments

Attachment A Initial Peer Review Clarifying Questions
Attachment B W-Trans Responses to Initial Peer Review Clarifying Questions

FEHR PEERS

Attachment A

Initial Peer Review Clarifying Questions

FEHR PEERS

Memorandum

Date: June 23, 2023

To: Rima Ghannam, Sertior

From: Ian Barnes, PE and Katy Cole, PE, Fehr & Peers

Subject: Initial Request for Clarification on Items Contained in the Montaldo Apartments Project Transportation Impact Study

WC23-3996

The following is a request for clarification on items contained in the Transportation Impact Study (TIS) for the Montaldo Apartments Project in Sonoma, CA. The responses to this request will be considered during Fehr & Peers's peer review of the study.

As part of our peer review, Fehr & Peers performed an initial review of the TIS and have the following clarification questions related to the analysis documented in the study (particularly for VMT). It is important that the analysis be complete and provide substantial evidence that supports impact findings to provide a defensible environmental document. We appreciate the opportunity to collaborate with the City, W-Trans, and overall project team to enhance the defensibility of the CEQA Transportation analysis.

- It would be helpful to have additional clarification on the transportation CEQA metrics that are being used to respond to each of the CEQA criteria on page 2. It seems that all are addressed; however, the criteria being used to assess impacts do not appear to be defined clearly.
- Please provide reasoning for the use of the Density Adjustment (CAPCOA measure T-1) to further adjust the VMT estimates from the SCTA model. In preparing the reasoning, please respond to the following factors that CEQA commenters may bring up:
    - CAPCOA cautions users to consider double counting for "VMT benefits that may already be accounted for the model used to produce the unmitigated or baseline VMT estimate. Regional travel demand models are generally sensitive to built environmental and transit service variables (e.g., density, proximity to transit). VMT estimates developed for a project or program that use such models may, therefore, already account for VMT reductions associated with certain measures in this Handbook (e.g., T-1, Increase Residential Density)."
    - SCTA model includes multifamily dwelling unit as a land use variable.

  - In the base year (2019) SCTA model, TAZ 829 appears to include ~550 single family dwelling units and ~300 multifamily dwelling units coded (in this case, MFDU refers to ITE Trip Generation Manual Land Use Code 220 "multifamily"). The data quoted comes from a version of the SCTA model dated 5/9/22 – model version differences may be present.
  - TAZ 829 is not served by a public transit route that meets the Public Resources Code for high quality transit
  - Project includes off-street parking in-line with the City Code (i.e., enough off-street parking to allow for the majority of residents to store a vehicle on-site) and over-parked considering State requirements.
  - Project site would generally have the same distances to complementary land uses (schools, shopping, employment) as other residential units within the TAZ.

- Please provide context regarding the 30% VMT per capita reduction versus other residential units in TAZ 829. How/why would the VMT be lower (in terms of person behavior) and what form(s) would the reduction take? VMT reduction occurs for the following reasons: less vehicle trips are made or shorter vehicle trips are made. In this case, is the VMT reduction attributable to less vehicle trips than their neighbors because of factors such as mode shift (walk, bike, transit, carpool), people not making trips they otherwise would, trip chaining, etc.? Or would it be because residents of this project would travel shorter distances as compared to their neighbors. Given all other factors consistent between residences in TAZ 829 and the project site, is a 30% VMT per capita reduction feasible on increased density alone (without mixed-uses, inclusion of complementary land uses on-site, highly incentivizing mode shift)?
- Please clarify and document the assumptions and procedures of the Density Adjustment calculation. Was the default 9.1 du/acre used in the analysis, or was the 9.1 du/acre adjusted in accordance with footnote (C) in the GHG calculation variable table? Relevant footnote below:

  (C) The residential density of typical development is based on the blended average density of residential development in the U.S. forecasted for 2025. This estimate includes apartments, condominiums, and townhouses, as well as detached single-family housing on both small and large lots. An acre in this context is defined as an acre of developed land, not including streets, school sites, parks, and other undevelopable land. <u>If reductions are being calculated from a specific baseline derived from a travel demand forecasting model, the residential density of the relevant transportation analysis zone should be used instead of the value for a typical development.</u>
- The trip generation assumptions use standard trip generation rates from the ITE Trip Generation Manual for multi-family units. Please provide clarification on why unadjusted trip generation rates were used but adjustments were made to VMT.

- For the congestion-based analysis, text on page 4 notes that the morning peak hour "reflects conditions during the home to work or school commute." However, the counts for study intersections were obtained on July 12, 2022. Please provide additional information (e.g., year-round schools) that supports counts in July being reflective of typical traffic conditions when school is in session.

This concludes our initial list of clarifying questions for W-Trans as part of our peer review of the Montaldo Apartments TIS. Please call Ian Barnes at (707) 582-0039 if you have any questions.

FEHR PEERS

Attachment B

W-Trans Responses to Initial Peer Review Clarifying Questions

Memorandum

Date: July 28, 2023

Project: SON069

To: Trent Sansone
DeNova Homes

From: Dalene J. Whitlock
dwhitlock@w-trans.com

Subject: Response to Comments on the *Transportation Impact Study for the Montaldo Apartments Project*

In response to comments on our *Transportation Impact Study for the Montaldo Apartments Project* from Fehr & Peers as contained in a memorandum dated June 23, 2023, to Rima Ghannam from Ian Barnes and Katy Cole, the study has been updated as indicated below. The comments are provided, sometimes paraphrased, for ease of reference.

- It would be helpful to have additional clarification on the transportation CEQA metrics that are being used to respond to each of the CEQA criteria on page 2. It seems that all are addressed; however, the criteria being used to assess impacts do not appear to be defined clearly.

The heading of the section on page 2 has been edited to remove "standards" and reflect that it presents the criteria only. The standards have been added to the first paragraph of the four sections related to the four CEQA metrics.

- Please provide reasoning for the use of the Density Adjustment (CAPCOA measure T-1) to further adjust the VMT estimates from the SCTA model.

As discussed during the call with the authors of the comments, the VMT analysis was updated to rely almost entirely on the affordability deduction. Note that the affordability deduction was calculated using the SCTA VMT tool, while the draft TIS relied on a method developed by the City of San Jose; as a result, the deduction in the revised report is higher than previously indicated. Regarding the density deduction, a more conservative approach was adopted, as the report now includes an analysis based on a density that is half that actually proposed. The combined deductions of these two factors were sufficient to achieve a less-than-significant finding.

- Please provide clarification on why unadjusted trip generation rates were used but adjustments were made to VMT.

A note has been added indicating that the analysis is conservatively based on the full trip generation without a deduction for the affordable units even though these units typically generate fewer trips.

- Please provide additional information (e.g., year-round schools) that supports counts in July being reflective of typical traffic conditions when school is in session.

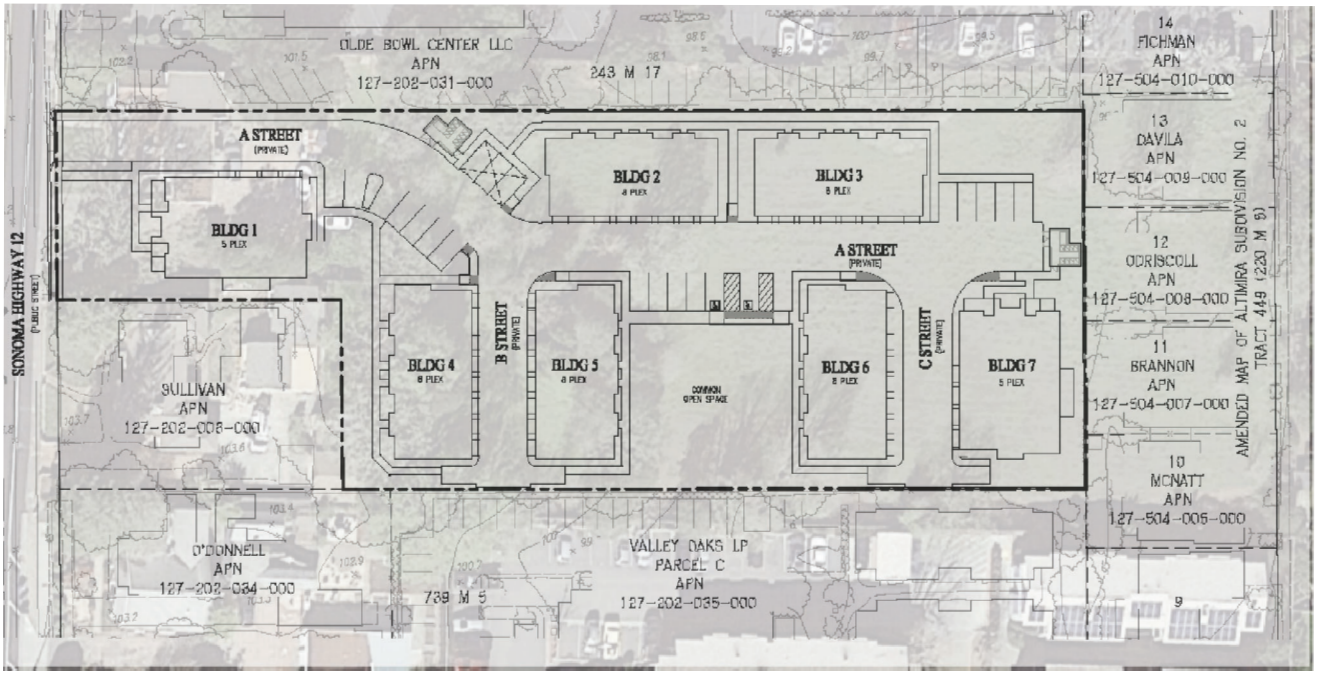
Text has been added indicating that due to high tourism activity during the summer, volumes during the critical p.m. peak hour would remain at the same level throughout the year, so the analysis adequately reflects year-round conditions.

The final report with these updates is attached.

DJW/djw/SON069.M1

Attachments: Final Transportation Impact Study for the Montaldo Apartments Project

Final Transportation Impact Study for the Montaldo Apartments Project



Prepared for the City of Sonoma

Submitted by
W-Trans

August 28, 2023

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Plates

Appendices

Executive Summary

The proposed project would result in the construction of 50 apartment units, including 13 to be designated affordable, on a site currently occupied by a single-family dwelling. The new apartment units would be expected to generate an average of 366 trips per weekday, including 23 trips during the morning peak hour and 28 during the evening peak hour. After deducting trips associated with the home to be razed to make way for the project, there would be a net new trip generation of 356 trips per weekday, with 22 during the morning peak hour and 27 during the evening peak hour.

The study area included three nearby signalized intersections. All three experienced collisions at slightly higher rates than statewide, though no specific issues were identified that would require remediation. These three intersections are operating acceptably at LOS C or better under existing volumes and are expected to continue doing so under Future volumes and with project trips added.

The proposed project would include construction along its frontage on SR 12, partially closing the gap along the east side of the road and improving pedestrian access. Existing facilities for pedestrians, bicyclists and transit riders are adequate, and the project will not result in any improvements that would inhibit future expansion of such facilities but would provide new sidewalk, consistent with City policy. The project would provide a bike parking supply that complies with City requirements.

The impact on VMT by the proposed project would be less-than-significant. Similarly, as there would be adequate sight distance at the driveway, it would have a less-than-significant safety impact. It is recommended that care be taken in the design and construction of the project to avoid placing signage or landscaping in the vision triangle. The impact on emergency response would also be less-than-significant.

Like the bike parking supply, the proposed supply of vehicle parking would be adequate to meet the applicable local and state requirements.

Introduction

This report presents an analysis of the potential traffic impacts and adverse operational effects that would be associated with the development of a proposed Montaldo Apartments project to be located at 19320 Sonoma Highway (State Route 12) in the City of Sonoma. The traffic study was completed in accordance with the criteria established by the City of Sonoma and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a transportation impact study is to provide City staff and policy makers with data that they can use to make an informed decision regarding the potential transportation impacts of a proposed project, and any associated improvements that would be required to mitigate these impacts to an acceptable level under CEQA, the City's General Plan, or other policies. This report provides an analysis of those items that are identified as areas of environmental concern under the California Environmental Quality Act (CEQA) and that, if significant and unavoidable, require an EIR. A Mitigated Negative Declaration (MND) or Negative Declaration is typically prepared if the project is determined to have less-than-significant impacts with or without mitigations. Impacts associated with access for pedestrians, bicyclists, and to transit; the vehicle miles traveled (VMT) generated by the project; adequacy of sight distance; and emergency access are addressed in the context of the CEQA criteria. While no longer a part of the CEQA review process, vehicular traffic service levels at key intersections were evaluated for consistency with General Plan policies by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on anticipated travel patterns specific to the proposed project, then analyzing the effect the new traffic would be expected to have on the study intersections and need for improvements to maintain acceptable operation. Adequacy of parking is also addressed as a policy issue.

Applied Criteria

The report is organized to provide background data that supports the various aspects of the analysis, followed by the assessment of CEQA issues and then the evaluation of policy-related issues. The CEQA criteria evaluated are as follows. The standards applied are indicated within the sections for each of these topics.

Would the project:

a. Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?
b. Conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b)?
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?
d. Result in inadequate emergency access?

Project Profile

The project as proposed would result in the construction of 50 apartments in eight buildings. A total of 13 units would be designated as affordable housing, including three extremely low-income units, five very low-income units, and five low-income units. The project site at 19320 Sonoma Highway (SR 12) is currently occupied by a single-family home, which would be demolished to make way for the project. Access to the site would be via a proposed driveway on Sonoma Highway. The location of the project site is shown in Figure 1.

son069.ai 7/20

Transportation Impact Study for the Montaldo Apartments Project

Figure 1 – Study Area and Existing Lane Configurations

W-Trans

Transportation Setting

Study Area and Periods

The study area would consist of the section of SR 12 fronting the project site and the project access point as well as the following intersections.

1. SR 12/Verano Avenue
2. SR 12/West Spain Street
3. SR 12/West Napa Street–Riverside Drive

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute. Counts were obtained for the study intersections on July 12, 2022. It is noted that while local schools were not in session at the time of the counts, schools generate a nominal number of trips during the critical evening peak hour, and this time period would be affected by higher summertime volumes associated with tourism in the Sonoma Valley. The volumes used therefore provide a reasonable estimate of year-round conditions.

Study Intersections

State Route 12/Verano Avenue is a signalized four-legged intersection with protected left-turn phasing on the northbound and southbound approaches. There are crosswalks with pedestrian phasing across all approaches. Northbound and southbound right-turn lanes are channelized, and pedestrian refuge islands are provided at the northwest and southeast corners of the intersection.

State Route 12/West Spain Street is a signalized tee intersection with protected left-turn phasing on the southbound approach. Marked crosswalks with pedestrian phasing are provided on the east and south legs.

State Route 12/West Napa Street–Riverside Drive is a four-legged intersection with protected left-turn phasing on the southbound and northbound approaches; it is noted that the south leg of the intersection is a driveway to the Staples shopping plaza. The westbound right-turn lane is channelized. A marked crosswalk with pedestrian phasing is provided on the west leg. The west leg is designated as Riverside Drive while the east leg is designated as West Napa Street, which is also part of SR 12 but referred to solely as West Napa Street in this report to distinguish it from the north-south segment of SR 12, also called Sonoma Highway.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is August 1, 2016, through July 31, 2021.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2018 Collision Data on California State Highways*, California Department of Transportation (Caltrans). These average rates statewide are for intersections in the same environment (urban, suburban, or rural), with the same number of approaches (three or four), and the same controls (all-way stop, two-way stop, or traffic signal). The calculated collision rates for all three study intersections

were greater than their respective statewide average collision rates so collision records were further reviewed. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates for the Study Intersections

Study Intersection	Number of Collisions (2016-2021)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. SR 12/Verano Ave	21	**0.50**	0.42
2. SR 12/W Spain St	9	**0.28**	0.20
3. SR 12/W Napa St–Riverside Dr	9	**0.26**	0.20

Note: c/mve = collisions per million vehicles entering; **bold** number indicates calculated collision rate greater than statewide average.

Of the 21 reported collisions at SR 12/Verano Avenue, there were six rear-end, five broadside, three sideswipe, three head-on, three vehicle-pedestrian, and one hit-object collision. Four out of six rear-end collisions occurred between westbound drivers approaching the intersection and were caused by factors such as unsafe speeding or driving under the influence. A review of Verano Avenue to the east of the SR 12 indicates that there are a traffic ahead warning sign and a 25-mph speed limit sign, but unsafe speed was one of the common primary factors for the collisions that occurred on the east leg of SR 12/Verano Avenue. The injury rate was 38.1 percent, which is slightly above the statewide average of 37.4 percent. As a collision pattern associated with speeding was identified, the City may wish to increase enforcement or consider implementing traffic calming measures on this section of Verano Avenue to reduce travel speeds and potentially the number of collisions.

The nine reported collisions at SR 12/West Spain Street included five rear-end, three hit-object, and one broadside collision. The common primary factor for the rear-end collisions was unsafe speed. However, as there were a limited number of collisions, the collision rate is only marginally above the average, and the injury rate of 44.4 percent is below the statewide average of 46.8 percent, no remedial action is recommended.

Of the nine collisions that occurred at SR 12/West Napa Street–Riverside Drive, there were two sideswipe, two rear-end, two head-on, one broadside, and two unspecified collisions. As there were various types of collisions, no clear patterns were identified. The injury rate of 22.2 percent is below the statewide average of 46.8 percent so no remedial action is recommended for this intersection.

Project Data

The project consists of 50 apartments in eight buildings, 13 of which would be designated as affordable housing units. The proposed project site plan is shown in Figure 2.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 10th Edition, 2017 for Multifamily Housing (Mid-Rise) (Land Use #221), as this land use most closely matches the proposed project. Trips associated with the existing dwelling were estimated using rates for Single Family Detached Housing (Land Use #210).

Based on the application of these assumptions, the proposed project is expected to generate an average of 366 trips per day at the driveway, including 23 a.m. peak hour trips and 28 trips during the p.m. peak hour. After deducting the trips associated with the existing dwelling, the project would be expected to generate 356 new trips per day, with 22 new trips during the morning peak hour and 27 new afternoon peak hour trips. These results are summarized in Table 2.

Table 2 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Existing											
Single Family Detached Housing	-1	9.44	-10	0.74	-1	0	-1	0.99	-1	-1	0
Proposed											
Multifamily Housing (mid-rise)	50	7.32	366	0.46	23	5	18	0.56	28	18	10
Total			**356**		**22**	**5**	**17**		**27**	**17**	**10**

Note: du = dwelling unit; ksf = 1,000 square feet

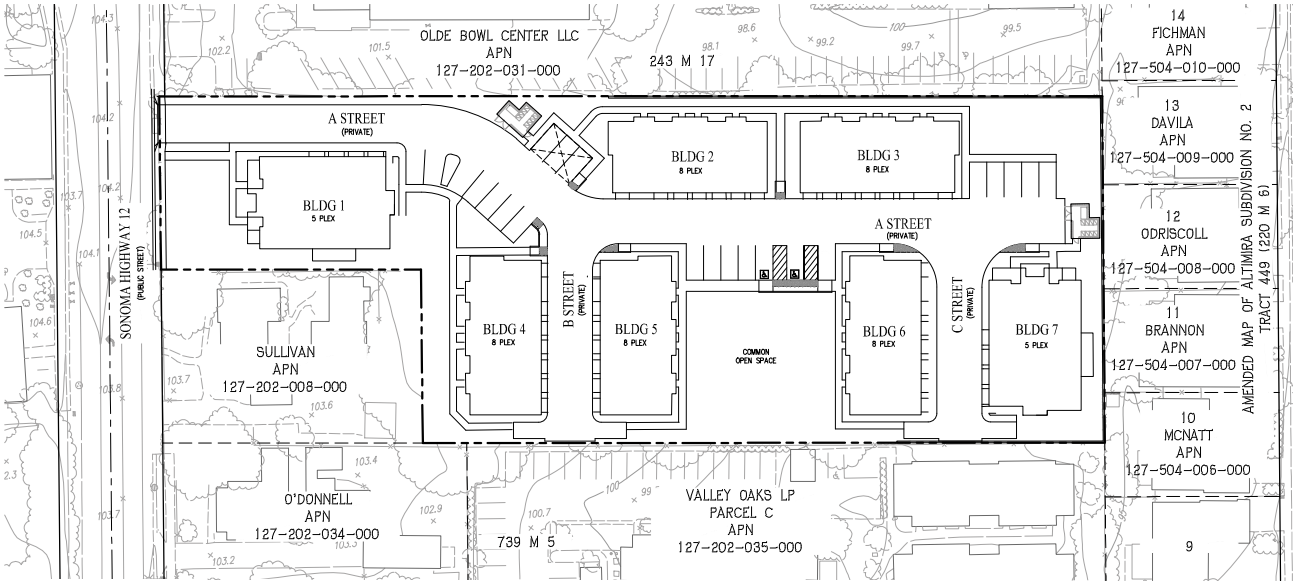
It is noted that trip rates from the 10th Edition of the *Trip Generation Manual* were used as the study was initiated prior to release of the 11th Edition. These rates were compared to the newer 11th Edition rates and it was determined that the 10th Edition of the *Trip Generation Manual* has higher standard rates for the "Multifamily Housing" and "Single Family Detached Housing" land uses. Therefore, using the estimated trip generation based on the 10th Edition of the *Trip Generation Manual*, as shown in Table 2, would result in a more conservative analysis. Further conservatism was incorporated as no reduction in the trip generation was taken to reflect the inclusion of affordable housing though such units typically generate fewer trips than a typical suburban apartment.

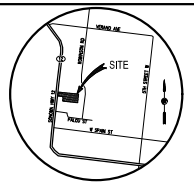
Trip Distribution

The pattern used to allocate new project trips to the street network was determined by reviewing employment patterns for residents of the City of Sonoma as indicated by Census data. The applied distribution is shown in Table 3.

Transportation Impact Study for the Montaldo Apartments Project

Figure 2 – Site Plan





GENERAL NOTES:

1.	OWNER:	DENOVA HOMES 1500 WILLOW PASS COURT, CONCORD, CA 94520 TRENT SANSON PHONE: (925) 852-0541
2.	CIVIL ENGINEER:	CARLSON, BARBEE, & GIBSON, INC. 2633 CAMINO RAMON, SUITE 350, SAN RAMON, CA 94583 RYAN HANSEN, RCE #80557 PHONE: (925) 866-0322
3.	ARCHITECT:	WHA ARCHITECTS 5000 EXECUTIVE PARKWAY, SUITE 375, SAN RAMON, CA 94583 ROBERT LEE PHONE: (925) 463-1700
4.	CONTOUR INTERVAL:	1 FOOT (EXISTING)
5.	PROPERTY ADDRESS:	19330 SONOMA HIGHWAY SONOMA, CA 95476
6.	APN	127-202-006-000 & 127-202-007-000
7.	LAND AREA SUMMARY:	GROSS AREA = 93,536 SF±, 2.15 AC±, NET AREA = 93,236 SF±, 2.14 AC± (LESS R/W DEDICATION, 300 SF)
8.	DENSITY:	23.3 DU/AC (NET)
9.	FLOOR AREA RATIO (FAR):	66,874 SF / 93,536 SF = 0.72
10.	SITE COVERAGE:	29,086 SF / 93,236 SF = 31.2%
11.	EXISTING PARCELS: PROPOSED PARCELS:	2 1
12.	NUMBER OF UNITS:	50 UNITS
13.	EXISTING ZONING:	WEST NAPA / SONOMA HIGHWAY CORRIDOR (C-COMMERCIAL – 20 DU/AC)
14.	GENERAL PLAN:	HOUSING OPPORTUNITY (15-25 DU/AC)
15.	UTILITIES: WATER: SEWER: STORM DRAIN: GAS & ELECTRIC:	EACH UNIT WILL BE SERVED WITH ONE WATER LATERAL AND ONE SANITARY SEWER LATERAL. CITY OF SONOMA SONOMA COUNTY WATER AGENCY CITY OF SONOMA PACIFIC GAS & ELECTRIC
16.	TRASH:	TRASH ENCLOSURE CAN PICKUP TO BE PROVIDED BY SONOMA GARBAGE COLLECTORS.
17.	STREETS:	ALL PROPOSED ON-SITE STREETS ARE PRIVATE. PUBLIC ACCESS FOR TRASH COLLECTION, UTILITY SERVICE, AND OTHER CITY SERVICES SHALL BE GRANTED OVER THE PRIVATE STREETS VIA EASEMENT DEDICATION.
18.	GRADING:	PROPOSED GRADING AS SHOWN IS PRELIMINARY, FINISHED GRADING IS SUBJECT TO FINAL DESIGN.
19.	EROSION CONTROL:	EROSION CONTROL WILL BE PREPARED PER CITY STANDARDS AND ABAG RECOMMENDATIONS.
20.	BENCHMARK:	THE BENCHMARK FOR THIS SURVEY IS A BRASS DISK SET IN CONCRETE POST, DESIGNATION R 205, PID JT0238, HAVING AN NGVD29 PUBLISHED ELEVATION OF 40.83 FEET.
	BASIS OF BEARINGS:	THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTHERLY LINE OF THE PARCEL SHOWN ON THAT RECORD OF SURVEY "BEING THE LANDS OF SONOMA COMMUNITY DEVELOPMENT AGENCY, A PUBLIC BODY AS DESCRIBED BY GRANT DEED RECORDED UNDER DOCUMENT NUMBER 2008-050403, OFFICIAL RECORDS OF SONOMA COUNTY", FILED FOR RECORD IN BOOK 739 OF MAPS AT PAGE, 5 (739 M 5) AS DETERMINED BY THE FOUND MONUMENTS SHOWN HEREON. THE BEARING BEING NORTH 83°01'20" WEST.
21.	FLOOD ZONE DESIGNATION:	ZONE X: AREAS OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAINS. PER FEMA FLOOD INSURANCE RATE MAP, MAP NUMBER 06097C0936E, DATED DECEMBER 2, 2008.
22.	LANDSCAPING:	COMMON LANDSCAPING IMPROVEMENTS ARE TO BE DESIGNED WITH FUTURE DESIGN REVIEW APPLICATION, SUBJECT TO PLANNING COMMISSION APPROVAL OF VESTING TENTATIVE MAP.
23.	EASEMENTS:	ANY PRIVATE EASEMENTS SHALL BE DEDICATED TO OWNERS AND/OR THE HOMEOWNER ASSOCIATION OF THIS SUBDIVISION. RECIPROCAL ON LOT DRAINAGE EASEMENTS WILL BE DEFINED IN THE CC&R'S.

LEGEND

EXISTING	PROPOSED	DESCRIPTION
		PROPERTY BOUNDARY
		RIGHT OF WAY BOUNDARY
		CENTERLINE
		ADJACENT PROPERTY BOUNDARY
		EASEMENT LINE
EX		EXISTING
SCWA		SONOMA COUNTY WATER AGENCY
R/W		RIGHT OF WAY

SHEET SET

SHEET NO.	SHEET TITLE
C 1.0	TITLE SHEET
C 2.0	EXISTING CONDITIONS
C 3.0	PRELIMINARY SITE PLAN
C 4.0	PRELIMINARY GRADING & UTILITY PLAN
C 5.0	PRELIMINARY STORMWATER CONTROL PLAN
C 6.0	ALTERNATIVE SANITARY SEWER CONNECTIONS

TITLE SHEET

MONTALDO APARTMENTS

CITY OF SONOMA SONOMA COUNTY CALIFORNIA

SCALE: 1" = 30' DATE: JUNE 6, 2022

cbg CIVIL ENGINEERS • SURVEYORS • PLANNERS

SAN RAMON • (925) 866-0322
ROSEVILLE • (916) 788-4456
WWW.CBANDG.COM

SHEET NO. C 1.0 OF 6 SHEETS

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Source: Weinstein Architects + Urban Designers LLC 3/13

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W-Trans

Table 3 – Trip Distribution Assumptions	
Route	**Percent**
North on Sonoma Hwy	40%
West on Riverside Dr	10%
East on Spain St West	20%
South on Fifth St West	30%
TOTAL	**100%**

Circulation System

This section addresses the first transportation bullet point on the CEQA checklist, which relates to the potential for a project to conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. The project would be considered to have a significant impact if it conflicts with any plans or policies or would preclude implementation of planned improvements to transportation facilities.

Pedestrian Facilities

Existing and Planned Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site; however, sidewalk gaps can be found along some roadways in the vicinity of the project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points.

- **State Route (SR) 12** – Continuous sidewalk coverage is provided on both sides of SR 12 between the north limit of the project site and Verano Avenue; there is currently no sidewalk along the project frontage. South of the project site to West Napa Road sidewalk is provided intermittently on the east side of SR 12; there is no sidewalk on the west side. Lighting is provided by overhead streetlights.
- **Verano Avenue** – Continuous sidewalk coverage is provided on both sides of Verano Avenue. Lighting is provided by overhead streetlights.
- **West Spain Street** – Sidewalks are available on both sides of West Spain Street between SR 12 and Fourth Street West and lit by overhead streetlights.
- **Riverside Drive-West Napa Street** – Continuous sidewalks are provided on the north side of Riverside Drive but not on the south side. West Napa Street east of SR 12 has continuous sidewalks on the north side while there is an intermittent sidewalk on the south side. Lighting is provided by overhead streetlights.

Pedestrian Safety

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue for pedestrians. Collision records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports were reviewed for the most current five-year period available, which was August 1, 2016, through July 31, 2021, at the time of the analysis. During the five-year study period there were three reported collisions involving pedestrians at the SR 12/Verano Avenue intersection. Of the three collisions, two collisions occurred between pedestrians proceeding straight and a motorist making a left turn; both had a primary collision factor of pedestrian right-of-way violations. The remaining collision was due to a pedestrian violation. All three collisions resulted in injuries. As the existing signal operation includes a pedestrian phase and none of the crashes involved a pedestrian crossing to the pork chop islands, which can result in conflicts with pedestrian traffic, no further improvements are suggested.

Project Impacts on Pedestrian Facilities

Given the proximity of commercial and recreational uses to the site, it is reasonable to assume that some project residents will want to walk, bicycle, and/or use transit for trips from and to the project site. The project as proposed includes construction of a sidewalk along the project frontage, connecting to the existing sidewalk to the north and south. Further, there would be adequate pedestrian sidewalk and crosswalk connections to the nearby shopping plazas including Maxwell Village north of the project site and Vineyard Center near the intersection of SR 12/Verano Avenue. There is also a Staples Shopping Center on the south side of the SR 12/West Napa Street–

Riverside Drive intersection; limited travel to this shopping center is anticipated as sidewalks are missing along undeveloped parcels on the east side of SR 12 between the project site and the Staples Shopping Center so pedestrians would need to walk on delineated shoulders along these undeveloped parcels.

Finding – Upon constructing sidewalks along the project frontage with SR 12, there would be adequate pedestrian access between the project site and the surrounding shopping centers including Maxwell Village and Vineyard Center. There are intermittent sidewalks on SR 12 between the project site and the Staples Shopping Center, limiting access to use of the paved shoulders.

Bicycle Facilities

Existing and Planned Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2020, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

Existing facilities in the project area include Class II bike lanes on Verano Avenue between Arnold Drive and SR 12 and the Class I Sonoma City Trail between SR 12 and Fourth Street East. Planned facilities include Class II bike lanes along SR 12 between Donald Street and West Napa Street, as well as along Petaluma Avenue and West Napa Street to the south of the project site. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 4 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *Bicycle and Pedestrian Master Plan*, Sonoma County Transportation Authority (SCTA), *Updated Project List 2019*.

Table 4 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Sonoma City Trail	I	1.48	SR 12	4th St E
Central Sonoma Valley Bikeway*	I	0.32	Main St	Sonoma Creek Bridge
Verano Ave*	II	0.93	Arnold Dr	SR 12
Planned				
Sonoma City Trail Extension*	I	0.16	Verano Ave	Western City Limit
SR 12*	II	0.60	Verano Ave	W Napa St
W Napa St	II	1.04	SR 12	E Napa St
Petaluma Ave*	II	0.62	Riverside Dr	Arnold Dr
Verano Ave*	III	0.30	SR 12	5th St W
Riverside Dr*	III	0.8	Verano	Petaluma Ave

Notes: * All or portions of these bikeways are located outside City limits.
Source: *Countywide Bicycle and Pedestrian Master Plan Updated Project List 2019,* Sonoma County Transportation Authority (SCTA), 2019

Bicyclist Safety

Collision records for the study area were reviewed to determine if there had been any bicyclist-involved crashes. During the five-year study period between August 1, 2016, and July 31, 2021, there were no reported collisions involving bicyclists at any of the study intersections.

Project Impacts on Bicycle Facilities

Upon completion of the planned nearby bicycle projects, bicycle facilities, together with shared use of minor streets, would provide adequate access for bicyclist to and from the project site.

Bicycle Storage

Sonoma City Code Section 19.48.110 states that the requirements for bicycle parking for multifamily residential and commercial developments are to be determined on a case-by-case basis. There would be 48 bicycle parking spaces in the 68 one- to two-car garages as well as a shared bicycle rack to hold four to five bicycles.

Finding – Bicycle facilities serving the project site are adequate and would be further enhanced upon completion of the planned bicycle projects in the project vicinity. The project includes 48 bicycle parking spaces in the private garages and a shared bicycle rack that can hold four to five bicycles.

Recommendation – Bicycle storage should be provided based on guidance from the City.

Transit Facilities

Existing Transit Facilities

Sonoma County Transit (SCT) provides fixed route bus service throughout the County of Sonoma, including within the City of Sonoma. The nearest transit stops within walking distance of the project site are located on both sides of SR 12 near the intersection with Ramon Street as well as at Maxwell Village Shopping Center and on the east side of SR 12 near Spain Street. While the transit stops located on the east of SR 12 are served by Routes 30X, 32, and 34, the transit stops located on the west of SR 12, including those near Ramon Street and located within the Maxwell Village Shopping Center, are served by Routes 32 and 34.

Existing transit routes and their operation are summarized in Table 5.

Table 5 – Transit Routes

Transit Agency Route	Distance to Stop (mi)[1]	Service			Connection
		Days of Operation	Time	Frequency	
Sonoma County Transit					
Route 30X	0.09	Sun	7:40 p.m. -8:30 p.m.	N/A*	Sonoma Plaza/Santa Rosa Transit Mall
Route 32	0.09	Mon – Fri Sat	7:30 a.m. – 4:20 p.m. 8:00 a.m. – 4:20 p.m.	0.5 – 1 hr	Sonoma Plaza/Fiesta Plaza/Sonoma Valley Hospital
Route 34	0.09	Mon-Fri	East: 6:45 p.m. – 7:50 p.m. West: 3:50 p.m. – 5:00 p.m.	N/A*	Sonoma Plaza/Santa Rosa Transit Mall

Note: [1] Defined as the shortest walking distance between the project site and the nearest bus stop; *Route 30X and 34 only operates once on Sunday
Source: https://sctransit.com/

Two or three bicycles can be carried on most SCT buses. Bike rack space is on a first come, first served basis.

Dial-a-ride, also known as paratransit, or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. Paratransit is provided by SCT Transit and is designed to serve the needs of individuals with disabilities within the County of Sonoma.

Impact on Transit Facilities

Existing transit stops are within an acceptable walking distance of the site and would be reachable upon construction of sidewalks on the project frontage with SR 12. Transit riders would be spread across multiple routes and times, resulting in a nominal increase in ridership per bus that could be accommodated within the existing available capacity.

Finding – Existing transit facilities serving the project site are adequate.

Significance Finding – The project would not conflict with any plans or policies for transportation facilities so would have a less-than-significant impact relative to this criteria.

Vehicle Miles Traveled (VMT)

The potential for the project to conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b) was evaluated based on the project's anticipated Vehicle Miles Traveled (VMT).

Background and Threshold of Significance

Senate Bill (SB) 743 established the change in vehicle miles traveled (VMT) as the metric to be applied for determining traffic impacts associated with development projects. Because the City of Sonoma has not yet adopted a standard of significance for evaluating VMT, guidance provided by the California Governor's Office of Planning and Research (OPR) in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018, was used. This document indicates that a residential project generating vehicle travel that is 15 or more percent below the existing citywide residential VMT per capita may indicate a less-than-significant transportation impact.

Project Impact on VMT

Based on data from the Sonoma County Transportation Authority (SCTA) travel demand model, which was most recently updated in December 2021, the City of Sonoma has a baseline average residential VMT of 28.94 miles per capita. Applying OPR's guidance, a residential project generating VMT that is 15 percent or more below the citywide baseline, or 24.60 miles per capita or less, would have a less-than-significant VMT impact. The SCTA model includes traffic analysis zones (TAZ) covering geographic areas throughout Sonoma County. The Montaldo Apartments project site is located within TAZ 829, which has a baseline VMT per capita of 26.84 miles. For the project to have a VMT per capita below the citywide significance threshold of 24.60 miles, a VMT reduction of at least 8.3 percent would need to be achieved.

The VMT associated with a development project is influenced by factors including the provision of onsite affordable housing and density. The publication *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity* published by California Air Pollution Control Officers Association (CAPCOA) includes a methodology to determine the VMT reductions associated with both of these factors. VMT reductions for the project were estimated using the VMT tool developed by SCTA, which applies the CAPCOA VMT reduction formulas and was intended for use by communities in Sonoma County.

Since 25 percent of the proposed units would be affordable, the SCTA VMT tool estimates that project VMT would be reduced by 7.2 percent. The potential for VMT reductions due to the density of the proposed project was also considered. The proposed project includes 50 apartment units on 2.14 net acres, resulting in a residential density of 23.3 units per acre. Per the CAPCOA methodology, this density was compared to the national suburban average of 9.1 units per acre and, based on the reduced number of trips associated with more compact development, translates to a VMT reduction of 30 percent below baseline levels. To provide greater certainty of the impact assessment, a more conservative approach was adopted. For the purpose of calculating a density-related reduction in VMT, the project density was assumed to be 50 percent lower than its actual level and was reduced from 23.3 units per acre to 11.7 units per acre.

Using this conservative assumption, the CAPCOA formula would estimate a VMT reduction of 6.2 percent due to the density of the project. When combined with the estimated 7.2 percent reduction due to the provision of affordable housing, this yields a combined VMT reduction of 13.4 percent. Per methodologies provided by CAPCOA, the number is dampened to 12.9 percent to reflect the diminishing effects of multiple VMT reduction strategies. With the application of this adjustment, the project is anticipated to generate 23.38 VMT per capita, which is below the applied VMT significance threshold of 24.60 VMT/capita. The proposed project would therefore be expected to result in a less-than-significant VMT impact. The VMT findings are shown in Table 6, and information including a summary of the input variables and adjustments is included in Appendix B.

Table 6 – Vehicle Miles Traveled Analysis Summary				
VMT Metric	**Citywide Baseline VMT Rate**	**Significance Threshold (15% below baseline)**	**Project TAZ VMT Rate**	**Resulting Significance**
Residential VMT per Capita (Citywide)	28.94	24.60	23.38	Less than significant

Note: VMT Rate is measured in VMT/Capita, or the number of daily miles driven per resident

Significance Finding – The project would be expected to have a less-than-significant transportation impact on vehicle miles traveled.

Safety Issues

The potential for the project to impact safety was evaluated in terms of the adequacy of sight distance and need for turn lanes at the project access. This section addresses the third transportation bullet on the CEQA checklist which is whether or not the project would substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Site Access

The site would be accessed via a proposed driveway on SR 12. Along the project frontage, SR 12 has a posted speed limit of 30 mph and a two-way left-turn lane (TWLTL) that can accommodate turns into and out of the project driveway.

Sight Distance

Sight distance along SR 12 at the project driveway was evaluated based on criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distances for minor street approaches that are either a private road or a driveway are based on stopping sight distance. Both use the approach travel speeds as the basis for determining the recommended sight distance. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street.

For a posted speed limit of 30 mph on SR 12, the minimum stopping sight distance needed is 200 feet. Based on the review of field conditions, sight lines to and from the project driveway extend approximately 300 feet to the north and 250 feet to the south, which is more than adequate for the posted speed limit. Additionally, adequate stopping sight distance is available for a following driver to notice and react to a preceding motorist slowing to turn right into the project driveway. Left turns into the project site would be accommodated by the existing two-way left-turn lane on SR 12. While sight lines are currently clear, care should be taken to maintain unobstructed sight lines during the design and construction of the proposed driveway, and placement of any roadside structures within the vision triangle should be avoided. The vision triangle is denoted graphically in Plate 1; the Intersection Sight Distance (ISD) length should be a minimum of 200 feet.

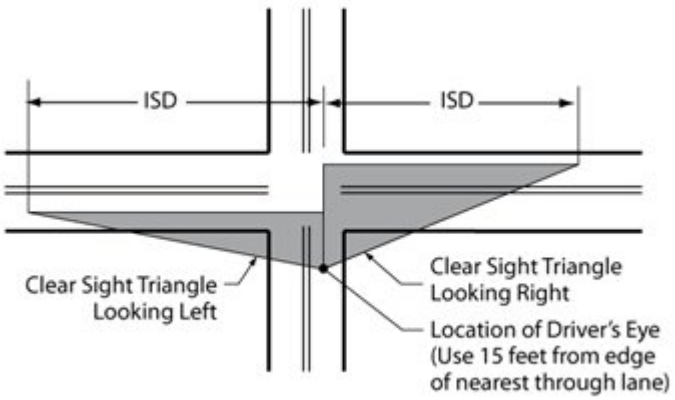


Plate 1 Vision Triangle Graphic

Finding – Sight distances along SR 12 at the location of the proposed driveway are adequate.

Recommendation – To maintain adequate sight distances, any new roadside structures and landscaping should be kept out of sight lines to the project driveway.

Significance Finding – The project would have a less-than-significant impact on safety as it would not introduce any hazards as a result of its design nor would it result in an incompatible use.

Emergency Access

The final transportation bullet on the CEQA checklist requires an evaluation as to whether the project would result in inadequate emergency access or not. This evaluation includes an analysis of the adequacy of the site's design to accommodate emergency response vehicles as well as the project's potential to increase emergency response times.

Adequacy of Site Access

The proposed driveway and drive aisles would be at least 22 feet wide, which would be adequate for emergency vehicle access. The proposed driveways and drive aisles are presumed to meet current *Sonoma Valley Fire District Fire Prevention Standards & Guidelines* and so can be expected to accommodate the access requirements for both emergency and passenger vehicles.

Off-Site Impacts

While the project would be expected to result in a minor increase in delay for traffic on SR 12, emergency response vehicles have lights and sirens to bypass queued traffic and minimize the effects of intersection delay; therefore, the project would be expected to have a negligible effect on emergency response times.

Significance Finding – Emergency access and circulation are anticipated to function acceptably, and traffic from the proposed development would be expected to have a less-than-significant impact on emergency response times.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

All the study intersections were analyzed using the signalized intersection methodology for auto modes published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 6th, 2018. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The signalized methodology is based on factors including traffic volumes, green time for each movement, phasing, whether the signals are coordinated or not, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using signal timing obtained from Caltrans.

The ranges of delay associated with the various levels of service are indicated in Table 7.

Table 7 – Signalized Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual*, Transportation Research Board, 6th, 2018

Traffic Operation Standards

Caltrans

All three intersections are along SR 12, and therefore under the jurisdiction of Caltrans, Caltrans does not have a standard of significance relative to operation as this is no longer a CEQA issue. The new *Vehicle Miles Traveled-Focused Transportation Impact Study Guide* (TISG), published in May 2020, replaced the *Guide for the Preparation of Traffic Impact Studies*, 2002. As indicated in the TISG, the Department is transitioning away from requesting LOS or other vehicle operations analyses of land use projects and will instead focus on Vehicle Miles Traveled (VMT). Adequacy of operation was therefore evaluated using the City of Sonoma's standards.

City of Sonoma

In the *2016 Circulation Element* of the *City of Sonoma General Plan*, the following policy was adopted:

> ***Policy 1.5**: Establish a motor vehicle Level of Service (LOS) standard of LOS D at intersections. The following shall be taken into consideration in applying this standard:*
>
> - *Efforts to meet the vehicle LOS standard shall not result in diminished safety for other modes including walking, bicycling, or transit (see Policy 1.6).*

- *The standard shall be applied to the overall intersection operation and not that of any individual approach or movement.*
- *Consideration shall be given to the operation of the intersection over time, rather than relying exclusively on peak period conditions.*
- *The five intersections surrounding the historic Sonoma Plaza shall be exempt from vehicle LOS standards in order to maintain the historic integrity of the Plaza and prioritize non-auto modes.*

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. The traffic count data was collected on Tuesday, July 12, 2022.

Intersection Levels of Service

Under existing conditions, all the study intersections operate acceptably at LOS A or B. A summary of the intersection Level of Service calculations is contained in Table 8. The existing traffic volumes are shown in Figure 3, and copies of the calculations are provided in Appendix C.

Table 8 – Existing Peak Hour Intersection Levels of Service

Study Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. SR 12/Verano Ave	14.6	B	16.4	B
2. SR 12/West Spain St	11.5	B	16.0	B
3. SR 12/West Napa St–Riverside Dr	9.6	A	11.4	B

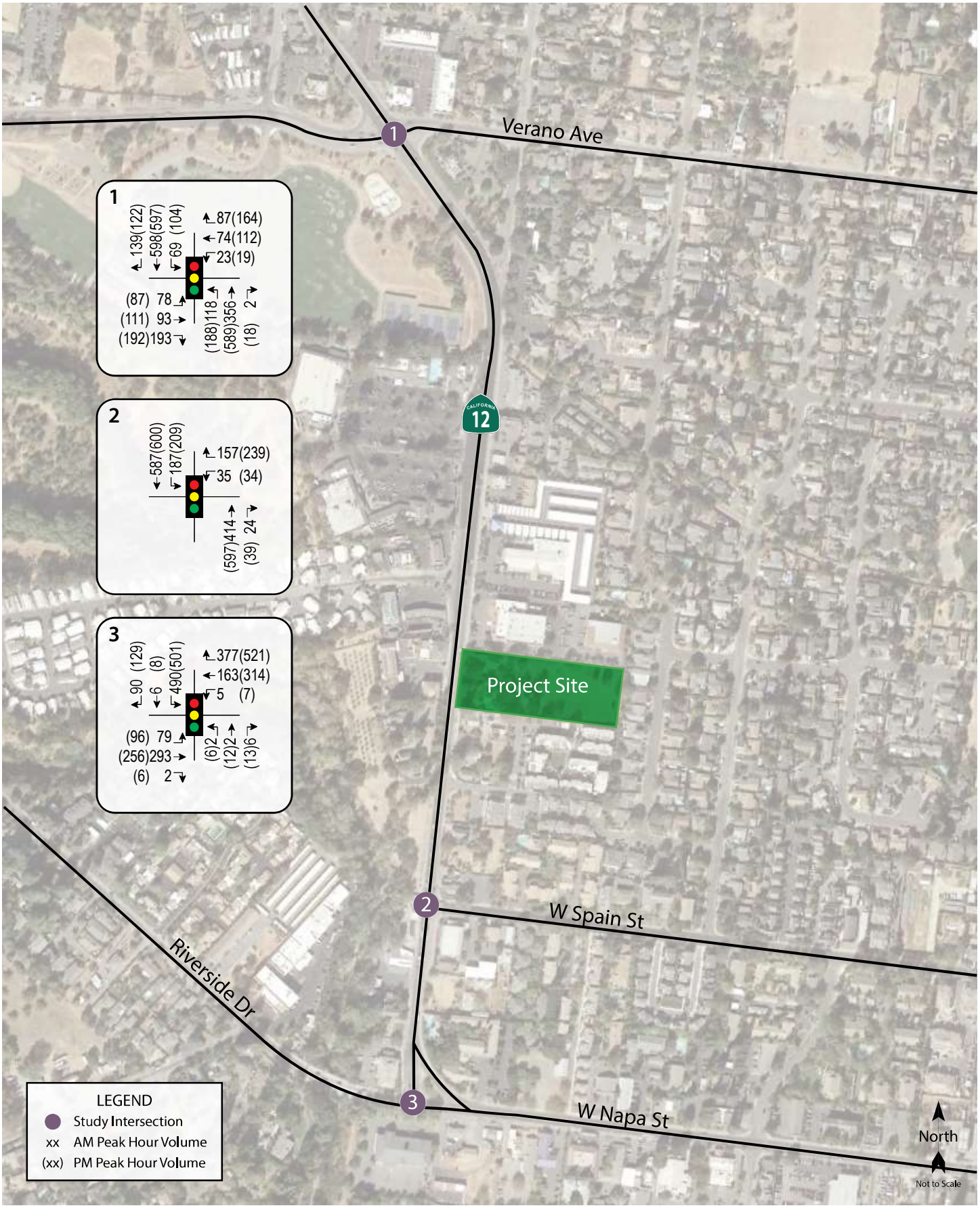
Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the Sonoma County Transportation Authority's (SCTA) gravity demand model and translated to turning movement volumes at each of the study intersections using the "Furness" method. The Furness method is an iterative process that employs existing turn movement data, existing link volumes, and future link volumes to project likely turning future movement volumes at intersections.

According to the City of Sonoma's *2016 Circulation Element*, the City and Caltrans may widen SR 12 between Riverside Drive and Maxwell Village Center, including the project frontage, to five lanes; however, this would only occur if the widening was determined to be necessary. In this analysis, it was assumed that SR 12 would remain in its existing configuration.

Under the anticipated Future volumes, the study intersections are expected to continue operating acceptably at Level of Service B or C. Future volumes are shown in Figure 4 and operating conditions are summarized in Table 9.



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Transportation Impact Study for the Montaldo Apartments Project

Figure 3 – Existing Traffic Volumes

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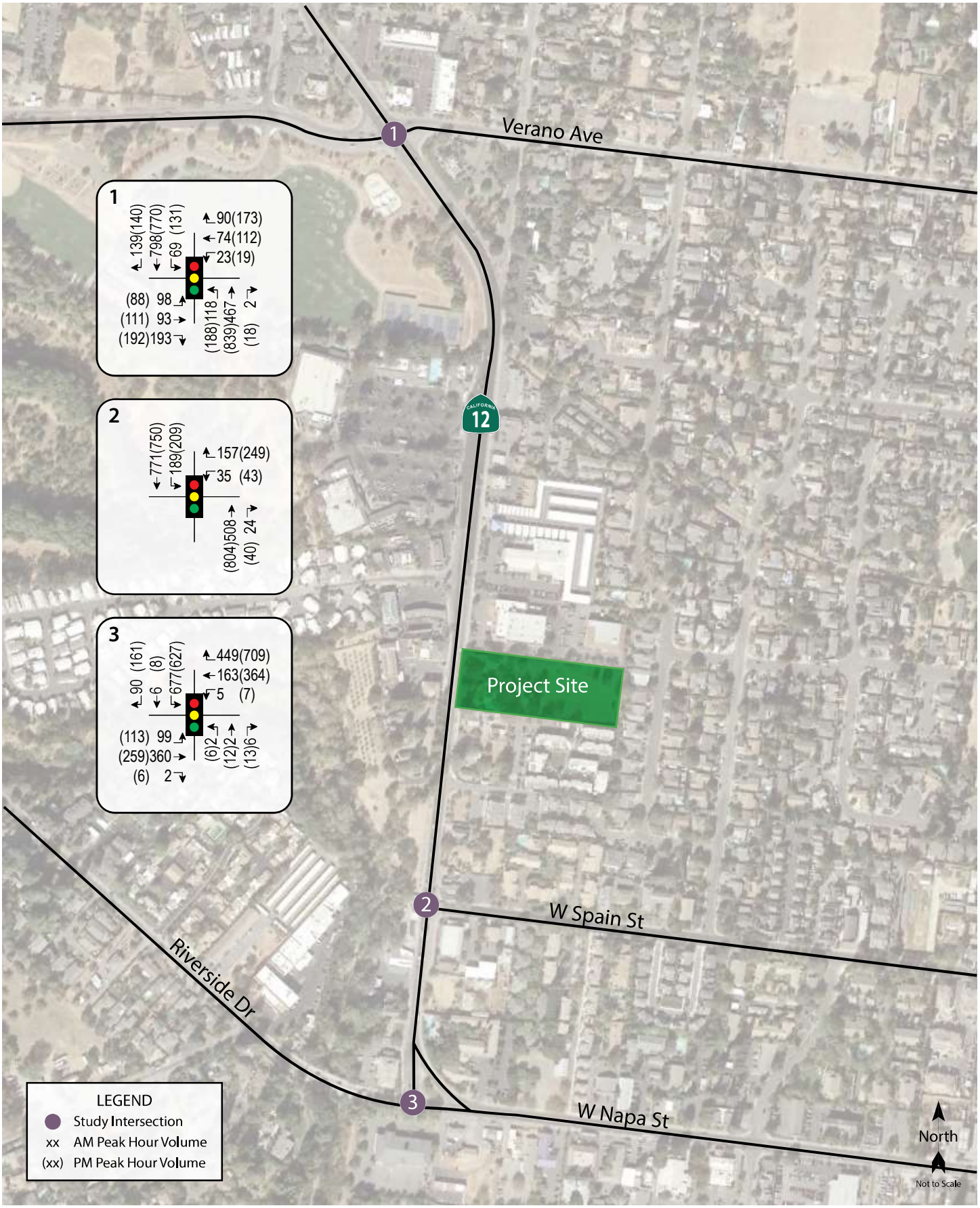

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Transportation Impact Study for the Montaldo Apartments Project

Figure 4 – Future Traffic Volumes

W-Trans

Table 9 – Future Peak Hour Intersection Levels of Service				
Study Intersection ***Approach***	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. SR 12/Verano Ave	15.6	B	17.8	B
2. SR 12/West Spain St	12.1	B	24.3	C
3. SR 12/West Napa St–Riverside Dr	10.8	B	12.6	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Project Conditions

Existing plus Project Conditions

Upon the addition of project–generated traffic to the Existing volumes, the study intersections are expected to continue operating acceptably at LOS A or B with no or minor increases to the intersection delays. These results are summarized in Table 10. Project traffic volumes are shown in Figure 5.

Table 10 – Existing and Existing plus Project Peak Hour Intersection Levels of Service								
Study Intersection ***Approach***	**Existing Conditions**				**Existing plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. SR 12/Verano Ave	14.6	B	16.4	B	14.6	B	16.4	B
2. SR 12/West Spain St	11.5	B	16.0	B	11.5	B	16.3	B
3. SR 12/West Napa St–Riverside Dr	9.7	A	11.4	B	9.7	A	11.4	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding – The study intersections are expected to continue operating acceptably at the same Levels of Service upon the addition of project-generated traffic as without it.

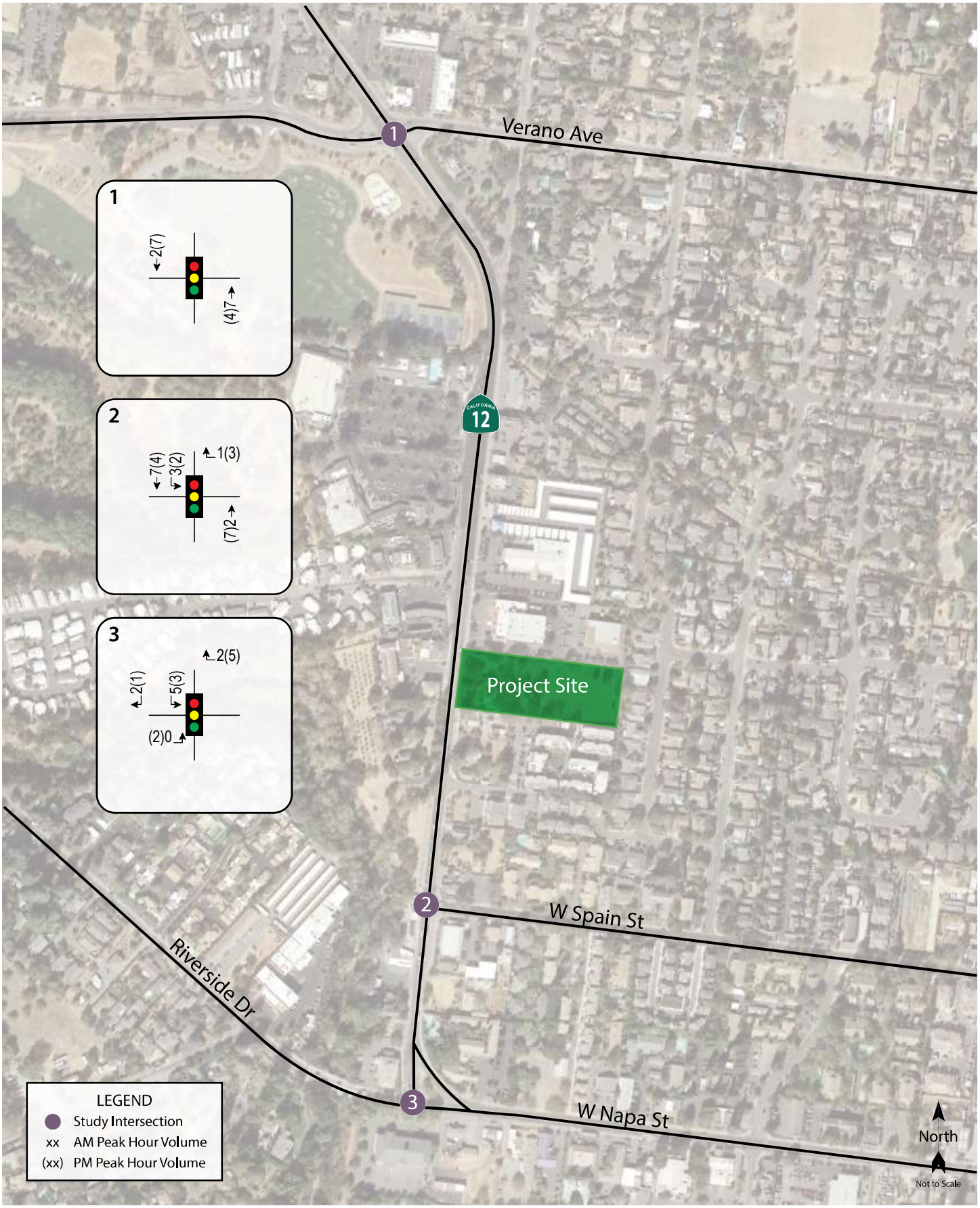
Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, the study intersections are expected to operate acceptably at LOS B or C. Project trips would result in no or minor increases to the intersection delays. The Future plus Project operating conditions are summarized in Table 11.

Table 11 – Future and Future plus Project Peak Hour Intersection Levels of Service								
Study Intersection ***Approach***	**Future Conditions**				**Future plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. SR 12/Verano Ave	15.6	B	17.8	B	15.6	B	17.8	B
2. SR 12/West Spain St	12.1	B	24.3	C	12.2	B	25.2	C
3. SR 12/West Napa St–Riverside Dr	10.8	B	12.6	B	10.8	B	12.6	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding – The study intersections would continue operating acceptably with project traffic added, at the same Levels of Service as without it.



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Transportation Impact Study for the Montaldo Apartments Project

Figure 5 – Project Traffic Volumes

Parking

The project was analyzed to determine whether the proposed parking supply would be sufficient for the anticipated parking demand. The project site as proposed would provide a total of 94 parking spaces, including 68 garage spaces, 21 open parking spaces, and three covered parking spaces; it is noted that seven of 24 non-garage spaces would be assigned to the residents while the remaining 19 non-garage spaces would be used as guest parking spaces.

Based on the City of Sonoma Municipal Code, Chapter 19.48.040; Number of Parking Spaces Required, multifamily housings are required to provide residential parking at a rate of 1.5 spaces per unit plus guest parking at a rate of 25 percent of the total required spaces. These rates translate to a total required parking supply of 94 spaces, including 75 residential parking spaces and 19 guest parking spaces. The proposed parking supply of 94 spaces meets the City requirements.

It is noted that although the proposed parking supply meets the City requirements, the project qualifies to provide less parking based on the California Density Bonus Law (AB 2345), which states that local governments may not require parking at a rate of more than 1.5 parking spaces per 2-bedroom unit, upon the developer's request. As the project includes 50 2-bedroom units, a total of 75 parking spaces would be required based on the California Density Bonus Law, which is fewer than the proposed parking supply.

The proposed parking supply and City and State requirements are shown in Table 12.

Table 12 – Parking Analysis Summary

Land Use	Units	Supply (spaces)	City Requirements		State Requirements	
			Rate	Spaces Required	Rate	Spaces Required
Multifamily Housing	(50) 2-bdr	94	1.875 per du	94	1.5 per 2-bdr	75

Notes: bdr = bedrooms; du = dwelling units.

Finding – The proposed parking supply would satisfy the State's Density Bonus Law and City Code requirements.

Conclusions and Recommendations

Conclusions

CEQA Issues

- The proposed project would generate an average of 366 trips per day at the driveway, including 23 a.m. peak hour trips and 28 trips during the p.m. peak hour. After accounting for the trips associated with the existing single-family housing on-site, the project would be expected to generate an average of 356 new daily trips, including 22 new morning peak hour trips and 27 new afternoon peak hour trips.

- Upon completion of the project, there would be adequate pedestrian facilities between the project site and the nearby shopping centers to the north. Between the project site and Staples Shopping Center to the south, however, sidewalks on SR 12 are missing along the undeveloped parcels and require pedestrians to walk on the roadway shoulders.

- The existing bicycle facilities are adequate and would be further improved upon completion of the planned bicycle projects in the project vicinity. Existing transit facilities are adequate to serve trips from and to the project site. Within the project site, there would be 48 bicycle parking spaces in the private garages and a shared bicycle rack that can hold four to five bicycles.

- The project is expected to have a less-than-significant impact on VMT.

- There are adequate sight distances along SR 12 at the proposed driveway location.

- The proposed access and circulation are anticipated to function acceptably for emergency response vehicles. Further, the project-generated trips would be expected to have a less-than-significant impact on emergency response times.

Policy Issues

- Under Existing and Future Conditions, the study intersections are expected to operate acceptably with and without the project trips.

- The proposed parking supply would satisfy both the State Density Bonus Law and City parking requirements.

Recommendations

CEQA Issues

- To maintain adequate sight distances, any new roadside structures and landscaping should be placed out of sight lines at the project driveway.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE, PTOE
Assistant Planner	Jade Kim
Assistant Engineer	Nathan Sharafian
Graphics	Cameron Wong
Editing/Formatting	Alex Scrobonia, Hannah Yung-Boxdell, Jessica Bender
Quality Control	Dalene J. Whitlock, PE, PTOE

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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Worksheet

Montaldo Apartments

Intersection # 1: SR-12 & Verano Avenue
Date of Count: Tuesday, July 12, 2022

Number of Collisions: 26
Number of Injuries: 10
Number of Fatalities: 0
Average Daily Traffic (ADT): 22900
Start Date: August 1, 2016
End Date: July 31, 2021
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Suburban

$$\text{Collision Rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x Days per Year x Number of Years}}$$

$$\text{Collision Rate} = \frac{26 \times 1{,}000{,}000}{22{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.62 c/mve**	**0.0%**	**38.5%**
Statewide Average*	**0.42 c/mve**	**0.5%**	**37.4%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Intersection # 2: SR-12 & W Napa St-Riverside Dr
Date of Count: Tuesday, July 12, 2022

Number of Collisions: 10
Number of Injuries: 2
Number of Fatalities: 0
Average Daily Traffic (ADT): 18900
Start Date: August 1, 2016
End Date: July 31, 2021
Number of Years: 5

Intersection Type: Tee
Control Type: Signals
Area: Urban

$$\text{Collision Rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x Days per Year x Number of Years}}$$

$$\text{Collision Rate} = \frac{10 \times 1{,}000{,}000}{18{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.29 c/mve**	**0.0%**	**20.0%**
Statewide Average*	**0.20 c/mve**	**0.5%**	**46.8%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Worksheet

Montaldo Apartments

Intersection # 3: SR-12 & W Spain St
Date of Count: Tuesday, July 12, 2022

Number of Collisions: 9
Number of Injuries: 4
Number of Fatalities: 0
Average Daily Traffic (ADT): 17600
Start Date: August 1, 2016
End Date: July 31, 2021
Number of Years: 5

Intersection Type: Tee
Control Type: Signals
Area: Urban

$$\text{Collision Rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x Days per Year x Number of Years}}$$

$$\text{Collision Rate} = \frac{9 \times 1{,}000{,}000}{17{,}600 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.28 c/mve**	**0.0%**	**44.4%**
Statewide Average*	**0.20 c/mve**	**0.5%**	**46.8%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Appendix B

VMT Calculations

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Montaldo Apartment VMT Assessment

W-Trans 8/28/2022

OPR Residential VMT Threshold

28.94 VMT/Capita Citywide Average - City of Sonoma
24.60 OPR Threshold = 15% below Citywide Average

Base Unadjusted Project VMT

26.84 Base VMT/Capita from SCTA Model - Project in TAZ 829

50 Multi Family Units | 2.13 Occupancy/Unit | 107 Residents

2858 Base Unadjusted Project VMT (mi) | Residents ("capita")

VMT Adjustments and Potential Mitigation Measures

26.84 Base VMT/Capita from SCTA Model - Project in TAZ 829
24.60 OPR Threshold = 15% below Citywide Average
-8.3% Project VMT Reduction Required to meet OPR Threshold

A. Density Adjustment

Source: CAPCOA 2021 *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*

Note: calculated density reduced by 50% compared to actual to be conservative

50 Project Units
-6.2% VMT Reduction
-1.66 Adjustment to Base Project VMT/Capita
2.14 Project Acres
23.4 Project Density

B. Integrate Affordable Housing

Source: California Housing Partnership

13 units: 5 Low Income, 5 Very Low Income, 3 Extremely Low Income
-7.2% VMT Reduction
-1.92 Adjustment to Base Project VMT/Capita

Combined VMT Adjustments (A through B)

-13.4% Combined Measures VMT Reduction (unadjusted)
-12.9% Adjusted for Dampening of Combined Measures (per CAPCOA)
-3.46 Adjustment to Base Project VMT/Capita

VMT Projections After Adjustments and Mitigation

26.84 Base VMT/Capita from SCTA Model
-3.46 Adjustment to Base Project VMT/Capita
23.38 Project VMT/Capita with Adjustments
24.60 OPR Significance Threshold
YES Is threshold met with adjustments and mitigation?

2858 Unadjusted Base Residential VMT (mi)
-369 VMT Reduction with Adjustments
2490 Project VMT (mi) with Adjustments

Appendix C

Intersection Level of Service Calculations

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HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	78	93	193	23	74	87	118	356	2	69	598	139
Future Volume (veh/h)	78	93	193	23	74	87	118	356	2	69	598	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1864	1864	1864	1841	1841	1841	1856	1856	1856
Adj Flow Rate, veh/h	81	97	154	24	77	52	123	371	0	72	623	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	3	3	3
Cap, veh/h	309	329	278	129	267	278	233	1380		180	1283	
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.13	0.39	0.00	0.10	0.36	0.00
Sat Flow, veh/h	1253	1864	1572	214	1509	1572	1753	3589	0	1767	3618	0
Grp Volume(v), veh/h	81	97	154	101	0	52	123	371	0	72	623	0
Grp Sat Flow(s),veh/h/ln	1253	1864	1572	1723	0	1572	1753	1749	0	1767	1763	0
Q Serve(g_s), s	2.9	2.2	4.4	0.0	0.0	1.4	3.2	3.5	0.0	1.9	6.7	0.0
Cycle Q Clear(g_c), s	5.3	2.2	4.4	2.3	0.0	1.4	3.2	3.5	0.0	1.9	6.7	0.0
Prop In Lane	1.00		1.00	0.24		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	309	329	278	395	0	278	233	1380		180	1283	
V/C Ratio(X)	0.26	0.29	0.55	0.26	0.00	0.19	0.53	0.27		0.40	0.49	
Avail Cap(c_a), veh/h	677	876	739	901	0	771	716	3930		361	3962	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.8	17.5	18.4	17.5	0.0	17.2	19.8	10.0	0.0	20.6	12.0	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.6	0.1	0.0	0.1	0.7	0.1	0.0	0.5	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.9	1.5	0.9	0.0	0.5	1.2	1.1	0.0	0.7	2.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	17.7	19.0	17.7	0.0	17.3	20.5	10.2	0.0	21.1	12.4	0.0
LnGrp LOS	B	B	B	B	A	B	C	B		C	B	
Approach Vol, veh/h		332			153			494			695	
Approach Delay, s/veh		18.9			17.5			12.8			13.3	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.7	22.9		14.3	10.2	24.4		14.3
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24
Max Q Clear Time (g_c+I1), s	5.2	8.7		7.3	3.9	5.5		4.3
Green Ext Time (p_c), s	0.1	7.2		0.7	0.0	4.0		0.4

Intersection Summary	
HCM 6th Ctrl Delay	14.6
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	157	414	24	187	587
Future Volume (veh/h)	35	157	414	24	187	587
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1885	1885	1841	1841	1856	1856
Adj Flow Rate, veh/h	38	171	450	26	203	638
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	4	4	3	3
Cap, veh/h	261	233	656	556	359	1230
Arrive On Green	0.15	0.15	0.36	0.36	0.20	0.66
Sat Flow, veh/h	1795	1598	1841	1560	1767	1856
Grp Volume(v), veh/h	38	171	450	26	203	638
Grp Sat Flow(s),veh/h/ln	1795	1598	1841	1560	1767	1856
Q Serve(g_s), s	0.8	4.7	9.5	0.5	4.7	8.0
Cycle Q Clear(g_c), s	0.8	4.7	9.5	0.5	4.7	8.0
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	261	233	656	556	359	1230
V/C Ratio(X)	0.15	0.73	0.69	0.05	0.57	0.52
Avail Cap(c_a), veh/h	712	633	1824	1546	623	1838
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.9	18.6	12.5	9.6	16.3	3.9
Incr Delay (d2), s/veh	0.3	4.5	1.8	0.0	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.8	3.5	0.1	1.7	1.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.2	23.0	14.3	9.6	16.8	4.4
LnGrp LOS	B	C	B	A	B	A
Approach Vol, veh/h	209		476			841
Approach Delay, s/veh	22.0		14.0			7.4
Approach LOS	C		B			A

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	13.9	20.9				34.8	10.6
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	6.7	11.5				10.0	6.7
Green Ext Time (p_c), s	0.2	4.7				7.4	0.5

Intersection Summary	
HCM 6th Ctrl Delay	11.5
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	79	293	2	5	163	377	2	2	6	490	6	90
Future Volume (veh/h)	79	293	2	5	163	377	2	2	6	490	6	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1856	1856	1900	1900	1900	1856	1856	1856
Adj Flow Rate, veh/h	83	308	2	5	172	0	2	2	6	516	6	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	3	3	3
Cap, veh/h	664	641	4	111	632		10	10	30	1051	29	457
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.00	0.03	0.03	0.03	0.31	0.31	0.31
Sat Flow, veh/h	1210	1856	12	13	1832	1572	340	340	1020	3428	94	1493
Grp Volume(v), veh/h	83	0	310	177	0	0	10	0	0	516	0	101
Grp Sat Flow(s),veh/h/ln	1210	0	1868	1845	0	1572	1699	0	0	1714	0	1587
Q Serve(g_s), s	0.0	0.0	4.5	0.0	0.0	0.0	0.2	0.0	0.0	4.3	0.0	1.6
Cycle Q Clear(g_c), s	1.1	0.0	4.5	2.4	0.0	0.0	0.2	0.0	0.0	4.3	0.0	1.6
Prop In Lane	1.00		0.01	0.03		1.00	0.20		0.60	1.00		0.94
Lane Grp Cap(c), veh/h	664	0	645	743	0		49	0	0	1051	0	486
V/C Ratio(X)	0.12	0.00	0.48	0.24	0.00		0.20	0.00	0.00	0.49	0.00	0.21
Avail Cap(c_a), veh/h	1151	0	1397	1475	0		538	0	0	5423	0	2510
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.8	0.0	8.9	8.2	0.0	0.0	16.5	0.0	0.0	9.8	0.0	8.9
Incr Delay (d2), s/veh	0.1	0.0	0.6	0.2	0.0	0.0	0.7	0.0	0.0	0.5	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.4	0.7	0.0	0.0	0.1	0.0	0.0	1.2	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.9	0.0	9.5	8.4	0.0	0.0	17.2	0.0	0.0	10.4	0.0	9.2
LnGrp LOS	A	A	A	A	A		B	A	A	B	A	A
Approach Vol, veh/h		393			177			10			617	
Approach Delay, s/veh		9.2			8.4			17.2			10.2	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		14.4		15.7		4.7		15.7				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		6.3		4.4		2.2		6.5				
Green Ext Time (p_c), s		4.4		0.9		0.0		2.0				

Intersection Summary	
HCM 6th Ctrl Delay	9.6
HCM 6th LOS	A

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	111	192	19	112	164	188	589	18	104	597	122
Future Volume (veh/h)	87	111	192	19	112	164	188	589	18	104	597	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1894	1894	1894	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	90	114	152	20	115	131	194	607	0	107	615	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	0	0	0	1	1	1	1	1	1
Cap, veh/h	311	400	335	105	362	336	258	1288		216	1205	
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.14	0.36	0.00	0.12	0.34	0.00
Sat Flow, veh/h	1123	1864	1562	123	1686	1565	1795	3676	0	1795	3676	0
Grp Volume(v), veh/h	90	114	152	135	0	131	194	607	0	107	615	0
Grp Sat Flow(s),veh/h/ln	1123	1864	1562	1809	0	1565	1795	1791	0	1795	1791	0
Q Serve(g_s), s	3.9	2.7	4.4	0.0	0.0	3.8	5.4	6.8	0.0	2.9	7.2	0.0
Cycle Q Clear(g_c), s	7.0	2.7	4.4	3.2	0.0	3.8	5.4	6.8	0.0	2.9	7.2	0.0
Prop In Lane	1.00		1.00	0.15		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	311	400	335	467	0	336	258	1288		216	1205	
V/C Ratio(X)	0.29	0.28	0.45	0.29	0.00	0.39	0.75	0.47		0.49	0.51	
Avail Cap(c_a), veh/h	562	818	686	885	0	717	685	3759		343	3759	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.4	17.2	17.9	17.4	0.0	17.6	21.5	12.9	0.0	21.6	13.9	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.4	0.1	0.0	0.3	1.7	0.4	0.0	0.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	1.1	1.5	1.3	0.0	1.3	2.2	2.4	0.0	1.2	2.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	17.4	18.3	17.5	0.0	17.9	23.2	13.3	0.0	22.2	14.4	0.0
LnGrp LOS	C	B	B	B	A	B	C	B		C	B	
Approach Vol, veh/h		356			266			801			722	
Approach Delay, s/veh		18.6			17.7			15.7			15.6	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.7	22.7		17.0	11.5	23.9		17.0				
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7				
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24				
Max Q Clear Time (g_c+I1), s	7.4	9.2		9.0	4.9	8.8		5.8				
Green Ext Time (p_c), s	0.2	7.1		0.8	0.1	7.0		0.7				

Intersection Summary	
HCM 6th Ctrl Delay	16.4
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	34	239	597	39	209	600	
Future Volume (veh/h)	34	239	597	39	209	600	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	
Adj Flow Rate, veh/h	36	252	628	41	220	632	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	1	1	1	1	1	1	
Cap, veh/h	344	306	809	685	287	1256	
Arrive On Green	0.19	0.19	0.43	0.43	0.16	0.67	
Sat Flow, veh/h	1795	1598	1885	1596	1795	1885	
Grp Volume(v), veh/h	36	252	628	41	220	632	
Grp Sat Flow(s),veh/h/ln	1795	1598	1885	1596	1795	1885	
Q Serve(g_s), s	1.0	9.2	17.4	0.9	7.2	10.3	
Cycle Q Clear(g_c), s	1.0	9.2	17.4	0.9	7.2	10.3	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	344	306	809	685	287	1256	
V/C Ratio(X)	0.10	0.82	0.78	0.06	0.77	0.50	
Avail Cap(c_a), veh/h	529	471	1390	1176	471	1390	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	20.4	23.7	14.9	10.2	24.5	5.1	
Incr Delay (d2), s/veh	0.1	6.9	2.3	0.1	1.6	0.4	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.4	3.8	6.9	0.3	3.0	2.8	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	20.5	30.5	17.2	10.3	26.2	5.6	
LnGrp LOS	C	C	B	B	C	A	
Approach Vol, veh/h	288		669			852	
Approach Delay, s/veh	29.3		16.8			10.9	
Approach LOS	C		B			B	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	14.5	30.9				45.3	15.7
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	9.2	19.4				12.3	11.2
Green Ext Time (p_c), s	0.2	6.8				7.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	16.0
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	256	6	7	314	521	6	12	13	501	8	129
Future Volume (veh/h)	96	256	6	7	314	521	6	12	13	501	8	129
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	104	278	7	8	341	0	7	13	14	545	9	140
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	524	572	14	99	578		31	58	63	1100	31	476
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.00	0.09	0.09	0.09	0.32	0.32	0.32
Sat Flow, veh/h	1049	1843	46	13	1863	1598	360	669	720	3483	97	1508
Grp Volume(v), veh/h	104	0	285	349	0	0	34	0	0	545	0	149
Grp Sat Flow(s),veh/h/ln	1049	0	1889	1876	0	1598	1750	0	0	1742	0	1605
Q Serve(g_s), s	0.0	0.0	4.7	0.0	0.0	0.0	0.7	0.0	0.0	4.9	0.0	2.7
Cycle Q Clear(g_c), s	2.7	0.0	4.7	6.1	0.0	0.0	0.7	0.0	0.0	4.9	0.0	2.7
Prop In Lane	1.00		0.02	0.02		1.00	0.21		0.41	1.00		0.94
Lane Grp Cap(c), veh/h	524	0	586	677	0		152	0	0	1100	0	507
V/C Ratio(X)	0.20	0.00	0.49	0.52	0.00		0.22	0.00	0.00	0.50	0.00	0.29
Avail Cap(c_a), veh/h	904	0	1270	1348	0		497	0	0	4952	0	2282
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.1	0.0	10.8	11.3	0.0	0.0	16.4	0.0	0.0	10.7	0.0	10.0
Incr Delay (d2), s/veh	0.2	0.0	0.6	0.6	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.6	2.1	0.0	0.0	0.3	0.0	0.0	1.5	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.3	0.0	11.5	11.9	0.0	0.0	16.7	0.0	0.0	11.2	0.0	10.4
LnGrp LOS	B	A	B	B	A		B	A	A	B	A	B
Approach Vol, veh/h		389			349			34			694	
Approach Delay, s/veh		11.2			11.9			16.7			11.1	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.9		15.7		7.1		15.7				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		6.9		8.1		2.7		6.7				
Green Ext Time (p_c), s		5.2		2.0		0.0		2.0				

Intersection Summary	
HCM 6th Ctrl Delay	11.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	78	93	193	23	74	87	118	363	2	69	600	139
Future Volume (veh/h)	78	93	193	23	74	87	118	363	2	69	600	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1864	1864	1864	1841	1841	1841	1856	1856	1856
Adj Flow Rate, veh/h	81	97	154	24	77	52	123	378	0	72	625	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	3	3	3
Cap, veh/h	309	329	277	129	266	277	233	1382		180	1285	
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.13	0.40	0.00	0.10	0.36	0.00
Sat Flow, veh/h	1253	1864	1572	214	1509	1572	1753	3589	0	1767	3618	0
Grp Volume(v), veh/h	81	97	154	101	0	52	123	378	0	72	625	0
Grp Sat Flow(s),veh/h/ln	1253	1864	1572	1723	0	1572	1753	1749	0	1767	1763	0
Q Serve(g_s), s	2.9	2.2	4.4	0.0	0.0	1.4	3.2	3.6	0.0	1.9	6.7	0.0
Cycle Q Clear(g_c), s	5.3	2.2	4.4	2.3	0.0	1.4	3.2	3.6	0.0	1.9	6.7	0.0
Prop In Lane	1.00		1.00	0.24		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	309	329	277	395	0	277	233	1382		180	1285	
V/C Ratio(X)	0.26	0.29	0.56	0.26	0.00	0.19	0.53	0.27		0.40	0.49	
Avail Cap(c_a), veh/h	676	875	738	900	0	770	716	3926		361	3958	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.9	17.5	18.4	17.6	0.0	17.2	19.8	10.1	0.0	20.6	12.0	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.6	0.1	0.0	0.1	0.7	0.2	0.0	0.5	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.9	1.5	0.9	0.0	0.5	1.2	1.2	0.0	0.7	2.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	17.7	19.1	17.7	0.0	17.3	20.5	10.2	0.0	21.1	12.4	0.0
LnGrp LOS	C	B	B	B	A	B	C	B		C	B	
Approach Vol, veh/h		332			153			501			697	
Approach Delay, s/veh		18.9			17.6			12.7			13.3	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.7	23.0		14.3	10.2	24.5		14.3				
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7				
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24				
Max Q Clear Time (g_c+I1), s	5.2	8.7		7.3	3.9	5.6		4.3				
Green Ext Time (p_c), s	0.1	7.3		0.7	0.0	4.0		0.4				

Intersection Summary			
HCM 6th Ctrl Delay		14.6	
HCM 6th LOS		B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	158	416	24	190	594
Future Volume (veh/h)	35	158	416	24	190	594
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1885	1885	1841	1841	1856	1856
Adj Flow Rate, veh/h	38	172	452	26	207	646
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	4	4	3	3
Cap, veh/h	263	234	657	557	359	1230
Arrive On Green	0.15	0.15	0.36	0.36	0.20	0.66
Sat Flow, veh/h	1795	1598	1841	1560	1767	1856
Grp Volume(v), veh/h	38	172	452	26	207	646
Grp Sat Flow(s),veh/h/ln	1795	1598	1841	1560	1767	1856
Q Serve(g_s), s	0.8	4.7	9.6	0.5	4.8	8.2
Cycle Q Clear(g_c), s	0.8	4.7	9.6	0.5	4.8	8.2
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	263	234	657	557	359	1230
V/C Ratio(X)	0.14	0.74	0.69	0.05	0.58	0.53
Avail Cap(c_a), veh/h	708	630	1815	1538	619	1829
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.0	18.6	12.5	9.6	16.4	4.0
Incr Delay (d2), s/veh	0.3	4.5	1.8	0.0	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.8	3.5	0.1	1.7	1.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.2	23.1	14.3	9.6	17.0	4.5
LnGrp LOS	B	C	B	A	B	A
Approach Vol, veh/h	210		478			853
Approach Delay, s/veh	22.1		14.1			7.5
Approach LOS	C		B			A

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	14.0	21.0				35.0	10.7
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	6.8	11.6				10.2	6.7
Green Ext Time (p_c), s	0.2	4.7				7.5	0.5

Intersection Summary			
HCM 6th Ctrl Delay		11.5	
HCM 6th LOS		B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	79	293	2	5	163	379	2	2	6	495	6	92
Future Volume (veh/h)	79	293	2	5	163	379	2	2	6	495	6	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1856	1856	1900	1900	1900	1856	1856	1856
Adj Flow Rate, veh/h	83	308	2	5	172	0	2	2	6	521	6	97
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	3	3	3
Cap, veh/h	662	638	4	111	630		10	10	30	1058	29	461
Arrive On Green	0.34	0.34	0.34	0.34	0.34	0.00	0.03	0.03	0.03	0.31	0.31	0.31
Sat Flow, veh/h	1210	1856	12	13	1832	1572	340	340	1020	3428	92	1494
Grp Volume(v), veh/h	83	0	310	177	0	0	10	0	0	521	0	103
Grp Sat Flow(s),veh/h/ln	1210	0	1868	1845	0	1572	1699	0	0	1714	0	1587
Q Serve(g_s), s	0.0	0.0	4.6	0.0	0.0	0.0	0.2	0.0	0.0	4.3	0.0	1.7
Cycle Q Clear(g_c), s	1.1	0.0	4.6	2.4	0.0	0.0	0.2	0.0	0.0	4.3	0.0	1.7
Prop In Lane	1.00		0.01	0.03		1.00	0.20		0.60	1.00		0.94
Lane Grp Cap(c), veh/h	662	0	643	741	0		49	0	0	1058	0	490
V/C Ratio(X)	0.13	0.00	0.48	0.24	0.00		0.20	0.00	0.00	0.49	0.00	0.21
Avail Cap(c_a), veh/h	1148	0	1392	1470	0		536	0	0	5405	0	2501
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.9	0.0	9.0	8.3	0.0	0.0	16.5	0.0	0.0	9.8	0.0	8.9
Incr Delay (d2), s/veh	0.1	0.0	0.6	0.2	0.0	0.0	0.7	0.0	0.0	0.5	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.4	0.7	0.0	0.0	0.1	0.0	0.0	1.2	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.0	0.0	9.6	8.5	0.0	0.0	17.3	0.0	0.0	10.3	0.0	9.2
LnGrp LOS	A	A	A	A	A		B	A	A	B	A	A
Approach Vol, veh/h		393			177			10			624	
Approach Delay, s/veh		9.2			8.5			17.3			10.2	
Approach LOS		A			A			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		14.5		15.7		4.7		15.7				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		6.3		4.4		2.2		6.6				
Green Ext Time (p_c), s		4.5		0.9		0.0		2.0				

Intersection Summary	
HCM 6th Ctrl Delay	9.7
HCM 6th LOS	A

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	111	192	19	112	164	188	593	18	104	604	122
Future Volume (veh/h)	87	111	192	19	112	164	188	593	18	104	604	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1894	1894	1894	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	90	114	152	20	115	131	194	611	0	107	623	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	0	0	0	1	1	1	1	1	1
Cap, veh/h	310	400	335	105	362	336	257	1295		216	1213	
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.14	0.36	0.00	0.12	0.34	0.00
Sat Flow, veh/h	1123	1864	1562	123	1686	1565	1795	3676	0	1795	3676	0
Grp Volume(v), veh/h	90	114	152	135	0	131	194	611	0	107	623	0
Grp Sat Flow(s),veh/h/ln	1123	1864	1562	1809	0	1565	1795	1791	0	1795	1791	0
Q Serve(g_s), s	3.9	2.7	4.5	0.0	0.0	3.8	5.5	6.9	0.0	2.9	7.3	0.0
Cycle Q Clear(g_c), s	7.1	2.7	4.5	3.2	0.0	3.8	5.5	6.9	0.0	2.9	7.3	0.0
Prop In Lane	1.00		1.00	0.15		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	310	400	335	466	0	336	257	1295		216	1213	
V/C Ratio(X)	0.29	0.29	0.45	0.29	0.00	0.39	0.76	0.47		0.50	0.51	
Avail Cap(c_a), veh/h	559	814	682	881	0	713	682	3741		341	3741	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.5	17.3	18.0	17.5	0.0	17.7	21.7	12.9	0.0	21.7	13.9	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.4	0.1	0.0	0.3	1.7	0.4	0.0	0.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	1.1	1.5	1.3	0.0	1.3	2.2	2.4	0.0	1.2	2.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.7	17.5	18.4	17.6	0.0	18.0	23.4	13.3	0.0	22.3	14.4	0.0
LnGrp LOS	C	B	B	B	A	B	C	B		C	B	
Approach Vol, veh/h		356			266			805			730	
Approach Delay, s/veh		18.7			17.8			15.7			15.6	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.7	22.9		17.0	11.5	24.1		17.0				
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7				
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24				
Max Q Clear Time (g_c+I1), s	7.5	9.3		9.1	4.9	8.9		5.8				
Green Ext Time (p_c), s	0.2	7.2		0.8	0.1	7.0		0.7				

Intersection Summary	
HCM 6th Ctrl Delay	16.4
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	34	242	604	39	211	604	
Future Volume (veh/h)	34	242	604	39	211	604	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	
Adj Flow Rate, veh/h	36	255	636	41	222	636	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	1	1	1	1	1	1	
Cap, veh/h	346	308	815	690	284	1256	
Arrive On Green	0.19	0.19	0.43	0.43	0.16	0.67	
Sat Flow, veh/h	1795	1598	1885	1596	1795	1885	
Grp Volume(v), veh/h	36	255	636	41	222	636	
Grp Sat Flow(s),veh/h/ln	1795	1598	1885	1596	1795	1885	
Q Serve(g_s), s	1.0	9.5	17.9	0.9	7.3	10.5	
Cycle Q Clear(g_c), s	1.0	9.5	17.9	0.9	7.3	10.5	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	346	308	815	690	284	1256	
V/C Ratio(X)	0.10	0.83	0.78	0.06	0.78	0.51	
Avail Cap(c_a), veh/h	523	465	1372	1161	465	1372	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	20.6	24.0	15.0	10.2	25.0	5.2	
Incr Delay (d2), s/veh	0.1	7.5	2.4	0.1	1.8	0.5	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.4	4.0	7.1	0.3	3.1	2.9	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	20.7	31.4	17.4	10.3	26.8	5.6	
LnGrp LOS	C	C	B	B	C	A	
Approach Vol, veh/h	291		677			858	
Approach Delay, s/veh	30.1		17.0			11.1	
Approach LOS	C		B			B	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	14.5	31.4				45.9	15.9
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	9.3	19.9				12.5	11.5
Green Ext Time (p_c), s	0.2	6.9				7.2	0.5

Intersection Summary	
HCM 6th Ctrl Delay	16.3
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	98	256	6	7	314	526	6	12	13	504	8	130
Future Volume (veh/h)	98	256	6	7	314	526	6	12	13	504	8	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	107	278	7	8	341	0	7	13	14	548	9	141
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	523	571	14	99	577		31	58	63	1104	31	478
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.00	0.09	0.09	0.09	0.32	0.32	0.32
Sat Flow, veh/h	1049	1843	46	13	1863	1598	360	669	720	3483	96	1509
Grp Volume(v), veh/h	107	0	285	349	0	0	34	0	0	548	0	150
Grp Sat Flow(s),veh/h/ln	1049	0	1889	1876	0	1598	1750	0	0	1742	0	1605
Q Serve(g_s), s	0.0	0.0	4.8	0.0	0.0	0.0	0.7	0.0	0.0	4.9	0.0	2.7
Cycle Q Clear(g_c), s	2.8	0.0	4.8	6.1	0.0	0.0	0.7	0.0	0.0	4.9	0.0	2.7
Prop In Lane	1.00		0.02	0.02		1.00	0.21		0.41	1.00		0.94
Lane Grp Cap(c), veh/h	523	0	585	676	0		152	0	0	1104	0	509
V/C Ratio(X)	0.20	0.00	0.49	0.52	0.00		0.22	0.00	0.00	0.50	0.00	0.29
Avail Cap(c_a), veh/h	901	0	1267	1345	0		497	0	0	4942	0	2278
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.2	0.0	10.9	11.3	0.0	0.0	16.5	0.0	0.0	10.7	0.0	10.0
Incr Delay (d2), s/veh	0.2	0.0	0.6	0.6	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	1.6	2.1	0.0	0.0	0.3	0.0	0.0	1.5	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.4	0.0	11.5	12.0	0.0	0.0	16.7	0.0	0.0	11.2	0.0	10.4
LnGrp LOS	B	A	B	B	A		B	A	A	B	A	B
Approach Vol, veh/h		392			349			34			698	
Approach Delay, s/veh		11.2			12.0			16.7			11.0	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		16.0		15.7		7.1		15.7				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		6.9		8.1		2.7		6.8				
Green Ext Time (p_c), s		5.2		2.0		0.0		2.1				

Intersection Summary	
HCM 6th Ctrl Delay	11.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	98	93	193	23	74	90	118	467	2	69	798	139
Future Volume (veh/h)	98	93	193	23	74	90	118	467	2	69	798	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1864	1864	1864	1841	1841	1841	1856	1856	1856
Adj Flow Rate, veh/h	102	97	154	24	77	55	123	486	0	72	831	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	3	3	3
Cap, veh/h	297	340	287	117	276	287	212	1533		169	1456	
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.12	0.44	0.00	0.10	0.41	0.00
Sat Flow, veh/h	1249	1864	1572	210	1515	1572	1753	3589	0	1767	3618	0
Grp Volume(v), veh/h	102	97	154	101	0	55	123	486	0	72	831	0
Grp Sat Flow(s),veh/h/ln	1249	1864	1572	1725	0	1572	1753	1749	0	1767	1763	0
Q Serve(g_s), s	4.3	2.5	5.0	0.0	0.0	1.7	3.7	5.1	0.0	2.2	10.2	0.0
Cycle Q Clear(g_c), s	7.0	2.5	5.0	2.6	0.0	1.7	3.7	5.1	0.0	2.2	10.2	0.0
Prop In Lane	1.00		1.00	0.24		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	297	340	287	393	0	287	212	1533		169	1456	
V/C Ratio(X)	0.34	0.29	0.54	0.26	0.00	0.19	0.58	0.32		0.42	0.57	
Avail Cap(c_a), veh/h	578	760	641	785	0	669	621	3409		313	3436	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.0	19.9	20.9	19.9	0.0	19.6	23.4	10.3	0.0	24.0	12.7	0.0
Incr Delay (d2), s/veh	0.3	0.2	0.6	0.1	0.0	0.1	0.9	0.2	0.0	0.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	1.0	1.8	1.1	0.0	0.6	1.5	1.7	0.0	0.9	3.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.2	20.1	21.5	20.1	0.0	19.7	24.4	10.5	0.0	24.7	13.2	0.0
LnGrp LOS	C	C	C	C	A	B	C	B		C	B	
Approach Vol, veh/h		353			156			609			903	
Approach Delay, s/veh		21.6			19.9			13.3			14.1	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.0	28.4		16.0	10.6	29.8		16.0
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24
Max Q Clear Time (g_c+I1), s	5.7	12.2		9.0	4.2	7.1		4.6
Green Ext Time (p_c), s	0.1	10.4		0.7	0.0	5.4		0.4

Intersection Summary	
HCM 6th Ctrl Delay	15.6
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	157	508	24	189	771
Future Volume (veh/h)	35	157	508	24	189	771
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1885	1885	1841	1841	1856	1856
Adj Flow Rate, veh/h	38	171	552	26	205	838
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	4	4	3	3
Cap, veh/h	257	229	753	638	327	1274
Arrive On Green	0.14	0.14	0.41	0.41	0.19	0.69
Sat Flow, veh/h	1795	1598	1841	1560	1767	1856
Grp Volume(v), veh/h	38	171	552	26	205	838
Grp Sat Flow(s),veh/h/ln	1795	1598	1841	1560	1767	1856
Q Serve(g_s), s	0.9	5.2	12.9	0.5	5.5	13.2
Cycle Q Clear(g_c), s	0.9	5.2	12.9	0.5	5.5	13.2
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	257	229	753	638	327	1274
V/C Ratio(X)	0.15	0.75	0.73	0.04	0.63	0.66
Avail Cap(c_a), veh/h	633	563	1623	1375	554	1636
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	21.0	12.7	9.1	19.2	4.6
Incr Delay (d2), s/veh	0.3	4.8	2.0	0.0	0.7	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.1	4.7	0.2	2.1	2.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	19.4	25.8	14.7	9.1	19.9	5.5
LnGrp LOS	B	C	B	A	B	A
Approach Vol, veh/h	209		578			1043
Approach Delay, s/veh	24.7		14.5			8.3
Approach LOS	C		B			A

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	14.2	25.6				39.7	11.3
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	7.5	14.9				15.2	7.2
Green Ext Time (p_c), s	0.2	6.0				10.6	0.5

Intersection Summary	
HCM 6th Ctrl Delay	12.1
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	99	360	2	5	163	449	2	2	6	677	6	90
Future Volume (veh/h)	99	360	2	5	163	449	2	2	6	677	6	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1856	1856	1900	1900	1900	1856	1856	1856
Adj Flow Rate, veh/h	104	379	2	5	172	0	2	2	6	713	6	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	3	3	3
Cap, veh/h	603	577	3	100	568		10	10	30	1280	35	557
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.00	0.03	0.03	0.03	0.37	0.37	0.37
Sat Flow, veh/h	1210	1859	10	14	1830	1572	340	340	1020	3428	94	1493
Grp Volume(v), veh/h	104	0	381	177	0	0	10	0	0	713	0	101
Grp Sat Flow(s),veh/h/ln	1210	0	1869	1844	0	1572	1699	0	0	1714	0	1587
Q Serve(g_s), s	0.0	0.0	6.8	0.0	0.0	0.0	0.2	0.0	0.0	6.4	0.0	1.6
Cycle Q Clear(g_c), s	1.7	0.0	6.8	2.8	0.0	0.0	0.2	0.0	0.0	6.4	0.0	1.6
Prop In Lane	1.00		0.01	0.03		1.00	0.20		0.60	1.00		0.94
Lane Grp Cap(c), veh/h	603	0	580	668	0		49	0	0	1280	0	593
V/C Ratio(X)	0.17	0.00	0.66	0.26	0.00		0.20	0.00	0.00	0.56	0.00	0.17
Avail Cap(c_a), veh/h	1042	0	1257	1324	0		484	0	0	4878	0	2258
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.8	0.0	11.5	10.2	0.0	0.0	18.3	0.0	0.0	9.6	0.0	8.1
Incr Delay (d2), s/veh	0.1	0.0	1.3	0.2	0.0	0.0	0.7	0.0	0.0	0.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.4	0.9	0.0	0.0	0.1	0.0	0.0	1.8	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.9	0.0	12.8	10.4	0.0	0.0	19.1	0.0	0.0	10.1	0.0	8.3
LnGrp LOS	A	A	B	B	A		B	A	A	B	A	A
Approach Vol, veh/h		485			177			10			814	
Approach Delay, s/veh		12.2			10.4			19.1			9.9	
Approach LOS		B			B			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		18.1		15.7		4.8		15.7				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		8.4		4.8		2.2		8.8				
Green Ext Time (p_c), s		6.1		0.9		0.0		2.5				

Intersection Summary			
HCM 6th Ctrl Delay		10.8	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	111	192	19	112	173	188	839	18	131	770	140
Future Volume (veh/h)	88	111	192	19	112	173	188	839	18	131	770	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1894	1894	1894	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	91	114	152	20	115	140	194	865	0	135	794	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	0	0	0	1	1	1	1	1	1
Cap, veh/h	284	388	325	95	350	326	244	1449		215	1391	
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.14	0.40	0.00	0.12	0.39	0.00
Sat Flow, veh/h	1113	1864	1562	125	1683	1564	1795	3676	0	1795	3676	0
Grp Volume(v), veh/h	91	114	152	135	0	140	194	865	0	135	794	0
Grp Sat Flow(s),veh/h/ln	1113	1864	1562	1808	0	1564	1795	1791	0	1795	1791	0
Q Serve(g_s), s	4.5	3.1	5.1	0.0	0.0	4.7	6.3	11.3	0.0	4.3	10.4	0.0
Cycle Q Clear(g_c), s	8.2	3.1	5.1	3.6	0.0	4.7	6.3	11.3	0.0	4.3	10.4	0.0
Prop In Lane	1.00		1.00	0.15		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	284	388	325	445	0	326	244	1449		215	1391	
V/C Ratio(X)	0.32	0.29	0.47	0.30	0.00	0.43	0.80	0.60		0.63	0.57	
Avail Cap(c_a), veh/h	481	718	601	778	0	628	601	3297		300	3297	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.7	20.0	20.8	20.2	0.0	20.6	25.0	14.0	0.0	25.0	14.4	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.4	0.1	0.0	0.3	2.2	0.6	0.0	1.1	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	1.3	1.8	1.5	0.0	1.6	2.6	4.1	0.0	1.8	3.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.9	20.1	21.1	20.3	0.0	20.9	27.3	14.5	0.0	26.2	14.9	0.0
LnGrp LOS	C	C	C	C	A	C	C	B		C	B	
Approach Vol, veh/h		357			275			1059			929	
Approach Delay, s/veh		21.5			20.6			16.9			16.5	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.3	28.3		18.1	12.3	29.3		18.1				
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7				
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24				
Max Q Clear Time (g_c+I1), s	8.3	12.4		10.2	6.3	13.3		6.7				
Green Ext Time (p_c), s	0.2	9.7		0.7	0.1	10.8		0.7				

Intersection Summary			
HCM 6th Ctrl Delay		17.8	
HCM 6th LOS		B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	43	249	804	40	209	750	
Future Volume (veh/h)	43	249	804	40	209	750	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	
Adj Flow Rate, veh/h	45	262	846	42	220	789	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	1	1	1	1	1	1	
Cap, veh/h	337	300	946	801	260	1328	
Arrive On Green	0.19	0.19	0.50	0.50	0.14	0.70	
Sat Flow, veh/h	1795	1598	1885	1596	1795	1885	
Grp Volume(v), veh/h	45	262	846	42	220	789	
Grp Sat Flow(s),veh/h/ln	1795	1598	1885	1596	1795	1885	
Q Serve(g_s), s	1.7	12.9	32.8	1.1	9.7	17.2	
Cycle Q Clear(g_c), s	1.7	12.9	32.8	1.1	9.7	17.2	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	337	300	946	801	260	1328	
V/C Ratio(X)	0.13	0.87	0.89	0.05	0.85	0.59	
Avail Cap(c_a), veh/h	400	356	1050	889	355	1328	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	27.3	31.9	18.2	10.3	33.7	6.1	
Incr Delay (d2), s/veh	0.2	18.3	9.8	0.0	10.0	0.9	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.7	6.3	15.3	0.4	4.8	5.4	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	27.5	50.2	28.0	10.3	43.7	6.9	
LnGrp LOS	C	D	C	B	D	A	
Approach Vol, veh/h	307		888			1009	
Approach Delay, s/veh	46.9		27.2			14.9	
Approach LOS	D		C			B	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	16.4	45.2				61.6	19.2
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	11.7	34.8				19.2	14.9
Green Ext Time (p_c), s	0.1	5.7				9.1	0.3

Intersection Summary			
HCM 6th Ctrl Delay		24.3	
HCM 6th LOS		C	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	259	6	7	364	709	6	12	13	627	8	161
Future Volume (veh/h)	113	259	6	7	364	709	6	12	13	627	8	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	123	282	7	8	396	0	7	13	14	682	9	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	428	538	13	89	544		31	57	62	1266	29	554
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.00	0.09	0.09	0.09	0.36	0.36	0.36
Sat Flow, veh/h	998	1844	46	11	1865	1598	360	669	720	3483	78	1525
Grp Volume(v), veh/h	123	0	289	404	0	0	34	0	0	682	0	184
Grp Sat Flow(s),veh/h/ln	998	0	1890	1877	0	1598	1749	0	0	1742	0	1603
Q Serve(g_s), s	0.0	0.0	5.5	0.0	0.0	0.0	0.8	0.0	0.0	6.6	0.0	3.5
Cycle Q Clear(g_c), s	5.3	0.0	5.5	8.3	0.0	0.0	0.8	0.0	0.0	6.6	0.0	3.5
Prop In Lane	1.00		0.02	0.02		1.00	0.21		0.41	1.00		0.95
Lane Grp Cap(c), veh/h	428	0	551	633	0		149	0	0	1266	0	583
V/C Ratio(X)	0.29	0.00	0.52	0.64	0.00		0.23	0.00	0.00	0.54	0.00	0.32
Avail Cap(c_a), veh/h	743	0	1148	1220	0		450	0	0	4476	0	2061
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.6	0.0	12.7	13.7	0.0	0.0	18.3	0.0	0.0	10.8	0.0	9.8
Incr Delay (d2), s/veh	0.4	0.0	0.8	1.1	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	2.0	3.0	0.0	0.0	0.3	0.0	0.0	2.1	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.0	0.0	13.4	14.7	0.0	0.0	18.5	0.0	0.0	11.3	0.0	10.2
LnGrp LOS	B	A	B	B	A		B	A	A	B	A	B
Approach Vol, veh/h		412			404			34			866	
Approach Delay, s/veh		13.3			14.7			18.5			11.1	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.3		16.2		7.4		16.2				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		8.6		10.3		2.8		7.5				
Green Ext Time (p_c), s		6.9		2.2		0.0		2.2				

Intersection Summary			
HCM 6th Ctrl Delay		12.6	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	98	93	193	23	74	90	118	474	2	69	800	139
Future Volume (veh/h)	98	93	193	23	74	90	118	474	2	69	800	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1864	1864	1864	1841	1841	1841	1856	1856	1856
Adj Flow Rate, veh/h	102	97	154	24	77	55	123	494	0	72	833	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	3	3	3
Cap, veh/h	297	340	286	117	276	286	212	1534		169	1458	
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.12	0.44	0.00	0.10	0.41	0.00
Sat Flow, veh/h	1249	1864	1572	210	1515	1572	1753	3589	0	1767	3618	0
Grp Volume(v), veh/h	102	97	154	101	0	55	123	494	0	72	833	0
Grp Sat Flow(s),veh/h/ln	1249	1864	1572	1725	0	1572	1753	1749	0	1767	1763	0
Q Serve(g_s), s	4.3	2.5	5.0	0.0	0.0	1.7	3.7	5.2	0.0	2.2	10.2	0.0
Cycle Q Clear(g_c), s	7.0	2.5	5.0	2.6	0.0	1.7	3.7	5.2	0.0	2.2	10.2	0.0
Prop In Lane	1.00		1.00	0.24		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	297	340	286	393	0	286	212	1534		169	1458	
V/C Ratio(X)	0.34	0.29	0.54	0.26	0.00	0.19	0.58	0.32		0.43	0.57	
Avail Cap(c_a), veh/h	578	759	640	784	0	668	621	3405		313	3433	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.0	19.9	20.9	20.0	0.0	19.6	23.5	10.4	0.0	24.1	12.7	0.0
Incr Delay (d2), s/veh	0.3	0.2	0.6	0.1	0.0	0.1	0.9	0.2	0.0	0.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	1.0	1.8	1.1	0.0	0.6	1.5	1.7	0.0	0.9	3.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.3	20.1	21.5	20.1	0.0	19.7	24.4	10.5	0.0	24.7	13.2	0.0
LnGrp LOS	C	C	C	C	A	B	C	B		C	B	
Approach Vol, veh/h		353			156			617			905	
Approach Delay, s/veh		21.6			20.0			13.3			14.1	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.0	28.5		16.0	10.6	29.9		16.0				
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7				
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24				
Max Q Clear Time (g_c+I1), s	5.7	12.2		9.0	4.2	7.2		4.6				
Green Ext Time (p_c), s	0.1	10.4		0.7	0.0	5.5		0.4				

Intersection Summary			
HCM 6th Ctrl Delay		15.6	
HCM 6th LOS		B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	158	510	24	192	778
Future Volume (veh/h)	35	158	510	24	192	778
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1885	1885	1841	1841	1856	1856
Adj Flow Rate, veh/h	38	172	554	26	209	846
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	4	4	3	3
Cap, veh/h	258	230	754	639	327	1274
Arrive On Green	0.14	0.14	0.41	0.41	0.19	0.69
Sat Flow, veh/h	1795	1598	1841	1560	1767	1856
Grp Volume(v), veh/h	38	172	554	26	209	846
Grp Sat Flow(s),veh/h/ln	1795	1598	1841	1560	1767	1856
Q Serve(g_s), s	0.9	5.3	13.0	0.5	5.6	13.5
Cycle Q Clear(g_c), s	0.9	5.3	13.0	0.5	5.6	13.5
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	258	230	754	639	327	1274
V/C Ratio(X)	0.15	0.75	0.73	0.04	0.64	0.66
Avail Cap(c_a), veh/h	630	561	1616	1369	551	1629
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.2	21.1	12.8	9.1	19.3	4.6
Incr Delay (d2), s/veh	0.3	4.8	2.0	0.0	0.8	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.1	4.8	0.2	2.1	2.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	19.5	25.9	14.8	9.1	20.1	5.6
LnGrp LOS	B	C	B	A	C	A
Approach Vol, veh/h	210		580			1055
Approach Delay, s/veh	24.7		14.5			8.4
Approach LOS	C		B			A

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	14.2	25.7				39.9	11.4
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	7.6	15.0				15.5	7.3
Green Ext Time (p_c), s	0.2	6.0				10.7	0.5

Intersection Summary			
HCM 6th Ctrl Delay		12.2	
HCM 6th LOS		B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	99	360	2	5	163	451	2	2	6	682	6	92
Future Volume (veh/h)	99	360	2	5	163	451	2	2	6	682	6	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1856	1856	1900	1900	1900	1856	1856	1856
Adj Flow Rate, veh/h	104	379	2	5	172	0	2	2	6	718	6	97
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	3	3	3
Cap, veh/h	601	575	3	100	566		10	10	30	1287	35	561
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.00	0.03	0.03	0.03	0.38	0.38	0.38
Sat Flow, veh/h	1210	1859	10	14	1830	1572	340	340	1020	3428	92	1494
Grp Volume(v), veh/h	104	0	381	177	0	0	10	0	0	718	0	103
Grp Sat Flow(s),veh/h/ln	1210	0	1869	1844	0	1572	1699	0	0	1714	0	1587
Q Serve(g_s), s	0.0	0.0	6.9	0.0	0.0	0.0	0.2	0.0	0.0	6.4	0.0	1.7
Cycle Q Clear(g_c), s	1.7	0.0	6.9	2.8	0.0	0.0	0.2	0.0	0.0	6.4	0.0	1.7
Prop In Lane	1.00		0.01	0.03		1.00	0.20		0.60	1.00		0.94
Lane Grp Cap(c), veh/h	601	0	578	666	0		49	0	0	1287	0	596
V/C Ratio(X)	0.17	0.00	0.66	0.27	0.00		0.20	0.00	0.00	0.56	0.00	0.17
Avail Cap(c_a), veh/h	1038	0	1253	1320	0		482	0	0	4862	0	2250
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.8	0.0	11.6	10.2	0.0	0.0	18.4	0.0	0.0	9.6	0.0	8.1
Incr Delay (d2), s/veh	0.1	0.0	1.3	0.2	0.0	0.0	0.7	0.0	0.0	0.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.4	0.9	0.0	0.0	0.1	0.0	0.0	1.8	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.0	0.0	12.9	10.4	0.0	0.0	19.1	0.0	0.0	10.1	0.0	8.3
LnGrp LOS	A	A	B	B	A		B	A	A	B	A	A
Approach Vol, veh/h		485			177			10			821	
Approach Delay, s/veh		12.3			10.4			19.1			9.9	
Approach LOS		B			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		18.3		15.7		4.8		15.7				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		8.4		4.8		2.2		8.9				
Green Ext Time (p_c), s		6.1		0.9		0.0		2.5				

Intersection Summary	
HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
1: Sonoma Hwy (SR 12) & Verano Ave

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	111	192	19	112	173	188	843	18	131	777	140
Future Volume (veh/h)	88	111	192	19	112	173	188	843	18	131	777	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1864	1864	1864	1894	1894	1894	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	91	114	152	20	115	140	194	869	0	135	801	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	0	0	0	1	1	1	1	1	1
Cap, veh/h	284	388	325	95	350	325	244	1453		214	1394	
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.14	0.41	0.00	0.12	0.39	0.00
Sat Flow, veh/h	1113	1864	1562	125	1683	1564	1795	3676	0	1795	3676	0
Grp Volume(v), veh/h	91	114	152	135	0	140	194	869	0	135	801	0
Grp Sat Flow(s),veh/h/ln	1113	1864	1562	1808	0	1564	1795	1791	0	1795	1791	0
Q Serve(g_s), s	4.6	3.1	5.1	0.0	0.0	4.7	6.3	11.4	0.0	4.3	10.5	0.0
Cycle Q Clear(g_c), s	8.2	3.1	5.1	3.6	0.0	4.7	6.3	11.4	0.0	4.3	10.5	0.0
Prop In Lane	1.00		1.00	0.15		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	284	388	325	445	0	325	244	1453		214	1394	
V/C Ratio(X)	0.32	0.29	0.47	0.30	0.00	0.43	0.80	0.60		0.63	0.57	
Avail Cap(c_a), veh/h	480	716	599	776	0	626	599	3287		300	3287	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.7	20.0	20.8	20.2	0.0	20.6	25.1	14.0	0.0	25.1	14.4	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.4	0.1	0.0	0.3	2.2	0.6	0.0	1.1	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	1.3	1.8	1.5	0.0	1.6	2.7	4.1	0.0	1.8	3.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.0	20.2	21.2	20.4	0.0	21.0	27.3	14.5	0.0	26.3	14.9	0.0
LnGrp LOS	C	C	C	C	A	C	C	B		C	B	
Approach Vol, veh/h		357			275			1063			936	
Approach Delay, s/veh		21.6			20.7			16.9			16.6	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.3	28.4		18.2	12.4	29.4		18.2				
Change Period (Y+Rc), s	* 5.2	5.1		* 5.7	* 5.2	5.1		* 5.7				
Max Green Setting (Gmax), s	* 20	55.0		* 23	* 10	55.0		* 24				
Max Q Clear Time (g_c+I1), s	8.3	12.5		10.2	6.3	13.4		6.7				
Green Ext Time (p_c), s	0.2	9.8		0.7	0.1	10.9		0.7				

Intersection Summary	
HCM 6th Ctrl Delay	17.8
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Sonoma Hwy (SR 12) & W Spain St

07/28/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	43	252	811	40	211	754	
Future Volume (veh/h)	43	252	811	40	211	754	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	
Adj Flow Rate, veh/h	45	265	854	42	222	794	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	1	1	1	1	1	1	
Cap, veh/h	339	302	946	801	261	1329	
Arrive On Green	0.19	0.19	0.50	0.50	0.15	0.70	
Sat Flow, veh/h	1795	1598	1885	1596	1795	1885	
Grp Volume(v), veh/h	45	265	854	42	222	794	
Grp Sat Flow(s),veh/h/ln	1795	1598	1885	1596	1795	1885	
Q Serve(g_s), s	1.7	13.2	33.8	1.1	9.9	17.6	
Cycle Q Clear(g_c), s	1.7	13.2	33.8	1.1	9.9	17.6	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	339	302	946	801	261	1329	
V/C Ratio(X)	0.13	0.88	0.90	0.05	0.85	0.60	
Avail Cap(c_a), veh/h	394	351	1034	876	350	1329	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	27.7	32.3	18.6	10.4	34.2	6.2	
Incr Delay (d2), s/veh	0.2	19.4	10.7	0.0	10.9	0.9	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.7	6.6	16.0	0.4	5.0	5.6	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	27.8	51.8	29.3	10.5	45.1	7.1	
LnGrp LOS	C	D	C	B	D	A	
Approach Vol, veh/h	310		896			1016	
Approach Delay, s/veh	48.3		28.4			15.4	
Approach LOS	D		C			B	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	16.6	45.9				62.5	19.5
Change Period (Y+Rc), s	* 4.7	* 4.7				* 4.7	4.0
Max Green Setting (Gmax), s	* 16	* 45				* 45	18.0
Max Q Clear Time (g_c+I1), s	11.9	35.8				19.6	15.2
Green Ext Time (p_c), s	0.1	5.3				9.1	0.3

Intersection Summary	
HCM 6th Ctrl Delay	25.2
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Riverside Drive/E Napa St (SR 12) & Sonoma Hwy (SR 12)

07/28/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	115	259	6	7	364	714	6	12	13	630	8	162
Future Volume (veh/h)	115	259	6	7	364	714	6	12	13	630	8	162
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	125	282	7	8	396	0	7	13	14	685	9	176
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	426	537	13	89	544		31	57	62	1269	28	556
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.00	0.09	0.09	0.09	0.36	0.36	0.36
Sat Flow, veh/h	998	1844	46	11	1865	1598	360	669	720	3483	78	1525
Grp Volume(v), veh/h	125	0	289	404	0	0	34	0	0	685	0	185
Grp Sat Flow(s),veh/h/ln	998	0	1890	1877	0	1598	1749	0	0	1742	0	1603
Q Serve(g_s), s	0.0	0.0	5.5	0.0	0.0	0.0	0.8	0.0	0.0	6.7	0.0	3.6
Cycle Q Clear(g_c), s	5.4	0.0	5.5	8.3	0.0	0.0	0.8	0.0	0.0	6.7	0.0	3.6
Prop In Lane	1.00		0.02	0.02		1.00	0.21		0.41	1.00		0.95
Lane Grp Cap(c), veh/h	426	0	551	633	0		149	0	0	1269	0	584
V/C Ratio(X)	0.29	0.00	0.52	0.64	0.00		0.23	0.00	0.00	0.54	0.00	0.32
Avail Cap(c_a), veh/h	740	0	1145	1217	0		448	0	0	4464	0	2055
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.7	0.0	12.7	13.7	0.0	0.0	18.3	0.0	0.0	10.8	0.0	9.8
Incr Delay (d2), s/veh	0.4	0.0	0.8	1.1	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	2.0	3.1	0.0	0.0	0.3	0.0	0.0	2.1	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.1	0.0	13.5	14.8	0.0	0.0	18.6	0.0	0.0	11.3	0.0	10.2
LnGrp LOS	B	A	B	B	A		B	A	A	B	A	B
Approach Vol, veh/h		414			404			34			870	
Approach Delay, s/veh		13.4			14.8			18.6			11.1	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.3		16.2		7.4		16.2				
Change Period (Y+Rc), s		3.7		3.7		3.7		3.7				
Max Green Setting (Gmax), s		55.0		26.0		11.0		26.0				
Max Q Clear Time (g_c+I1), s		8.7		10.3		2.8		7.5				
Green Ext Time (p_c), s		6.9		2.2		0.0		2.2				

Intersection Summary	
HCM 6th Ctrl Delay	12.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.