Transportation Impact Study for the Quick Quack Carwash Project

Prepared for the City of Santa Rosa

Submitted by
W-Trans

December 3, 2024

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Executive Summary

The proposed Quick Quack Car Wash Project would be located at 4358 Sonoma Highway (SR 12) in the City of Santa Rosa and include the construction of a 108-foot-long single-tunnel automated car wash that would be accessed from eastbound Sonoma Highway via an existing driveway. The new car wash would include two automated vehicle license readers, one of which would also include a pay station. The two-lane approach to the license readers would accommodate approximately 14 vehicles, and it is expected that car wash peak demand would be adequately contained with an estimated maximum of six vehicles in the queue. Ten self-service vacuum stations would be provided for patrons, one of which would be ADA-compliant, and three parking spaces would be provided for employees, one of which would be ADA-compliant.

The project would be expected to generate an average of 982 net trips per day, including 32 trips during the a.m. peak hour and 51 trips during the p.m. peak hour. A conservative pass-by trip discount of 35 percent was applied to account for the portion of project trips that would be drawn from existing traffic on Sonoma Highway.

As part of the project, a sidewalk would be constructed along the site frontage that would provide continuous pedestrian access to adjacent properties and bus stops. The project would not conflict with any policies or plans regarding pedestrian or transit modes of travel. The installation of bicycle storage facilities is recommended to meet the minimum requirements of the City's Municipal Code and, hence, would not conflict with plans or policies regarding bicycle travel. The project is expected to have a less-than-significant impact on VMT as well as on emergency response times.

Sight lines at the project driveway are adequate, though on-street parked vehicles have the potential to obstruct sight lines. It is recommended that on-street parking be prohibited on the south side of Sonoma Highway 40 feet to the west of the project driveway to ensure adequate sight lines for exiting vehicles.

The traffic operations analysis indicates that all three study intersections currently operate acceptably per applicable City traffic operations standards under Existing and Baseline Conditions, and they would continue to do so with the addition of project-generated traffic.

Introduction

This report presents an analysis of the potential transportation impacts and adverse operational effects that would be associated with development of a proposed Quick Quack Carwash at 4358 Sonoma Highway in the City of Santa Rosa. The transportation study was completed in accordance with the criteria established by the City of Santa Rosa, reflects a scope of work approved by City staff, 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 *Santa Rosa General Plan 2035*, 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, require an EIR. Impacts associated with access for pedestrians, bicyclists, and to transit; the vehicle miles traveled (VMT) generated by the project; potential safety concerns, adequacy of sight distance, need for turn lanes, and need for additional right-of-way controls; 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 *Santa Rosa General Plan 2035* 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 potentially identifying the need for improvements to maintain acceptable operation. The adequacy of parking is also addressed as a policy issue.

Applied Standards and 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 an evaluation of policy-related issues. The CEQA criteria evaluated are as follows.

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?

Additionally, Section 5.8, Transportation Goals & Policy, of the *Santa Rosa General Plan 2035* provides the following guidance relative to these CEQA criteria.

T-H-3 *Require new development to provide transit improvements, where a rough proportionality to demand from the project is established. Transit improvements may include:*

- Direct and paved pedestrian access to transit stops
- Bus turnouts and shelters
- Lane width to accommodate buses

General interpretation of Policy T-H-3. An impact is considered adverse if the project has the potential to disrupt existing transit operations or establishes transit facilities and equipment such that it creates a sight distance deficiency or vehicle conflict point.

T-J *Provide attractive and safe streets for pedestrians and bicyclists.*

General interpretation of Policy T-J. An impact is considered adverse if the project generates 20 pedestrians in any single hour at an unsignalized intersection, mid-block crossing or where no crossing has been established.

An impact is further considered significant if the project interrupts existing or proposed pedestrian, bicycle, or transit facilities, their path of travel, hinders direct access resulting in excessive rerouting, or creates a vehicle conflict condition that affects the safety of other roadway users.

Project Profile

The project as proposed includes the construction of a 108-foot-long single-tunnel automated car wash that would be accessed from eastbound Sonoma Highway via an existing driveway. The new car wash would include two automated vehicle license readers, one of which also would include a pay station. The two-lane approach to the license readers would accommodate approximately seven vehicles per lane in the drive aisle. Beyond that point, the two lanes would transition to form a single lane for the wash tunnel. Ten self-service vacuum stations would be provided for patrons, one of which would be ADA-compliant, and three spaces would be provided for employees, one of which would be ADA-compliant. The project site is located at 4358 Sonoma Highway (SR 12), as shown in Figure 1, and the Project Site Plan is shown in Figure 2.

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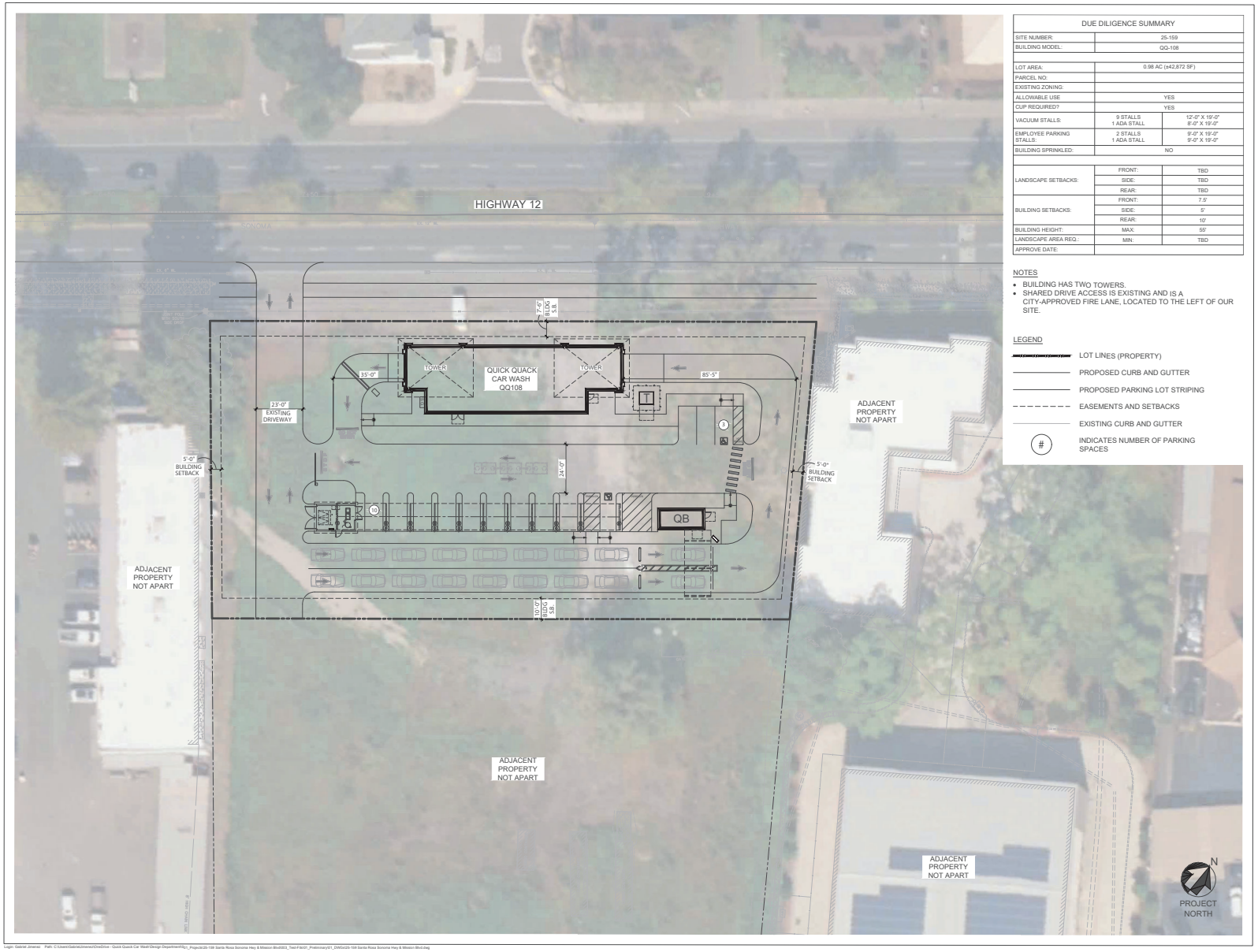
Transportation Impact Study for the Quick Quack Car Wash

Figure 1 – Study Area and Existing Lane Configurations

W-Trans



DUE DILIGENCE SUMMARY		
SITE NUMBER:	25-159	
BUILDING MODEL:	QQ-108	
LOT AREA:	0.98 AC (±42,872 SF)	
PARCEL NO:		
EXISTING ZONING:		
ALLOWABLE USE:	YES	
CUP REQUIRED?	YES	
VACUUM STALLS:	9 STALLS 1 ADA STALL	12'-0" X 19'-0" 8'-0" X 19'-0"
EMPLOYEE PARKING STALLS:	2 STALLS 1 ADA STALL	9'-0" X 19'-0" 9'-0" X 19'-0"
BUILDING SPRINKLED:	NO	
LANDSCAPE SETBACKS:	FRONT:	TBD
	SIDE:	TBD
	REAR:	TBD
BUILDING SETBACKS:	FRONT:	7.5'
	SIDE:	5'
	REAR:	10'
BUILDING HEIGHT:	MAX:	55'
LANDSCAPE AREA REQ.:	MIN:	TBD
APPROVE DATE:		

NOTES

- BUILDING HAS TWO TOWERS.
- SHARED DRIVE ACCESS IS EXISTING AND IS A CITY-APPROVED FIRE LANE, LOCATED TO THE LEFT OF OUR SITE.

LEGEND

- LOT LINES (PROPERTY)
- PROPOSED CURB AND GUTTER
- PROPOSED PARKING LOT STRIPING
- EASEMENTS AND SETBACKS
- EXISTING CURB AND GUTTER
- (#) INDICATES NUMBER OF PARKING SPACES

QUICK QUACK CAR WASH

6020 WEST OAKS BLVD, STE 300, ROCKLIN, CA 95765

PROJECT# 25-159
4332-4374 SONOMA HWY
SANTA ROSA, CA 95409
SONOMA COUNTY

#	DATE	REVISIONS
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-

TEST FIT

NOT FOR CONSTRUCTION

DRAWN BY: GJ

DATE: 06/24/2024

SCALE: 1" = 20'-0"

SHEET:

1 OF 2

Source: Quick Quack Car Wash 10/1

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Transportation Impact Study for the Quick Quack Car Wash

Figure 2 – Site Plan

Transportation Setting

Study Area and Periods

The study area varies depending on the topic. For pedestrian trips it consists of all streets within a half mile of the project site that would lie along primary routes of pedestrian travel or those leading to nearby generators. For bicycle trips it consists of all streets within one mile of the project site that would lie along primary routes of bicycle travel. For the safety and operational analyses, it consists of the project frontage and the following intersections.

1. Sonoma Highway (SR 12)/Brush Creek Road
2. Sonoma Highway (SR 12)/Village Parkway-Streamside Drive
3. Sonoma Highway (SR 12)/Mission Boulevard

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 typical 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 September 26, 2024.

Study Intersections

Sonoma Highway (SR 12)/Brush Creek Road is a three-legged signalized intersection with a marked crosswalk and on the north leg and curb ramps on the northwest and northeast corners. The signal operates with protected left-turn phasing on the eastbound and westbound approaches. Bike lanes are not present but wide shoulders that can accommodate bicycle travel exist on Sonoma Highway.

Sonoma Highway (SR 12)/Village Parkway-Streamside Drive is a four-legged signalized intersection with marked crosswalks on all but the west leg and curb ramps on all corners of the intersection. The signal operates with protected left-turn phasing on all approaches. Bike lanes are not present but wide shoulders that can accommodate bicycle travel exist on Sonoma Highway.

Sonoma Highway (SR 12)/Mission Boulevard is a signalized intersection with marked crosswalks and curb ramps on all four legs and corners of the intersection. The signal operates with protected left-turn phasing on all approaches. Bike lanes are present on Mission Boulevard north of Sonoma Highway, and wide shoulders that can accommodate bicycle travel are present south of Sonoma Highway as well as on Sonoma Highway east of the intersection.

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

Study Roadway

Sonoma Highway (SR 12) is a regional state highway that generally runs east-west and is classified as a regional arterial street within the City of Santa Rosa. Along the project frontage the road has a center median with two 12-foot travel lanes and parking available on both sides of the street. Traffic counts collected over 24 hours on September 26, 2024, indicate that the roadway is carrying approximately 35,400 vehicles per day.

Existing Transportation 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.

Sonoma Highway (SR 12) –Sidewalks are provided along both sides of the street but are discontinuous between Brush Creek Road and Mission Boulevard, including along the project frontage. The proposed project would complete the missing sidewalk segment. Three marked north-south crosswalks currently exist across Sonoma Highway: one at the Village Parkway-Streamside Drive intersection and two at the intersection of Mission Boulevard. All marked crosswalks are at signalized intersections and have curb ramps and pedestrian phasing. Continuous lighting is provided by overhead streetlights.

Existing and Planned Bicycle Facilities

The *Highway Design Manual,* 7th Edition, 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.

In the project area, Class I multi-use paths are found along Santa Rosa and Brush creeks, and Class II bike lanes are provided on Mission Boulevard north of Sonoma Highway as well as on Montgomery Drive to the south of the study area. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project vicinity. Table 1 summarizes the existing and planned bicycle facilities in the study area, as contained in the *City of Santa Rosa Bicycle & Pedestrian Master Plan Update 2018*, City of Santa Rosa, 2018.

Table 1 – Bicycle Facility Summary				
Status **Facility**	**Class**	**Length (miles)**	**Begin Point**	**End Point**
Existing				
Santa Rosa Creek Trail	I	1.62	Farmers Ln	Acacia Ln
Brush Creek Trail	I	2.50	Montecito Blvd	Flat Rock Park
Mission Blvd	II	0.95	Montecito Blvd	Sonoma Hwy
Sonoma Ave	II	0.51	Yulupa Ave	Summerfield Rd
Summerfield Rd	II	1.95	Montgomery Dr	Bethards Dr
Montgomery Dr	II	0.98	Hahman Dr	Summerfield Rd
Mission Blvd	III	0.18	Sonoma Hwy	Montgomery Dr
Montgomery Dr	III	0.17	Summerfield Rd	Mission Blvd
Proposed				
Sonoma Hwy-4th St	II	3.50	Farmers Ln	Los Alamos Rd
Franquette Ave-Hartley Dr	III	1.00	Yulupa Ave	Hoen Ave
Acacia Ln/Prospect Ave	III	0.60	Sherbrook Dr	Quiqq Dr

Source: *City of Santa Rosa Bicycle & Pedestrian Master Plan Update 2018;* Google Earth, 2024

Existing Transit Facilities

Santa Rosa CityBus and Sonoma County Transit provide fixed route bus service in the City of Santa Rosa, and the closest stops are located 0.2 miles northeast of the project site at the intersection of Sonoma Highway/Mission Boulevard. Existing transit routes and the details of their operation in the study area are summarized in Table 2.

Table 2 – Transit Routes					
Transit Route	**Distance to Stop (mi)[1]**	**Service**			**Connection**
		Days of Operation	**Time**	**Frequency**	
Santa Rosa CityBus					
Route 4/4B	0.2	Mon – Fri Sat Sun	6:00 a.m. – 8:15 p.m. 7:00 a.m. – 7:45 p.m. 10:00 a.m. – 4:45 p.m.	1 hour 1 hour 1 hour	Santa Rosa Transit Mall to Calistoga Road Loop
Sonoma County Transit					
Route 30/30X	0.2	Mon – Sun	6:00 a.m. – 9:00 p.m.	1 – 2 hours	Santa Rosa Transit Mall to Sonoma State University
Route 34	0.2	Mon – Fri (EB) Mon – Fri (WB)	6:55 a.m. 6:13 p.m.	Once daily Once daily	Sonoma Plaza to Santa Rosa Transit Mall

Note: [1] Defined as the shortest walking distance between the project sites and the nearest bus stop
Sources: srcitybus.org, sctransit.com; Google Earth, 2024

Bicycles can be carried on most Santa Rosa CityBus and Sonoma County Transit buses. Bike rack space is available on a first come, first served basis, and bikes are not allowed inside buses. 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

disability. Santa Rosa CityBus and Sonoma County Transit Paratransit services are designed to accommodate the needs of individuals with disabilities within three-quarters of a mile of existing bus routes.

Collision History

The collision histories for the three study intersections along Sonoma Highway were 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 October 1, 2018, through September 30, 2023.

The calculated collision rates for the three study intersections near the project site were compared to average collision rates for similar facilities statewide, as indicated in *2021 Collision Data on California State Highways*, California Department of Transportation, 2023. These average rates statewide are for roadways in a similar urban environment. At all three study intersections, the calculated collision rates are lower than the respective statewide averages for similar facilities.

The collision rate calculations are provided in Appendix A. Collision rates for the study segments are compared to statewide averages for similar facilities in Table 3.

Table 3 – Collision Rates for the Study Segments

Study Roadway Segments	Number of Collisions (10/2018 - 9/2023)	Calculated Collision Rate (c/mvm)	Statewide Average Collision Rate (c/mvm)
1. Sonoma Hwy/Brush Creek Rd	13	0.22	0.28
2. Sonoma Hwy/Village Pkwy-Streamside Dr	8	0.16	0.33
3. Sonoma Hwy/Mission Blvd	16	0.20	0.33

Note: c/mvm = collisions per million vehicles miles

Pedestrian and Bicyclist Safety

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue for pedestrians or bicyclists. Collision records for the same five-year period analyzed above indicate that there were no reported collisions involving pedestrians or bicyclists at any of the three study intersections.

Project Data

The project would consist of a 108-foot-long single-tunnel automated car wash that would be accessed from eastbound Sonoma Highway via an existing driveway. The new car wash would include two automated vehicle license readers, one of which also would include a pay station. Ten self-service vacuum stations would be provided for patrons, one of which would be ADA-compliant, and three parking spaces would be provided for employees, one of which would be ADA-compliant.

Trip Generation

To estimate the anticipated trip generation of the proposed project, standard rates published by the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition, Institute of Transportation Engineers, 2021 for "Automated Car Wash" (ITE LU #948) were applied. There are no daily or morning peak hour rates for automated carwashes, though there are for a "Car Wash and Detail Center" (ITE LU #949). The trip generation rates and distribution for the project's a.m. peak hours were developed using ratios between the "Car Wash and Detail Center" land uses a.m. and p.m. peak hours, and the daily trip rate was developed using ratios between its daily trips and those in the a.m. peak hour.

Pass-by Trips

Some portion of traffic associated with the car wash would be drawn from existing traffic on Sonoma Highway. These vehicle trips are not considered "new" but would instead be comprised of drivers who are already driving on the adjacent street system and choose to make an interim stop, referred to as "pass-by" trip. The percentage of these pass-by trips was based on information provided in the *Trip Generation Manual*, 11th Edition, Institute of Transportation Engineers, 2021. Since the *Manual* does not provide a pass-by trip percentage for an Automated Car Wash, the pass-by trip percentages for "Gasoline/Service Station" (ITE LU #944) were used as a reference. However, to provide a conservative estimate, it was assumed that 35 percent of the proposed car wash trips would be pass-by trips, which is lower than the pass-by trip reductions of 63 percent during the morning peak period and 57 percent during the evening peak period for the "Gasoline/Service Station" land use.

Total Project Trip Generation

The theoretical trip generation potential for the proposed project using the abovementioned ITE rates is presented in Table 4. The proposed project would be expected to generate an average of 1,511 trips daily, including 49 during the morning peak hour and 78 during the evening peak hour. Since each vehicle serviced represents two trips (one in and one out), this translates to an average of 756 vehicles per day. After deducting for pass-by trips, the project would be expected to generate 982 new trips daily, including 32 during the morning peak hour and 51 during the evening peak hour.

Table 4 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Automated Car Wash	1 tunnel	1,510.8	1,511	49.01	49	33	16	77.50	78	39	39
Pass-by		*-35%*	*-529*	*-35%*	*-17*	*-12*	*-5*	*-35%*	*-27*	*-14*	*-13*
Net Project Trips			**982**		**32**	**21**	**11**		**51**	**25**	**26**

Based on the application of standard trip generation rates, the project would be expected to generate more than 50 net-new p.m. peak hour trips, so an operational analysis is required per the City's policies.

Trip Distribution

The pattern used to allocate new project trips to the street network was based on knowledge of the study area. The applied distribution assumptions and resulting trips associated with the car wash project are presented in Table 5.

Table 5 – Trip Distribution Assumptions

Route	Percent	Daily Trips	AM Trips	PM Trips
From/To Sonoma Hwy (SR 12) west	40%	393	13	20
From/To Sonoma Hwy (SR 12) east	40%	393	13	20
From/To Brush Creek Rd north	5%	49	2	3
From/To Mission Blvd north	5%	49	1	2
From/To Mission Blvd south	10%	98	3	6
TOTAL	**100%**	**982**	**32**	**51**

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.

Pedestrian Facilities

Project Impacts on Pedestrian Facilities

Given the proximity of residential land uses surrounding the site, it is reasonable to assume that some employees would want to walk, bicycle, and/or use transit to reach the Car Wash site.

Project Site – Sidewalks currently do not exist along the project frontage but would be constructed as part of the project. The project site plan indicates that pedestrian paths will be provided through the proposed parking area, with raised medians, curb ramps, and a marked crossing on the easterly side of the lot.

Finding – The project would not conflict with any policies related to pedestrian facilities.

Bicycle Facilities

The Santa Rosa City Code, Quality Code Publishing, 2017, Section 20-36.090, states that a "minimum of two short-term bicycle parking spaces and one long-term bicycle parking space shall be provided for new nonresidential development".

Project Impacts on Bicycle Facilities

Existing Class I, II, and III bicycle facilities together with shared use of minor streets provide adequate access for bicyclists.

Bicycle Storage

City Code Section 20-36.090 requires that bicycle parking accommodations be provided for all new non-residential projects. A minimum of two short-term and one long-term bicycle parking accommodations are required per this Section.

Bicycle parking is not identified on the site plan. It is recommended that at least one long-term and two shorter-term bicycle parking spaces be provided per City Code unless otherwise approved by the City of Santa Rosa.

Finding – The project may conflict with the City's Minimum Required Bicycle Parking policies.

Recommendation – It is recommended that two short-term bicycle parking spaces and one long-term bicycle parking space be provided for use by employees.

Transit Facilities

Impact on Transit Facilities

With three bus lines within a quarter mile of the project site, the transit load factors would likely be well distributed among existing transit users and the potential addition of employees who may use transit to access the Car Wash.

Existing transit routes are adequate to accommodate project-generated transit trips, and existing stops are within an acceptable walking distance of the site.

Finding – The project would be consistent with policies related to transit facilities and existing bus routes would be expected to adequately serve the added project-generated trips.

Significance Finding – The proposed project may conflict with required parking policies for bicycle storage facilities.

Recommendation – It is recommended that two short-term bicycle parking spaces and one long-term bicycle parking space be provided for use by employees.

Significance after Mitigation – Following the application of the above recommendation, the proposed project would not conflict with any programs, plans, ordinances, or policies relative to the circulation system for pedestrians, bicycles, and transit riders, and so would have a less-than-significant impact on these facilities.

Vehicle Miles Traveled (VMT)

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

Senate Bill (SB) 743 established the increase in Vehicle Miles Traveled (VMT) as a result of a project as the basis for determining transportation impacts. The City of Santa Rosa has established parameters for VMT analyses in the *Vehicle Miles Traveled (VMT) Guidelines Final Draft*, City of Santa Rosa, 2020. The City's parameters are consistent with guidance provided in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, California Governor's Office of Planning and Research (OPR), 2018.

The OPR *Technical Advisory* indicates that retail projects should generally be analyzed by examining total VMT, with an increase in total regional VMT being considered a significant impact. In the *Technical Advisory*, OPR also indicates that local-serving retail may generally be presumed by lead agencies to have a less-than-significant VMT impact (see *Technical Advisory* pages 16-17). OPR based this presumption on substantial evidence and research demonstrating that adding local-serving retail uses typically improves destination accessibility to customers. The theory behind this criterion is that while a larger retail project may generate interregional trips that increase a region's total VMT, small retail establishments do not necessarily add new trips to a region, but change where existing customers shop within the region, and often shorten trip lengths. The City of Santa Rosa *VMT Guidelines* cites a size of 10,000 square feet or greater as being a potential indicator of regional-serving retail (versus local-serving) that would typically require a quantitative VMT analysis. The project size is below the local-serving retail screening threshold of 10,000 square feet; therefore, it is reasonable to conclude that the project would have a less-than-significant transportation impact on VMT.

Significance Finding – The project would be screened from quantitative analysis and be presumed to have a less-than-significant impact on VMT.

Safety Issues

The potential for the project to impact safety was evaluated in terms of the adequacy of sight distance, on-site circulation, and queuing. This section addresses the third transportation bullet on the CEQA checklist which is whether 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

According to the project site plan, the project site would be accessed via an existing driveway on the south side of Sonoma Highway. Since Sonoma Highway has a continuous raised median, access to the project site could only be made via the eastbound direction with right-in/right-out access. Vehicles traveling westbound on Sonoma Highway would need to make a U-turn at the signal at Village Parkway-Streamside Drive to access the site. Conversely, vehicles wishing to travel westbound after exiting the project site would need to make a U-turn at Mission Boulevard.

Sight Distance

Sight distance along Sonoma Highway at the project driveway was evaluated based on sight distance criteria contained in in the *Highway Design Manual,* 7th Edition, Caltrans, 2020. These guidelines include recommended sight distances for drivers stopped on driveways and waiting to enter a public street based upon approach travel speeds. Although sight distance requirements are not applicable to urban driveways, the stopping sight distance criterion was applied for safety evaluation purposes.

For the posted 45-mph speed limit on Sonoma Highway adjacent to the project site, the minimum stopping sight distance needed is 360 feet. During a review of field conditions, it was determined that sight lines extend more than 360 feet to the west at the driveway. However, vehicles parked on Sonoma Highway adjacent to the project driveway would have the potential of reducing sight lines to an inadequate distance. To maintain adequate sight lines, it is recommended that on-street parking on the south side of Sonoma Highway be prohibited for 40 feet (approximately two parking spaces) west of the project driveway.

On-Site Circulation

The access and circulation associated with the project site was assessed to determine if the site's layout would provide adequate space and drive aisle widths for vehicles to maneuver throughout the site. Based on a review of the site plan, the internal drive aisle that connects the driveway to the car wash pay stations would have two one-way lanes and a width of 24 feet, which would provide space for queuing vehicles to advance and transition to a single 16-foot lane that narrows to 14 feet as it approaches the tunnel. There would also be a two-way 24-foot-wide drive aisle between the self-service vacuum stalls that would allow customers to maneuver their vehicles into and out of each vacuum service stall. The transition area between the pay stations and car wash tunnel includes a relatively small area where two lanes merge into a single lane.

Queuing Analysis

An analysis was conducted to identify the potential queuing of vehicles accessing the project site and to determine whether vehicles waiting to access the car wash would spill back onto Sonoma Highway.

Automated Car Wash

The 95th-percentile queue is generally applied as the acceptable limit for on-site circulation impacts. To assess the potential queuing on the site, factors such as vehicle storage capacity, arrival rate, and service rate were considered. The arrival rate is defined as the number of patrons arriving at the facility per hour. Similarly, the service rate is defined as the number of patrons served within an hour. The applied service rate was based on

information provided as well as data gleaned from the operation of similar car wash sites in the San Francisco Bay area.

The maximum one-hour arrival rate of car wash customers was set as 39 vehicles to match the inbound peak hour trip generation. The service rate was set to 60 vehicles per hour for a service rate of two minutes per vehicle, with two vehicles in the wash tunnel simultaneously. Based upon these rates, the estimated 95th-percentile queue was calculated to be six vehicles. The project site plan shows queuing capacity for approximately 14 vehicles within the pay station queuing space, so there would be more than adequate storage capacity for six vehicles queued in the drive aisle. The queuing calculation worksheet and site plan are provided in Appendix B.

Self-Service Vacuum Area

The vacuum area would be comprised of ten self-service vacuum and hand drying stations. These spaces can serve at least 80 vehicles per hour assuming that typical vacuum or hand drying services can be completed in 15 minutes or fewer. Therefore, the 10-space service area would provide adequate capacity since the serving capacity of 80 vehicles per hour is greater than the inbound trip generation of 39 vehicles per hour. This is a conservative analysis since it is recognized that only a portion of all customers purchasing a car wash would also use the vacuum or hand drying services.

Finding – Sight distances along Sonoma Highway at the project driveway are adequate for the approach speeds; however, it is noted that parked vehicles near the project driveway could interrupt sight lines.

Recommendation – To ensure that adequate sight lines are maintained, it is recommended that on-street parking be prohibited on the south side of Sonoma Highway for 40 feet west of the project driveway.

Significance Finding – The project would not introduce any hazards associated with its design or operation as drivers would have adequate sight lines for all movements at the driveways, and on-site queuing could be maintained within the available stacking space proposed. Therefore, the project would not have a significant impact on safety.

Emergency Access

The final transportation bullet on the CEQA checklist requires an evaluation as to whether the project would result in inadequate emergency access.

Adequacy of Site Access

Emergency vehicles would be able to enter the project site from the existing driveway on Sonoma Highway. According to the City of Santa Rosa's City Code, Section 20-36.080, the minimum width of driveways is 12 feet for one-way traffic and 20 feet for two-way traffic. Interior drive aisles would be 23 to 24 feet wide per the preliminary site plan, which is greater than the minimum driveway width for two-way traffic. The Santa Rosa Fire Prevention Bureau Standards specify a minimum roadway turning radius of 20 feet for the inside turn radius and 40 feet for the outside turn radius. On-site roadway turning radii appear to be in accordance with the City's standards, though review and approval from the fire code official would be required as part of the entitlement process.

Finding – Internal roadway width would be adequate for two-way traffic, and it is assumed that adequate radii would be provided for turns as the site plan would need to be reviewed and approved by a fire code official.

Off-Site Impacts

While the addition of project-generated traffic would be expected to result in minor increases in delay for vehicles at the study intersections, emergency response vehicles may use their lights and sirens to bypass queued traffic and minimize the effects of intersection delay; therefore, the project would be expected to have a negligible impact on emergency response times.

Finding – The proposed project is expected to have a nominal effect on response times.

Significance Finding – The proposed project would need to be designed to accommodate emergency response vehicles and would not impede emergency responders, resulting in a less-than-significant impact on emergency response.

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.

The study intersections were analyzed using the signalized methodology published in the *Highway Capacity Manual* (HCM) *7th Edition*, Transportation Research Board, 2022. 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 that include traffic volumes, green time for each movement, phasing, whether the signals are coordinated, truck traffic, and pedestrian activity. Signal timing for the three study intersections was obtained from Caltrans. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. The ranges of delay associated with the various levels of service are presented in Table 6.

Table 6 – Intersection Level of Service Criteria

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

Reference: *Highway Capacity Manual 7th Edition,* Transportation Research Board, 2022

Traffic Operation Standards

Caltrans

All three study intersections are on Highway 12, and therefore under the jurisdiction of the California Department of Transportation (Caltrans). Caltrans does not have operations standards for intersection level of service, as it now uses VMT as the basis for determining significant transportation impacts. The City of Santa Rosa's standards were therefore applied.

City of Santa Rosa

Section 5.8 Transportation Goals & Policy of the *Santa Rosa General Plan 2035* provides the following guidance relative to traffic operation.

T-D-1 *Maintain a Level of Service (LOS) D or better along all major corridors. Exceptions to meeting the standard include:*

- Within downtown;

- Where attainment would result in significant degradation;
- Where topography or impacts makes the improvement impossible; or
- Where attainment would ensure loss of an area's unique character.

The LOS is to be calculated using the average traffic demand over the highest 60-minute period.

The Traffic Engineering Division will require a level of service evaluation of arterial and collector corridors, if deemed necessary.

T-D-2 *Monitor level of service at intersections to assure that improvements or alterations to improve corridor level of service do not cause severe impacts at any single intersection.*

General interpretation of Policy T-D-2. The impact to an intersection is considered adverse if the project related and/or future trips result in:

1. The level of service (LOS) at an intersection degrading from LOS D or better to LOS E or F, or
2. An increase in average vehicle delay of greater than 5 seconds at a signalized intersection where the current LOS is either LOS E or F.
3. Queuing impacts based on a comparative analysis between the design queue length and the available queue storage capacity. Impacts include, but are not limited to, spillback queue at project access locations (both ingress and egress), turn lanes at intersections, lane drops, spillback that impacts upstream intersections, or interchange ramps.
4. Exceptions may be granted under the following conditions:
   a. Within downtown,
   b. Where attainment would result in significant degradation,
   c. Where topography or impacts makes the improvement impossible; or
   d. Where attainment would ensure loss of an area's unique character.

Existing Conditions

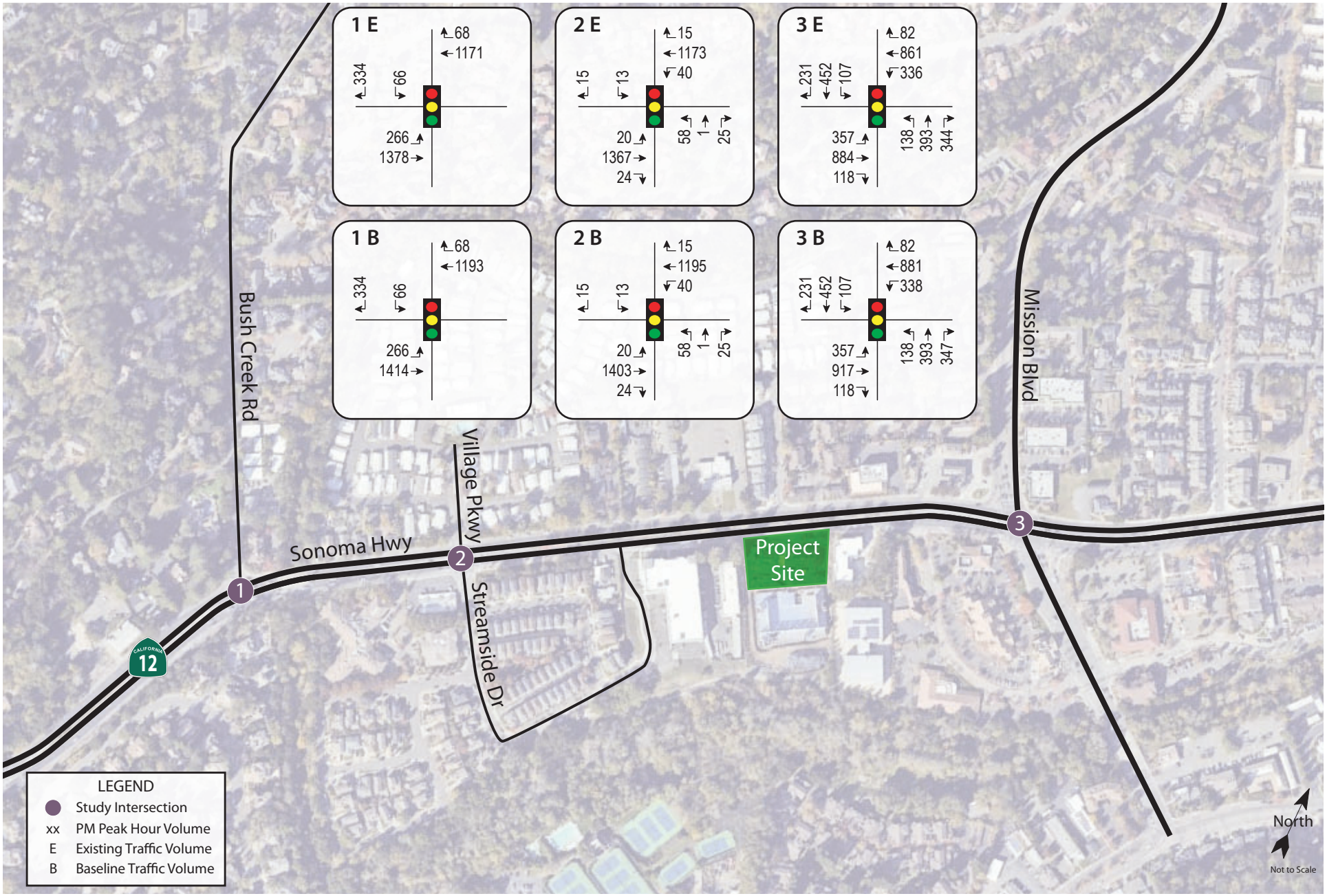
The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the p.m. peak period. This condition does not include project-generated traffic volumes. Existing turn-movement traffic volume data was collected on Thursday, September 26, 2024, while local schools were in session.

Under Existing Conditions, all study intersections operate acceptably at LOS D or better. A summary of the intersection Level of Service calculations is contained in Table 7. The existing traffic volumes are shown in Figure 3, and copies of the calculations are provided in Appendix C.

Table 7 – Existing PM Peak Hour Intersection Levels of Service

Study Intersection	Delay	LOS
1. Sonoma Hwy (SR 12)/Brush Creek Rd	33.3	C
2. Sonoma Hwy (SR 12)/Village Pkwy-Streamside Dr	6.9	A
3. Sonoma Hwy (SR 12)/Mission Blvd	44.2	D

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



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Transportation Impact Study for the Quick Quack Car Wash

Figure 3 – Existing and Baseline Traffic Volumes

W-Trans

Baseline Conditions

Baseline operating conditions were assessed with traffic from approved projects in and near the study area added to the existing volumes. The following four projects contained in the *Citywide Summary of Pending Development Report*, 2023, were included in the evaluation of Baseline Conditions. Unless stated otherwise, all projects have been approved and the same trip generation and distribution assumptions used in the traffic studies for the various projects, where available, were used in this analysis.

Mahonia Glen is a multi-family residential development project approved in 2020 and currently under construction at 5173 Sonoma Highway (SR 12) that consists of 99 apartment homes. Based on the *Traffic Impact Study for the Mahonia Glen Project*, W-Trans, 2020, the project is expected to generate 44 trips during the p.m. peak hour.

Acacia East is a single-family residential development project approved in 2007 and currently under construction at 660 Acacia Lane that consists of seven single-family homes. Based on rates published by the ITE *Trip Generation Manual,* 11th Edition, 2021, the project is expected to generate seven trips during the p.m. peak hour.

Acacia Village is a single-family residential development project approved in 2019 to be located at 746 Acacia Lane that will consist of 19 cottage homes and six single-family homes for a total of 25 residences. Based on the *Traffic Impact Study for the Acacia Village Project,* W-Trans, 2018, the project is expected to generate 25 trips during the p.m. peak hour.

Vista Gabrielle is a single-family residential development project approved in 2007 and to be located at 5150 Sonoma Highway (SR 12) that will consist of six single-family homes. Based on rates published by the *Trip Generation Manual*, the project is expected to generate six trips during the p.m. peak hour.

Under the baseline volumes resulting from adding trips associated with the four projects detailed above to existing volumes, all the study intersections would be expected to operate acceptably at LOS D or better. These results are shown in Table 8 and Baseline traffic volumes are shown in Figure 3.

Table 8 – Baseline PM Peak Hour Intersection Levels of Service

Study Intersection	Delay	LOS
1. Sonoma Hwy (SR 12)/Brush Creek Rd	33.1	C
2. Sonoma Hwy (SR 12)/Village Pkwy-Streamside Dr	6.9	A
3. Sonoma Hwy (SR 12)/Mission Blvd	44.1	D

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

It should be noted that with the addition of traffic volumes from the approved projects, average delay at the intersections of Sonoma Highway (SR 12)/Brush Creek Road and Sonoma Highway (SR 12)/Village Parkway-Streamside Drive decreases. While this is counter-intuitive, this condition occurs when trips are added to movements that are currently underutilized or have delays that are below the intersection average, resulting in a better balance between approaches and lower overall average delay. The approved projects add traffic predominantly to the through movements, which have average delays lower than the average for the intersections as a whole, resulting in a slight reduction in the overall average delay. The conclusion could incorrectly be drawn that the approved projects improve operation based on this data alone; however, it is more appropriate to conclude that this added traffic is expected to make use of excess capacity, and drivers would experience little, if any, change in conditions as a result.

Project Conditions

Existing plus Project Conditions

Upon the addition of anticipated project-generated traffic volumes to existing volumes, the study intersections would be expected operate acceptably at LOS D or better with increases to delay of less than five seconds. These results are summarized in Table 9, and project traffic volumes are shown in Figure 4 while Existing plus Project volumes are shown in Figure 5.

Table 9 – Existing and Existing plus Project PM Peak Hour Intersection Levels of Service

Study Intersection	Existing		Existing plus Project	
	Delay	LOS	Delay	LOS
1. Sonoma Hwy (SR 12)/Brush Creek Rd	33.3	C	33.3	C
2. Sonoma Hwy (SR 12)/Village Pkwy-Streamside Dr	6.9	A	7.1	A
3. Sonoma Hwy (SR 12)/Mission Blvd	44.2	D	44.5	D

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

Finding – All intersections are expected to operate acceptably with and without project traffic added to existing volumes.

Baseline plus Project Conditions

Upon the addition of expected project-generated traffic to baseline volumes, the study intersections are expected to operate acceptably at the same Levels of Service as without the project. The Baseline plus Project operating conditions are summarized in Table 10, and Baseline plus Project traffic volumes are shown in Figure 5.

Table 10 – Baseline and Baseline plus Project PM Peak Hour Intersection Levels of Service

Study Intersection	Baseline		Baseline plus Project	
	Delay	LOS	Delay	LOS
1. Sonoma Hwy (SR 12)/Brush Creek Rd	33.1	C	33.0	C
2. Sonoma Hwy (SR 12)/Village Pkwy-Streamside Dr	6.9	A	7.1	A
3. Sonoma Hwy (SR 12)/Mission Blvd	44.1	D	44.5	D

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

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

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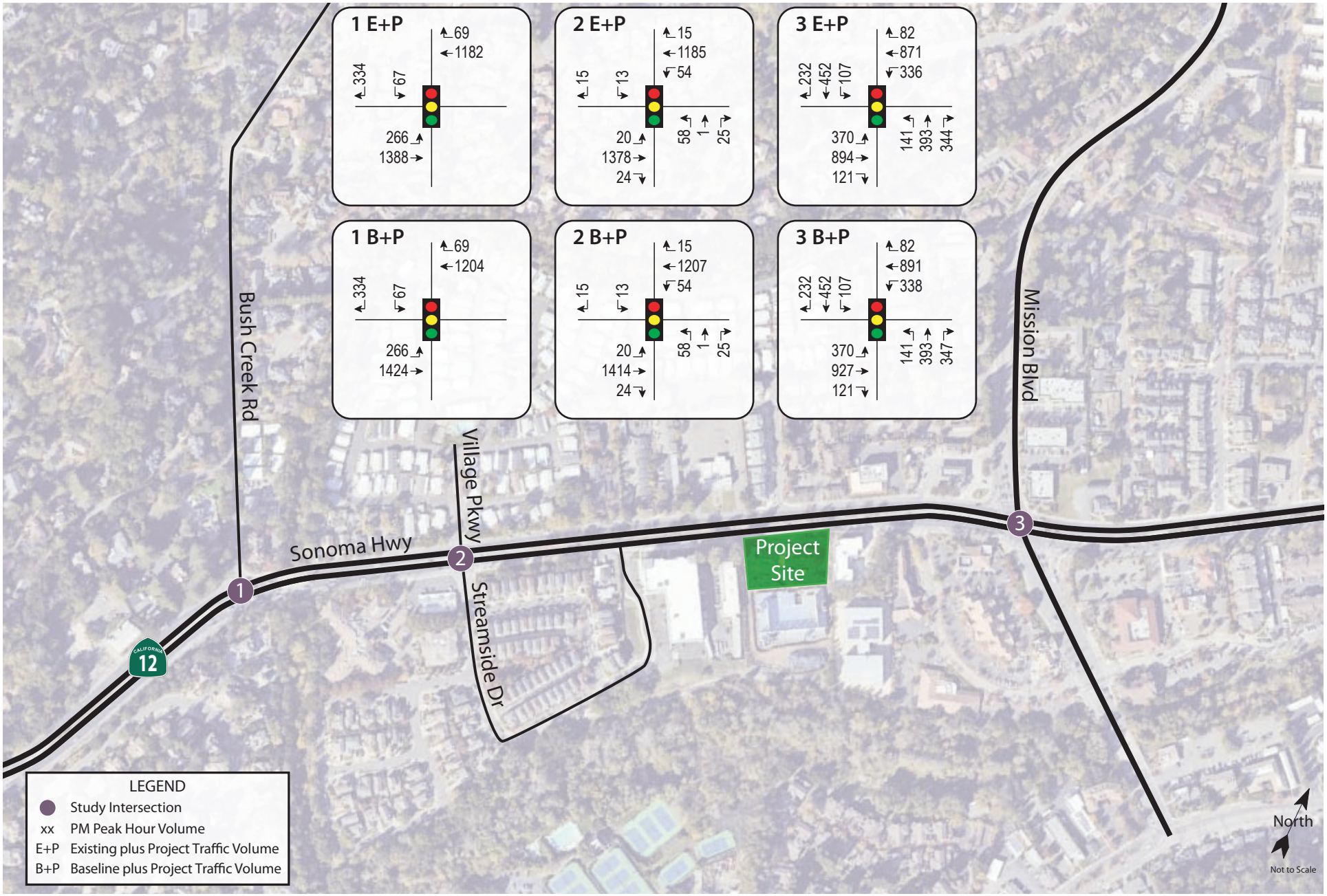
Figure 4 – Project Traffic Volumes

W-Trans



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Transportation Impact Study for the Quick Quack Car Wash

Figure 5 – Existing plus Project and Baseline plus Project Traffic Volumes

W-Trans

Parking

The project was analyzed to determine whether the proposed parking supply would be sufficient to conform to City requirements. However, Santa Rosa City Code, Section 20-36.040 provides no specific parking requirement for a car wash. According to the project site plan, 13 vehicle parking spaces would be provided on-site, two of which would be accessible. Of the 13 spaces, three are intended for employees, and the remainder are provided as self-service vacuum stations.

Finding – The Santa Rosa City Code does not provide requirements for off-street vehicle parking for a car wash land use. However, given the type of operation and staffing levels, the proposed parking supply appears to be adequate.

Conclusions and Recommendations

Conclusions

- The project would be expected to generate an average of 982 net new trips per day, including 32 a.m. peak-hour trips and 51 p.m. peak-hour trips.
- The calculated collision rates for the study intersections are below the statewide average for similar facilities, and there were no reported collisions during the study period involving pedestrians or bicyclists.
- The project would not conflict with any policies or plans regarding pedestrian, bicycle, or transit modes of travel. Bicycle storage facilities, however, are not proposed and do not meet the minimum requirements of the City's Municipal Code.
- The project is expected to have a less-than-significant impact on VMT.
- Sight lines at the project driveway are adequate, though on-street parked vehicles have the potential to obstruct sight lines.
- Emergency access and circulation within the project site would be adequate. The project would have a less-than-significant impact on emergency response times.
- Queuing capacity for approximately 14 vehicles within the pay station approach area would provide more than adequate storage capacity for the maximum of six queued vehicles expected.
- All study intersections would operate at acceptable Levels of Service under Existing and Baseline Conditions without and with traffic generated by the project.
- Although the Santa Rosa City Code does not provide requirements for off-street vehicle parking for the car wash land use, it does require that accommodations to park a minimum of three bicycles be provided.

Recommendations

- On-street parking should be prohibited on the south side of Sonoma Highway 40 feet to the west of the project driveway to ensure adequate sight lines for vehicles exiting the project driveway.
- The project should include a minimum of one long-term and two short-term bicycle parking spaces for use by employees.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE (Civil, Traffic), PTOE
Traffic Engineer	Kevin Carstens, PE (Civil, Traffic)
Associate Planner	Mark Brown
Assistant Engineers	Nathan Sharafian, EIT, Alyssa Labrador, EIT
Graphics	Jessica Bender
Editing/Formatting	Rebecca Mansour
Quality Control	Dalene J. Whitlock, PE (Civil, Traffic), PTOE

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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Worksheet

Quick Quack Carwash

Intersection # 1: Sonoma Hwy & Brush Creek Rd
Date of Count: Thursday, September 26, 2024

Number of Collisions: 13
Number of Injuries: 4
Number of Fatalities: 0
Average Daily Traffic (ADT): 32800
Start Date: October 1, 2018
End Date: September 30, 2023
Number of Years: 5

Intersection Type: Tee
Control Type: Signals
Area: Urban

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

$$\text{Collision Rate} = \frac{13 \times 1{,}000{,}000}{32{,}800 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.22 c/mve**	**0.0%**	**30.8%**
Statewide Average*	**0.28 c/mve**	**0.9%**	**49.1%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2021 Collision Data on California State Highways, Caltrans

Intersection # 2: Sonoma Hwy & Village Pkwy-Streamside Dr
Date of Count: Thursday, September 26, 2024

Number of Collisions: 8
Number of Injuries: 5
Number of Fatalities: 0
Average Daily Traffic (ADT): 27500
Start Date: October 1, 2018
End Date: September 30, 2023
Number of Years: 5

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

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

$$\text{Collision Rate} = \frac{8 \times 1{,}000{,}000}{27{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.16 c/mve**	**0.0%**	**62.5%**
Statewide Average*	**0.33 c/mve**	**0.6%**	**47.7%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2021 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Worksheet

Quick Quack Carwash

Intersection # 3: Sonoma Hwy & Mission Blvd
Date of Count: Thursday, September 26, 2024

Number of Collisions: 16
Number of Injuries: 5
Number of Fatalities: 0
Average Daily Traffic (ADT): 43000
Start Date: October 1, 2018
End Date: September 30, 2023
Number of Years: 5

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

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

$$\text{Collision Rate} = \frac{16 \times 1{,}000{,}000}{43{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.20 c/mve**	**0.0%**	**31.3%**
Statewide Average*	**0.33 c/mve**	**0.6%**	**47.7%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2021 Collision Data on California State Highways, Caltrans

Appendix B

Queuing Analysis

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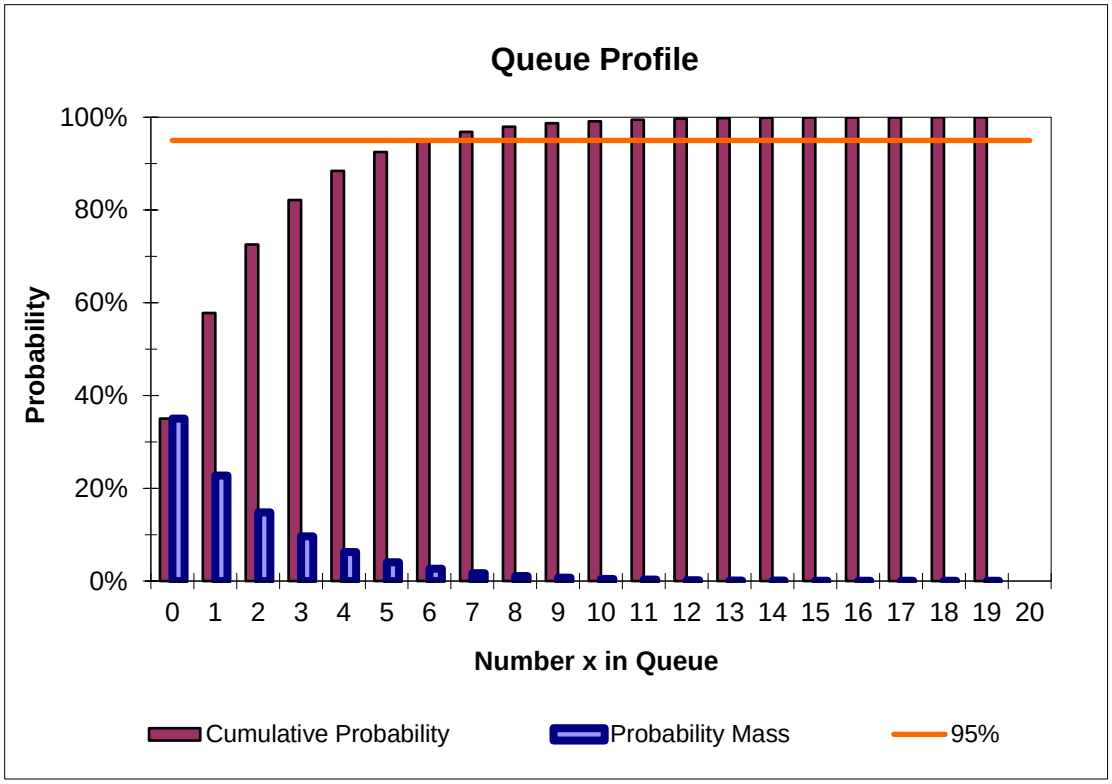
Drive Through Queuing Evaluation Worksheet

Project: 4358 Sonoma Hwy Quick Quack Car Wash TIS
Project No: SRO653
By: MB
Date: 11/12/2024

Arrival Rate (veh/hr):	39	No. of Service Points:	1
Service Rate (veh/hr):	60	Queuing Capacity (veh):	18

Probability the System is Empty	35%	
Probability the System is Full	0%	
Probability That Customer Waits	65%	
Average Time Customer Waits	2.9	minutes
Average Time Customer Waits To Get To Service Point	1.9	minutes
Probability That a Customer Elects Not to Enter the Queue	0%	
Average In System	1.9	vehicles
Average Total Length of Vehicles in System	46	feet
95th Percentile in System	6	vehicles
95th Percentile Total Length of Vehicles in System	150	feet



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Appendix C

Intersection Level of Service Calculations

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HCM 6th Signalized Intersection Summary
1: Sonoma Hwy SR 12 & Brush Creek Rd

11/05/2024

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	266	1378	1171	68	66	334
Future Volume (veh/h)	266	1378	1171	68	66	334
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	296	1531	1301	76	73	371
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	326	2610	1744	102	312	277
Arrive On Green	0.18	0.73	1.00	1.00	0.17	0.17
Sat Flow, veh/h	1781	3647	3506	199	1781	1585
Grp Volume(v), veh/h	296	1531	676	701	73	371
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1835	1781	1585
Q Serve(g_s), s	18.9	23.3	0.0	0.0	4.1	20.3
Cycle Q Clear(g_c), s	18.9	23.3	0.0	0.0	4.1	20.3
Prop In Lane	1.00			0.11	1.00	1.00
Lane Grp Cap(c), veh/h	326	2610	908	938	312	277
V/C Ratio(X)	0.91	0.59	0.74	0.75	0.23	1.34
Avail Cap(c_a), veh/h	496	2610	908	938	312	277
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.88	0.88	1.00	1.00
Uniform Delay (d), s/veh	46.5	7.2	0.0	0.0	41.2	47.8
Incr Delay (d2), s/veh	11.2	1.0	4.9	4.8	0.1	174.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	7.1	1.2	1.2	1.8	29.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.6	8.2	4.9	4.8	41.3	222.1
LnGrp LOS	E	A	A	A	D	F
Approach Vol, veh/h		1827	1377		444	
Approach Delay, s/veh		16.2	4.8		192.4	
Approach LOS		B	A		F	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		91.0		25.0	25.9	65.1
Change Period (Y+Rc), s		5.8		* 4.7	* 4.7	5.8
Max Green Setting (Gmax), s		85.2		* 20	* 32	48.2
Max Q Clear Time (g_c+I1), s		25.3		22.3	20.9	2.0
Green Ext Time (p_c), s		12.7		0.0	0.3	8.8

Intersection Summary	
HCM 6th Ctrl Delay	33.3
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
2: Streamside Dr/Village Pkwy & Sonoma Hwy SR 12

11/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1367	24	40	1173	15	58	1	25	13	0	15
Future Volume (veh/h)	20	1367	24	40	1173	15	58	1	25	13	0	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	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	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	1486	26	43	1275	16	63	1	27	14	0	16
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	2498	1091	115	2572	1124	168	6	154	180	0	161
Arrive On Green	0.09	1.00	1.00	0.06	0.72	0.72	0.10	0.10	0.10	0.10	0.00	0.10
Sat Flow, veh/h	1781	3554	1552	1781	3554	1553	1397	56	1516	1160	0	1585
Grp Volume(v), veh/h	22	1486	26	43	1275	16	63	0	28	14	0	16
Grp Sat Flow(s),veh/h/ln	1781	1777	1552	1781	1777	1553	1397	0	1572	1160	0	1585
Q Serve(g_s), s	1.3	0.0	0.0	2.7	17.9	0.3	5.1	0.0	1.9	1.1	0.0	1.1
Cycle Q Clear(g_c), s	1.3	0.0	0.0	2.7	17.9	0.3	8.0	0.0	1.9	3.0	0.0	1.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	1.00		1.00
Lane Grp Cap(c), veh/h	78	2498	1091	115	2572	1124	168	0	159	180	0	161
V/C Ratio(X)	0.28	0.59	0.02	0.37	0.50	0.01	0.38	0.00	0.18	0.08	0.00	0.10
Avail Cap(c_a), veh/h	312	2498	1091	312	2572	1124	427	0	451	436	0	455
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.2	0.0	0.0	52.0	6.9	4.5	51.9	0.0	47.7	49.1	0.0	47.3
Incr Delay (d2), s/veh	0.6	0.9	0.0	0.7	0.7	0.0	0.5	0.0	0.2	0.1	0.0	0.1
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	0.3	0.0	1.2	5.6	0.1	1.8	0.0	0.8	0.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.8	0.9	0.0	52.7	7.6	4.5	52.4	0.0	47.9	49.1	0.0	47.4
LnGrp LOS	D	A	A	D	A	A	D	A	D	D	A	D
Approach Vol, veh/h		1534			1334			91			30	
Approach Delay, s/veh		1.6			9.0			51.0			48.2	
Approach LOS		A			A			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.2	87.3		16.5	9.8	89.8		16.5				
Change Period (Y+Rc), s	* 4.7	5.8		* 4.7	* 4.7	5.8		* 4.7				
Max Green Setting (Gmax), s	* 20	47.2		* 33	* 20	47.2		* 33				
Max Q Clear Time (g_c+I1), s	4.7	2.0		5.0	3.3	19.9		10.0				
Green Ext Time (p_c), s	0.0	25.6		0.0	0.0	15.7		0.2				

Intersection Summary	
HCM 6th Ctrl Delay	6.9
HCM 6th LOS	A

Notes

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

HCM 6th Signalized Intersection Summary
3: Mission Blvd & Sonoma Hwy SR 12

11/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	357	884	118	336	861	82	138	393	344	107	452	231
Future Volume (veh/h)	357	884	118	336	861	82	138	393	344	107	452	231
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	364	902	120	343	879	84	141	401	0	109	461	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	414	1685	742	391	1662	731	197	554		195	550	
Arrive On Green	0.12	0.47	0.47	0.11	0.47	0.47	0.11	0.16	0.00	0.11	0.15	0.00
Sat Flow, veh/h	3456	3554	1565	3456	3554	1565	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	364	902	120	343	879	84	141	401	0	109	461	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1565	1728	1777	1565	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	14.0	24.1	5.9	13.2	23.6	4.1	10.3	14.5	0.0	7.8	17.0	0.0
Cycle Q Clear(g_c), s	14.0	24.1	5.9	13.2	23.6	4.1	10.3	14.5	0.0	7.8	17.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	414	1685	742	391	1662	731	197	554		195	550	
V/C Ratio(X)	0.88	0.54	0.16	0.88	0.53	0.11	0.72	0.72		0.56	0.84	
Avail Cap(c_a), veh/h	468	1685	742	417	1662	731	202	1008		202	1008	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	58.4	25.0	20.2	58.9	25.4	20.2	58.0	54.2	0.0	57.0	55.4	0.0
Incr Delay (d2), s/veh	14.7	1.2	0.5	16.9	1.2	0.3	9.5	0.7	0.0	1.8	1.3	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	6.8	10.0	2.3	6.6	9.9	1.6	5.2	6.6	0.0	3.6	7.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.1	26.2	20.7	75.8	26.6	20.5	67.5	54.9	0.0	58.8	56.8	0.0
LnGrp LOS	E	C	C	E	C	C	E	D		E	E	
Approach Vol, veh/h		1386			1306			542			570	
Approach Delay, s/veh		38.1			39.2			58.2			57.2	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.0	69.8	19.6	25.6	20.9	68.9	19.4	25.8
Change Period (Y+Rc), s	* 4.7	5.8	* 4.7	* 4.7	* 4.7	5.8	* 4.7	* 4.7
Max Green Setting (Gmax), s	* 16	45.2	* 15	* 38	* 18	43.2	* 15	* 38
Max Q Clear Time (g_c+I1), s	15.2	26.1	12.3	19.0	16.0	25.6	9.8	16.5
Green Ext Time (p_c), s	0.1	8.3	0.0	1.9	0.2	7.6	0.1	1.7

Intersection Summary	
HCM 6th Ctrl Delay	44.2
HCM 6th LOS	D

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
1: Sonoma Hwy SR 12 & Brush Creek Rd

11/05/2024

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	266	1388	1182	69	67	334
Future Volume (veh/h)	266	1388	1182	69	67	334
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	296	1542	1313	77	74	371
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	326	2610	1744	102	312	277
Arrive On Green	0.18	0.73	1.00	1.00	0.17	0.17
Sat Flow, veh/h	1781	3647	3505	200	1781	1585
Grp Volume(v), veh/h	296	1542	683	707	74	371
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1834	1781	1585
Q Serve(g_s), s	18.9	23.6	0.0	0.0	4.1	20.3
Cycle Q Clear(g_c), s	18.9	23.6	0.0	0.0	4.1	20.3
Prop In Lane	1.00			0.11	1.00	1.00
Lane Grp Cap(c), veh/h	326	2610	908	938	312	277
V/C Ratio(X)	0.91	0.59	0.75	0.75	0.24	1.34
Avail Cap(c_a), veh/h	496	2610	908	938	312	277
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.88	0.88	1.00	1.00
Uniform Delay (d), s/veh	46.5	7.2	0.0	0.0	41.2	47.8
Incr Delay (d2), s/veh	11.2	1.0	5.1	5.0	0.1	174.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	7.1	1.3	1.3	1.8	29.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.6	8.2	5.1	5.0	41.3	222.1
LnGrp LOS	E	A	A	A	D	F
Approach Vol, veh/h		1838	1390		445	
Approach Delay, s/veh		16.2	5.0		192.1	
Approach LOS		B	A		F	

Timer - Assigned Phs	2	4	5	6
Phs Duration (G+Y+Rc), s	91.0	25.0	25.9	65.1
Change Period (Y+Rc), s	5.8	* 4.7	* 4.7	5.8
Max Green Setting (Gmax), s	85.2	* 20	* 32	48.2
Max Q Clear Time (g_c+I1), s	25.6	22.3	20.9	2.0
Green Ext Time (p_c), s	12.9	0.0	0.3	9.0

Intersection Summary	
HCM 6th Ctrl Delay	33.3
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
2: Streamside Dr/Village Pkwy & Sonoma Hwy SR 12

11/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1378	24	54	1185	15	58	1	25	13	0	15
Future Volume (veh/h)	20	1378	24	54	1185	15	58	1	25	13	0	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	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	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	1498	26	59	1288	16	63	1	27	14	0	16
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	2467	1077	131	2572	1124	168	6	154	180	0	161
Arrive On Green	0.09	1.00	1.00	0.07	0.72	0.72	0.10	0.10	0.10	0.10	0.00	0.10
Sat Flow, veh/h	1781	3554	1552	1781	3554	1553	1397	56	1516	1160	0	1585
Grp Volume(v), veh/h	22	1498	26	59	1288	16	63	0	28	14	0	16
Grp Sat Flow(s),veh/h/ln	1781	1777	1552	1781	1777	1553	1397	0	1572	1160	0	1585
Q Serve(g_s), s	1.3	0.0	0.0	3.7	18.2	0.3	5.1	0.0	1.9	1.1	0.0	1.1
Cycle Q Clear(g_c), s	1.3	0.0	0.0	3.7	18.2	0.3	8.0	0.0	1.9	3.0	0.0	1.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	1.00		1.00
Lane Grp Cap(c), veh/h	78	2467	1077	131	2572	1124	168	0	159	180	0	161
V/C Ratio(X)	0.28	0.61	0.02	0.45	0.50	0.01	0.38	0.00	0.18	0.08	0.00	0.10
Avail Cap(c_a), veh/h	312	2467	1077	312	2572	1124	427	0	451	436	0	455
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.2	0.0	0.0	51.5	6.9	4.5	51.9	0.0	47.7	49.1	0.0	47.3
Incr Delay (d2), s/veh	0.6	0.9	0.0	0.9	0.7	0.0	0.5	0.0	0.2	0.1	0.0	0.1
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	0.3	0.0	1.6	5.7	0.1	1.8	0.0	0.8	0.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.8	0.9	0.0	52.4	7.6	4.5	52.4	0.0	47.9	49.1	0.0	47.4
LnGrp LOS	D	A	A	D	A	A	D	A	D	D	A	D
Approach Vol, veh/h		1546			1363			91			30	
Approach Delay, s/veh		1.6			9.5			51.0			48.2	
Approach LOS		A			A			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	86.3		16.5	9.8	89.8		16.5				
Change Period (Y+Rc), s	* 4.7	5.8		* 4.7	* 4.7	5.8		* 4.7				
Max Green Setting (Gmax), s	* 20	47.2		* 33	* 20	47.2		* 33				
Max Q Clear Time (g_c+I1), s	5.7	2.0		5.0	3.3	20.2		10.0				
Green Ext Time (p_c), s	0.0	25.8		0.0	0.0	15.8		0.2				

Intersection Summary	
HCM 6th Ctrl Delay	7.1
HCM 6th LOS	A

Notes

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

HCM 6th Signalized Intersection Summary
3: Mission Blvd & Sonoma Hwy SR 12

11/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	370	894	121	336	871	82	141	393	344	107	452	232
Future Volume (veh/h)	370	894	121	336	871	82	141	393	344	107	452	232
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	378	912	123	343	889	84	144	401	0	109	461	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	427	1685	742	391	1648	725	197	554		195	550	
Arrive On Green	0.12	0.47	0.47	0.11	0.46	0.46	0.11	0.16	0.00	0.11	0.15	0.00
Sat Flow, veh/h	3456	3554	1565	3456	3554	1565	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	378	912	123	343	889	84	144	401	0	109	461	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1565	1728	1777	1565	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	14.5	24.5	6.1	13.2	24.2	4.1	10.6	14.5	0.0	7.8	17.0	0.0
Cycle Q Clear(g_c), s	14.5	24.5	6.1	13.2	24.2	4.1	10.6	14.5	0.0	7.8	17.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	427	1685	742	391	1648	725	197	554		195	550	
V/C Ratio(X)	0.88	0.54	0.17	0.88	0.54	0.12	0.73	0.72		0.56	0.84	
Avail Cap(c_a), veh/h	468	1685	742	417	1648	725	202	1008		202	1008	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	58.2	25.1	20.3	58.9	25.9	20.5	58.1	54.2	0.0	57.0	55.4	0.0
Incr Delay (d2), s/veh	16.0	1.3	0.5	16.9	1.3	0.3	10.8	0.7	0.0	1.8	1.3	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	7.2	10.2	2.3	6.6	10.1	1.6	5.4	6.6	0.0	3.6	7.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.2	26.4	20.7	75.8	27.2	20.8	68.9	54.9	0.0	58.8	56.8	0.0
LnGrp LOS	E	C	C	E	C	C	E	D		E	E	
Approach Vol, veh/h		1413			1316			545			570	
Approach Delay, s/veh		38.7			39.4			58.6			57.2	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	20.0	69.8	19.6	25.6	21.4	68.4	19.4	25.8				
Change Period (Y+Rc), s	* 4.7	5.8	* 4.7	* 4.7	* 4.7	5.8	* 4.7	* 4.7				
Max Green Setting (Gmax), s	* 16	45.2	* 15	* 38	* 18	43.2	* 15	* 38				
Max Q Clear Time (g_c+I1), s	15.2	26.5	12.6	19.0	16.5	26.2	9.8	16.5				
Green Ext Time (p_c), s	0.1	8.3	0.0	1.9	0.2	7.5	0.1	1.7				

Intersection Summary	
HCM 6th Ctrl Delay	44.5
HCM 6th LOS	D

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
1: Sonoma Hwy SR 12 & Brush Creek Rd

11/12/2024

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	266	1414	1193	68	66	334
Future Volume (veh/h)	266	1414	1193	68	66	334
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	296	1571	1326	76	73	371
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	326	2610	1746	100	312	277
Arrive On Green	0.18	0.73	1.00	1.00	0.17	0.17
Sat Flow, veh/h	1781	3647	3510	195	1781	1585
Grp Volume(v), veh/h	296	1571	688	714	73	371
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1835	1781	1585
Q Serve(g_s), s	18.9	24.4	0.0	0.0	4.1	20.3
Cycle Q Clear(g_c), s	18.9	24.4	0.0	0.0	4.1	20.3
Prop In Lane	1.00			0.11	1.00	1.00
Lane Grp Cap(c), veh/h	326	2610	908	938	312	277
V/C Ratio(X)	0.91	0.60	0.76	0.76	0.23	1.34
Avail Cap(c_a), veh/h	496	2610	908	938	312	277
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.88	0.88	1.00	1.00
Uniform Delay (d), s/veh	46.5	7.3	0.0	0.0	41.2	47.8
Incr Delay (d2), s/veh	11.2	1.0	5.2	5.1	0.1	174.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	7.4	1.3	1.3	1.8	29.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.6	8.4	5.2	5.1	41.3	222.1
LnGrp LOS	E	A	A	A	D	F
Approach Vol, veh/h		1867	1402		444	
Approach Delay, s/veh		16.2	5.2		192.4	
Approach LOS		B	A		F	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		91.0		25.0	25.9	65.1
Change Period (Y+Rc), s		5.8		* 4.7	* 4.7	5.8
Max Green Setting (Gmax), s		85.2		* 20	* 32	48.2
Max Q Clear Time (g_c+I1), s		26.4		22.3	20.9	2.0
Green Ext Time (p_c), s		13.3		0.0	0.3	9.1

Intersection Summary	
HCM 6th Ctrl Delay	33.1
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
2: Streamside Dr/Village Pkwy & Sonoma Hwy SR 12

11/12/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1403	24	40	1195	15	58	1	25	13	0	15
Future Volume (veh/h)	20	1403	24	40	1195	15	58	1	25	13	0	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	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	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	1525	26	43	1299	16	63	1	27	14	0	16
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	2498	1091	115	2572	1124	168	6	154	180	0	161
Arrive On Green	0.09	1.00	1.00	0.06	0.72	0.72	0.10	0.10	0.10	0.10	0.00	0.10
Sat Flow, veh/h	1781	3554	1552	1781	3554	1553	1397	56	1516	1160	0	1585
Grp Volume(v), veh/h	22	1525	26	43	1299	16	63	0	28	14	0	16
Grp Sat Flow(s),veh/h/ln	1781	1777	1552	1781	1777	1553	1397	0	1572	1160	0	1585
Q Serve(g_s), s	1.3	0.0	0.0	2.7	18.5	0.3	5.1	0.0	1.9	1.1	0.0	1.1
Cycle Q Clear(g_c), s	1.3	0.0	0.0	2.7	18.5	0.3	8.0	0.0	1.9	3.0	0.0	1.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	1.00		1.00
Lane Grp Cap(c), veh/h	78	2498	1091	115	2572	1124	168	0	159	180	0	161
V/C Ratio(X)	0.28	0.61	0.02	0.37	0.50	0.01	0.38	0.00	0.18	0.08	0.00	0.10
Avail Cap(c_a), veh/h	312	2498	1091	312	2572	1124	427	0	451	436	0	455
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	0.82	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.2	0.0	0.0	52.0	7.0	4.5	51.9	0.0	47.7	49.1	0.0	47.3
Incr Delay (d2), s/veh	0.6	0.9	0.0	0.7	0.7	0.0	0.5	0.0	0.2	0.1	0.0	0.1
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	0.3	0.0	1.2	5.7	0.1	1.8	0.0	0.8	0.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.8	0.9	0.0	52.7	7.7	4.5	52.4	0.0	47.9	49.1	0.0	47.4
LnGrp LOS	D	A	A	D	A	A	D	A	D	D	A	D
Approach Vol, veh/h		1573			1358			91			30	
Approach Delay, s/veh		1.6			9.1			51.0			48.2	
Approach LOS		A			A			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.2	87.3		16.5	9.8	89.8		16.5				
Change Period (Y+Rc), s	* 4.7	5.8		* 4.7	* 4.7	5.8		* 4.7				
Max Green Setting (Gmax), s	* 20	47.2		* 33	* 20	47.2		* 33				
Max Q Clear Time (g_c+I1), s	4.7	2.0		5.0	3.3	20.5		10.0				
Green Ext Time (p_c), s	0.0	26.5		0.0	0.0	15.8		0.2				

Intersection Summary	
HCM 6th Ctrl Delay	6.9
HCM 6th LOS	A

Notes

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

HCM 6th Signalized Intersection Summary
3: Mission Blvd & Sonoma Hwy SR 12

11/12/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	357	917	118	338	881	82	138	393	347	107	452	231
Future Volume (veh/h)	357	917	118	338	881	82	138	393	347	107	452	231
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	364	936	120	345	899	84	141	401	0	109	461	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	414	1683	741	393	1662	731	197	554		195	550	
Arrive On Green	0.12	0.47	0.47	0.11	0.47	0.47	0.11	0.16	0.00	0.11	0.15	0.00
Sat Flow, veh/h	3456	3554	1565	3456	3554	1565	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	364	936	120	345	899	84	141	401	0	109	461	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1565	1728	1777	1565	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	14.0	25.4	5.9	13.3	24.3	4.1	10.3	14.5	0.0	7.8	17.0	0.0
Cycle Q Clear(g_c), s	14.0	25.4	5.9	13.3	24.3	4.1	10.3	14.5	0.0	7.8	17.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	414	1683	741	393	1662	731	197	554		195	550	
V/C Ratio(X)	0.88	0.56	0.16	0.88	0.54	0.11	0.72	0.72		0.56	0.84	
Avail Cap(c_a), veh/h	468	1683	741	417	1662	731	202	1008		202	1008	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	58.4	25.4	20.3	58.9	25.6	20.2	58.0	54.2	0.0	57.0	55.4	0.0
Incr Delay (d2), s/veh	14.7	1.3	0.5	17.1	1.3	0.3	9.5	0.7	0.0	1.8	1.3	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	6.8	10.6	2.3	6.6	10.2	1.6	5.2	6.6	0.0	3.6	7.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.1	26.7	20.7	76.0	26.9	20.5	67.5	54.9	0.0	58.8	56.8	0.0
LnGrp LOS	E	C	C	E	C	C	E	D		E	E	
Approach Vol, veh/h		1420			1328			542			570	
Approach Delay, s/veh		38.1			39.2			58.2			57.2	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.1	69.7	19.6	25.6	20.9	68.9	19.4	25.8
Change Period (Y+Rc), s	* 4.7	5.8	* 4.7	* 4.7	* 4.7	5.8	* 4.7	* 4.7
Max Green Setting (Gmax), s	* 16	45.2	* 15	* 38	* 18	43.2	* 15	* 38
Max Q Clear Time (g_c+I1), s	15.3	27.4	12.3	19.0	16.0	26.3	9.8	16.5
Green Ext Time (p_c), s	0.1	8.3	0.0	1.9	0.2	7.6	0.1	1.7

Intersection Summary	
HCM 6th Ctrl Delay	44.1
HCM 6th LOS	D

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
1: Sonoma Hwy SR 12 & Brush Creek Rd

11/12/2024

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	266	1424	1204	69	67	334
Future Volume (veh/h)	266	1424	1204	69	67	334
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	296	1582	1338	77	74	371
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	326	2610	1746	100	312	277
Arrive On Green	0.18	0.73	1.00	1.00	0.17	0.17
Sat Flow, veh/h	1781	3647	3509	196	1781	1585
Grp Volume(v), veh/h	296	1582	695	720	74	371
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1835	1781	1585
Q Serve(g_s), s	18.9	24.7	0.0	0.0	4.1	20.3
Cycle Q Clear(g_c), s	18.9	24.7	0.0	0.0	4.1	20.3
Prop In Lane	1.00			0.11	1.00	1.00
Lane Grp Cap(c), veh/h	326	2610	908	938	312	277
V/C Ratio(X)	0.91	0.61	0.76	0.77	0.24	1.34
Avail Cap(c_a), veh/h	496	2610	908	938	312	277
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.88	0.88	1.00	1.00
Uniform Delay (d), s/veh	46.5	7.4	0.0	0.0	41.2	47.8
Incr Delay (d2), s/veh	11.2	1.1	5.4	5.3	0.1	174.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	7.5	1.4	1.4	1.8	29.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.6	8.4	5.4	5.3	41.3	222.1
LnGrp LOS	E	A	A	A	D	F
Approach Vol, veh/h		1878	1415		445	
Approach Delay, s/veh		16.2	5.4		192.1	
Approach LOS		B	A		F	

Timer - Assigned Phs	2	4	5	6
Phs Duration (G+Y+Rc), s	91.0	25.0	25.9	65.1
Change Period (Y+Rc), s	5.8	* 4.7	* 4.7	5.8
Max Green Setting (Gmax), s	85.2	* 20	* 32	48.2
Max Q Clear Time (g_c+I1), s	26.7	22.3	20.9	2.0
Green Ext Time (p_c), s	13.5	0.0	0.3	9.3

Intersection Summary	
HCM 6th Ctrl Delay	33.0
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
2: Streamside Dr/Village Pkwy & Sonoma Hwy SR 12

11/12/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1414	24	54	1207	15	58	1	25	13	0	15
Future Volume (veh/h)	20	1414	24	54	1207	15	58	1	25	13	0	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	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	1758	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	1537	26	59	1312	16	63	1	27	14	0	16
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	2467	1077	123	2572	1124	168	6	154	180	0	161
Arrive On Green	0.09	1.00	1.00	0.07	0.72	0.72	0.10	0.10	0.10	0.10	0.00	0.10
Sat Flow, veh/h	1781	3554	1552	1674	3554	1553	1397	56	1516	1160	0	1585
Grp Volume(v), veh/h	22	1537	26	59	1312	16	63	0	28	14	0	16
Grp Sat Flow(s),veh/h/ln	1781	1777	1552	1674	1777	1553	1397	0	1572	1160	0	1585
Q Serve(g_s), s	1.3	0.0	0.0	3.9	18.7	0.3	5.1	0.0	1.9	1.1	0.0	1.1
Cycle Q Clear(g_c), s	1.3	0.0	0.0	3.9	18.7	0.3	8.0	0.0	1.9	3.0	0.0	1.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	1.00		1.00
Lane Grp Cap(c), veh/h	78	2467	1077	123	2572	1124	168	0	159	180	0	161
V/C Ratio(X)	0.28	0.62	0.02	0.48	0.51	0.01	0.38	0.00	0.18	0.08	0.00	0.10
Avail Cap(c_a), veh/h	312	2467	1077	293	2572	1124	427	0	451	436	0	455
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.81	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.2	0.0	0.0	51.6	7.0	4.5	51.9	0.0	47.7	49.1	0.0	47.3
Incr Delay (d2), s/veh	0.6	1.0	0.0	1.1	0.7	0.0	0.5	0.0	0.2	0.1	0.0	0.1
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	0.3	0.0	1.6	5.8	0.1	1.8	0.0	0.8	0.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.8	1.0	0.0	52.7	7.7	4.5	52.4	0.0	47.9	49.1	0.0	47.4
LnGrp LOS	D	A	A	D	A	A	D	A	D	D	A	D
Approach Vol, veh/h		1585			1387			91			30	
Approach Delay, s/veh		1.7			9.6			51.0			48.2	
Approach LOS		A			A			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	86.3		16.5	9.8	89.8		16.5				
Change Period (Y+Rc), s	* 4.7	5.8		* 4.7	* 4.7	5.8		* 4.7				
Max Green Setting (Gmax), s	* 20	47.2		* 33	* 20	47.2		* 33				
Max Q Clear Time (g_c+I1), s	5.9	2.0		5.0	3.3	20.7		10.0				
Green Ext Time (p_c), s	0.0	26.7		0.0	0.0	15.9		0.2				

Intersection Summary	
HCM 6th Ctrl Delay	7.1
HCM 6th LOS	A

Notes

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

HCM 6th Signalized Intersection Summary
3: Mission Blvd & Sonoma Hwy SR 12

11/12/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	370	927	121	338	891	82	141	393	347	107	452	232
Future Volume (veh/h)	370	927	121	338	891	82	141	393	347	107	452	232
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	378	946	123	345	909	84	144	401	0	109	461	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	427	1683	741	393	1648	725	197	554		195	550	
Arrive On Green	0.12	0.47	0.47	0.11	0.46	0.46	0.11	0.16	0.00	0.11	0.15	0.00
Sat Flow, veh/h	3456	3554	1565	3456	3554	1565	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	378	946	123	345	909	84	144	401	0	109	461	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1565	1728	1777	1565	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	14.5	25.8	6.1	13.3	24.9	4.1	10.6	14.5	0.0	7.8	17.0	0.0
Cycle Q Clear(g_c), s	14.5	25.8	6.1	13.3	24.9	4.1	10.6	14.5	0.0	7.8	17.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	427	1683	741	393	1648	725	197	554		195	550	
V/C Ratio(X)	0.88	0.56	0.17	0.88	0.55	0.12	0.73	0.72		0.56	0.84	
Avail Cap(c_a), veh/h	468	1683	741	417	1648	725	202	1008		202	1008	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	58.2	25.5	20.3	58.9	26.1	20.5	58.1	54.2	0.0	57.0	55.4	0.0
Incr Delay (d2), s/veh	16.0	1.4	0.5	17.1	1.3	0.3	10.8	0.7	0.0	1.8	1.3	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	7.2	10.7	2.3	6.6	10.4	1.6	5.4	6.6	0.0	3.6	7.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.2	26.9	20.8	76.0	27.4	20.8	68.9	54.9	0.0	58.8	56.8	0.0
LnGrp LOS	E	C	C	E	C	C	E	D		E	E	
Approach Vol, veh/h		1447			1338			545			570	
Approach Delay, s/veh		38.7			39.5			58.6			57.2	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	20.1	69.7	19.6	25.6	21.4	68.4	19.4	25.8				
Change Period (Y+Rc), s	* 4.7	5.8	* 4.7	* 4.7	* 4.7	5.8	* 4.7	* 4.7				
Max Green Setting (Gmax), s	* 16	45.2	* 15	* 38	* 18	43.2	* 15	* 38				
Max Q Clear Time (g_c+I1), s	15.3	27.8	12.6	19.0	16.5	26.9	9.8	16.5				
Green Ext Time (p_c), s	0.1	8.3	0.0	1.9	0.2	7.5	0.1	1.7				

Intersection Summary	
HCM 6th Ctrl Delay	44.5
HCM 6th LOS	D

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.