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Traffic Study

Benessere Vineyards Winery Modification P16-00432-MOD
Planning Commission Hearing Date (15, August, 2018)

Focused Traffic Analysis for the Proposed:

Benessere Vineyards Winery

Use Modification Project

County of Napa

Prepared for:

The County of Napa

At the Request of:

Benessere Vineyards

Draft Report

October, 2017

Prepared by:

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ENGINEERING SOLUTIONS

FOCUSED TRAFFIC ANALYSIS
PROPOSED BENESSERE VINEYARDS WINERY USE MODIFICATION PROJECT

Prepared For:
COUNTY OF NAPA
At the request of:
Benessere Vineyards

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1. Introduction

The following report provides a focused traffic analysis for the proposed Benessere Vineyards Winery Use Modification project located at 1010 Big Tree Road in Napa County--- (see Figure 1 for Project Vicinity Map). This traffic analysis is based on discussions with your planning consultant (Mr. Mark Phillips) about the proposed project characteristics as well as correspondence from Napa County Planning staff (Ms. Wyntress Balcher) related to the overall traffic scope/analysis. The methodologies for analyzing the potential impacts of proposed project uses are consistent with the Use Permit Modification (Supplemental Winery Uses) from Napa County Planning, Building, and Environmental Services.[1] The methodologies focus on both daily and peak hour trip generation associated with winery production, employment, and visitation levels. Proposed marketing plans and/or special events are also included in overall analyses of trip generation characteristics. Finally, the County has recently adopted revised transportation significance criteria established in the memorandum by Fehr and Peers.[2] Some of the key issues evaluated in this study include the following:

- Existing and future weekday PM peak hour and weekend (Saturday) mid-day peak hour operations at the Big Tree Road/State Route 29 (SR-29) intersection and daily traffic volumes along the Big Tree Road roadway segment;
- Near-Term (2020) traffic conditions reflecting other approved/pending projects in the study area encompassing Napa County and the Cities of St. Helena and Calistoga;
- Increase in proposed project trip generation relative to existing conditions from proposed project use modifications including production, visitation, employment, and marketing events;
- Project site access at the winery's Big Tree Road driveway and circulation of vehicles within the winery areas;
- Cumulative year 2030 (no project) conditions along Silverado Trail based on the Napa County General Plan Update EIR.

The following sections outline existing and future conditions with and without the increase in traffic from proposed Benessere Vineyards Winery Use modification project. Where necessary, measures have been recommended to ensure acceptable traffic flow, circulation, and/or fair share mitigation consistent with significance thresholds outlined in the Fehr and Peers memorandum.

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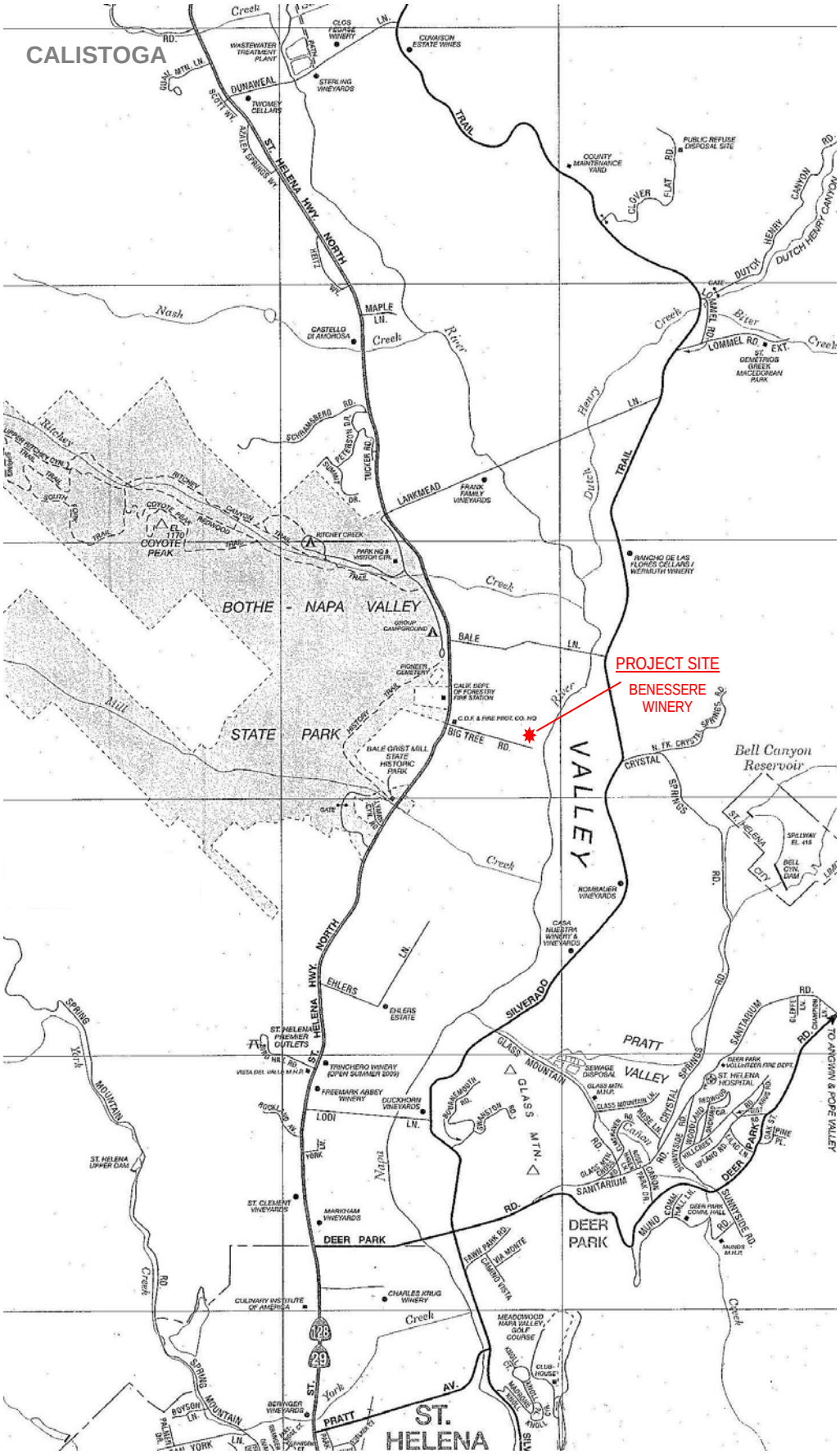
[1] Napa County Planning, Building, and Environmental Services, Use Permit Application (Supplemental Application for Winery Uses, Revised June 11, 2015.

[2] Fehr & Peers, Guidelines for Interpretation of General Plan Circulation Policies on Significance Criteria, December 1, 2015.



Project Vicinity Map

North

omni-means

figure 1

2. Existing Conditions

Proposed Project Site

The Benessere Vineyards Winery is located at 1010 Big Tree Road at the very east end of the roadway. Big Tree Road is located approximately 2.4 miles north of the City of St. Helena and 4.3 miles south of Calistoga off State Route 29. A brief description of each roadway follows:

Roadways

State Route 29 (SR-29) extends in a north-south direction between cities of St. Helena and Calistoga in the project study area. In this area, SR-29 is classified as a two-lane rural throughway based on the Napa County General Plan. The highway provides access north through Calistoga and into Lake County to Middleton and Lower Lake. South of St. Helena the highway provides access to Rutherford, Oakville, Yountville, Napa, American Canyon, and Vallejo. In the immediate project site area SR-29 has one travel lane in each direction with 2-4 foot striped shoulders. A CalFire substation (Sonoma Lake Napa Unit) is located on the northeast quadrant of the SR-29/Big Tree Road intersection. The speed limit on SR-29 is 50 mph in the project area.

Big Tree Road extends east from SR-29 for approximately 2,200 feet (1/4 mile) before accessing the Benessere Vineyards project driveway at the end of the roadway. A two-lane local roadway, Big Tree Road provides access to both State (CalFire) and agricultural winery facilities (Tudal Winery) in addition to Benessere Vineyards. Approximately 400 feet east of SR-29, Big Tree Road narrows from 22-24 feet to approximately 18-20 feet as it provides access to Tudal Winery and Benessere Vineyards Winery. In the wider roadway section immediately east of SR-29, Big Tree Road has curb and gutter on both sides of the street with pedestrian sidewalk (discontinuous) on the north side of the street adjacent to the CalFire substation.

It is noted that a private driveway (3473 St. Helena Highway) extends immediately west of Big Tree Road at SR-29. This private driveway creates a de-facto four-way intersection at SR-29 with Big Tree Road. However, weekday and weekend volumes to/from the private driveway are quite low (1 trip) during these time periods.

Existing Intersection Volumes

In order to identify existing peak hour operating conditions, existing peak period traffic counts were conducted at the major outlying Big Tree Road intersection at SR-29 west of the project driveway.[3,4] Vehicle counts were conducted during a weekday PM commute period and a Saturday peak afternoon period at the following intersection:

1. Big Tree Road/SR-29 Stop-control (Big Tree Road)

Peak period vehicle counts were conducted on a weekday late afternoon (4:00-6:00 p.m.) and Saturday afternoon (1:00-4:00 p.m.). The resultant "peak hour" of traffic flow on Silverado Trail occurs during 4:30-5:30 p.m. (Thursday) and 2:00-3:00 p.m. (Saturday). Peak period counts were conducted during the non harvest/crush season (Mid-June) and do not quite fully reflect peak traffic

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[3] Baymetrics Traffic Resources, Weekday peak period (4:00-6:00 p.m.) and Weekend (Saturday) peak period (1:00-4:00 p.m) vehicle turning movement counts at the Big Tree Road/State Route 29 intersection, June 20 & 24, 2017.
[4] Baymetrics Traffic Resources, Average daily traffic (ADT) counts on Big Tree Road immediately east of SR-29 and west of Benessere Vineyards Winery driveway, June 22-24, 2017.

conditions on SR-29 (August-September). Therefore, peak hour volumes on SR-29 were increased by 8.8% at the study intersections based on the most recent Caltrans Highway Volume data (average ADT vs. peak month ADT).

Existing weekday PM peak hour and weekend mid-day peak hour intersection volumes have been shown in Figure 2.

Roadway Volumes

New average daily traffic (ADT) counts were conducted along Big Tree Road immediately east of SR-29. As recorded, average daily traffic on the roadway is currently 195 vehicles. Again, these traffic counts were conducted during the month of June when ADT volumes do not quite reflect peak month activity (August-September). Therefore, recorded ADT volumes were increased by 8.8% to 212 vehicles to reflect peak month activity. An ADT of 212 vehicles on Big Tree Road reflects an operating capacity of LOS A based on a two-lane local roadway.

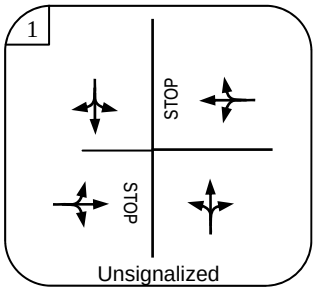
ADT volumes on SR-29 at Big Tree Road were derived from the most recent Caltrans volume data for SR-29.[5] Peak month ADT in the project study area is currently 14,900 vehicle on SR-29. Based on more recent roadway capacity research conducted as part of the 2010 Highway Capacity Manual and FDOT, a two-lane undivided roadway would have a capacity between 14,400-16,200 ADT to operate at LOS D (beyond 16,200 ADT reflects LOS E-F). Therefore, ADT volumes of 14,900 on SR-29 more closely relate to roadway LOS of D based on updated capacity models and research (see Appendices for Roadway LOS Table).[6]

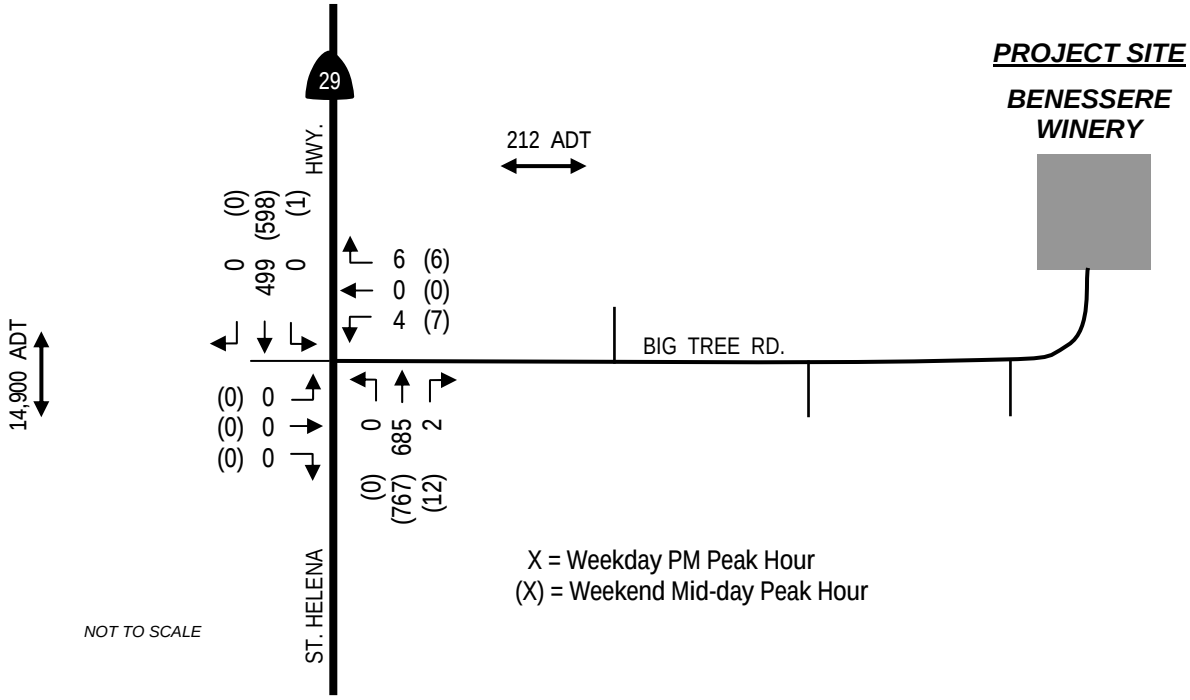
In addition to daily traffic volumes, peak hour arterial operation has also been considered. As with daily traffic, Big Tree Road is currently operating at LOS A (local collector street). SR-29 experiences peak hour arterial flow (two-way) of 1,186 vehicles during the weekday PM peak hour and 1,378 during the Saturday mid-day peak hour. Based on two-lane undivided uninterrupted flow highway capacities, this would yield LOS C during both time periods (see Appendices for Peak Hour Roadway LOS Table).

[5] Caltrans Highway Volumes, 2015 Traffic Volumes on California State Highways, Average Daily Traffic (ADT) volumes south of Larkmead Lane, Annual average and peak month volumes.

[6] Florida Department of Transportation (FDOT), 2012 Quality/Level of Service Handbook Tables, Table 2, Areas over 5,000 not in Urbanized Areas.

GEOMETRIES / CONTROLS:





Existing Weekday P.M. and (Weekend Mid-day) Peak Hour Volumes

North

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figure 2

Existing Intersection Methodology/Description

Intersection operation is one of the primary factors in evaluating the carrying capacity of a roadway network. Traffic conditions are measured by Level of Service (LOS), which applies a letter ranking to successive levels of intersection performance. LOS 'A' represents optimum conditions with free-flow travel and no congestion. LOS 'F' represents severe congestion with long delays at the approaches. For intersections with minor street stop control, the LOS reflects the delays experienced by the minor street approach. Level of service definitions are shown in Table 1.

The existing project driveway is located at the far eastern terminus of Big Tree Road and requires no turning movements to gain access (uncontrolled) from Big Tree Road. Guests and/or employees merely drive to the end of Big Tree Road and access the Benessere Vineyards Winery grounds through a gated access driveway that extends north onto the winery's vineyards to the winery operations buildings.

The Big Tree Road/SR-29 intersection is stop-sign controlled for westbound Big Tree Road at SR-29. Big Tree Road does not have separate westbound right or left-turn lanes at SR-29 but does have a slight "flare" for right-turn movements. Similarly, there are a no vehicle turn lanes on SR-29 at Big Tree Road. Southbound motorists on SR-29 must decelerate within the flow of traffic to turn left onto Big Tree Road. There is a northbound right-turn taper on SR-29 as the roadway flares out slightly towards Big Tree Road but no deceleration lane exists on SR-29 at this time.

Intersection levels-of-service have been based on the most recent Highway Capacity Manual (*HCM 2010*) operations methodology for unsignalized intersections. In addition, peak hour factors (PHF's) for each intersection approach have been incorporated into all existing and future intersection LOS calculations. The PHF is a measure of the traffic flow rate at each intersection approach. Based on field count data, these PHF's ranged from .25 to .96 dependent on each intersection. Intersection approaches with lower approach volumes typically have lower (and more conservative) PHF's. In addition, all through-traffic on Silverado Trail was adjusted to reflect 5% truck traffic and has been incorporated into the LOS calculations based on the most recent Caltrans data.

TABLE 1
INTERSECTION LEVEL-OF-SERVICE DEFINITIIONS

Level of Service	Type of Flow	Delay	Maneuverability	Stopped Delay/Vehicle (sec) Signalized/ Roundabouts	Stopped Delay/Vehicle (sec) Unsignalized/ All-Way Stop
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	< 10.0	< 10.0
B	Stable Flow	Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	>10.0 and < 20.0	>10.0 and < 15.0
C	Stable Flow	Higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted.	>20.0 and < 35.0	>15.0 and < 25.0
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	>35.0 and < 55.0	>25.0 and < 35.0
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	>55.0 and < 80.0	>35.0 and < 50.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	> 80.0	> 50.0

References: 2010 Highway Capacity Manual

Existing Intersection Operations

Existing weekday PM peak and weekend mid-day peak hour existing (no project) level-of-service has been shown in Table 2. As calculated, the Big Tree Road/State Route 29 (SR-29) intersection is operating at LOS C (20.8 seconds) during the weekday PM peak hour and LOS D (32.4 seconds) during the weekend mid-day peak hour. It is noted that unsignalized intersections along SR-29 can experience major delays for minor street stop-sign controlled traffic due to existing traffic components along the highway. Specifically, these factors on SR-29 include higher vehicle speeds, higher traffic volumes, and the lack of "gaps" in north-south traffic to allow safe access to/from SR-29. These conditions are very pronounced during the weekday and Saturday peak traffic flow periods when commute/tourist traffic is leaving or arriving in the Napa Valley. Through-traffic on SR-29 can cause long delays for stop-sign controlled westbound left and right-turn movements from Big Tree Road during these time periods. It is noted that the majority of vehicle traffic to/from Big Tree Road is primarily related to the existing CalFire Substation located on the northeast quadrant of the Big Tree Road/SR-29 intersection. Based on field observations, it appeared that the majority of inbound/outbound traffic to/from Big Tree Road during the commute periods is associated with employees and/or State vehicles associated with CalFire and less so for other winery-related traffic located further east on Big Tree Road.

TABLE 2
EXISTING AND NEAR-TERM (NO PROJECT) CONDITIONS: INTERSECTION LEVELS-OF-SERVICE
WEEKDAY PM PEAK AND WEEKEND MID-DAY PEAK HOUR[1, 2]

			Wkdy. PM LOS/Delay		Wknd. Mid-Day LOS/Delay	
	Intersection	Control Type	Existing (No Project)	Near-Term (No Project)	Existing (No Project)	Near-Term (No Project)
1	Big Tree Road/State Route 29	Stop	C 20.8	C 24.0	D 32.4	**E 43.5**

(1) Based on Highway Capacity Manual (HCM) 2010, Operations methodology for stop-sign controlled (unsignalized) intersections using Synchro-Simtraffic software. Intersection calculation yields an LOS and vehicle delay in seconds. Stated LOS refers to the minor street (stop-sign) controlled movement.

Signal Warrant Evaluation

Based on the California Manual on Uniform Traffic Control Devices (CAMUTCD) peak hour signal warrant criteria, the Big Tree Road/SR-29 unsignalized study intersection was evaluated for signalization.[7] The peak hour warrant(s) are one of several standards to help determine if installation of a traffic signal is appropriate. Qualifying for signalization using the peak hour warrants does not necessarily mean a signal should be installed. The decision to install a traffic signal should be based on further studies utilizing additional warrants as presented in the California MUTCD. At this time, the Big Tree Road/SR-29 intersections would not qualify for signalization under the peak hour warrant (the warrant graphs are provided in the Appendix). The driveway volumes at Big Tree Road are too low for warrant satisfaction (75 vehicle minor-street minimum volume).

[7] *California Manual on Uniform Traffic Control Devices (CAMUTCD), Chapter 4C, Peak hour signal warrant (#3), 2012.*

3. Near-Term (No Project) Conditions

Near-Term Methodology

Both near-term (year 2020-no project) and cumulative (year 2030) volume projections for SR-29 were reviewed from the Napa Valley Transportation Authority's traffic volume forecasts found in the Napa County General Plan Update EIR.[8] The forecasted increase in volume-to-capacity (v/c) ratio from Year 2003 to Year 2030 on State Route 29 (adjacent to Big Tree Road) was applied to the Year 2003 peak hour two-way volumes (1,344 vehicles) on the highway. This yielded a future volume of 2,896 weekday PM peak hour vehicles on SR-29 in the Year 2030. This would equate to a robust increase in traffic volumes of approximately 7.96% per year to the Year 2030 on SR-29.

In addition to Napa County General Plan Update EIR traffic projections, local approved/pending projects in the immediate study area have been included in overall traffic growth at the request of Napa County Public Works staff.[9] Specifically, ongoing development projects occurring within Napa County include the following:

- **Larkmead Winery** – 1100 Larkmead Lane, Napa County, approximately 1.0 miles north of the project site; increase annual production of 75,000 gallons; 18 full-time employees and seven part-time employees; average of 100 visitors per day; average of 120-500 guests at special events;
- **Flynnville Wine Company** – 1184 Maple Lane, approximately 2.0 miles north of the project site; new winery with an annual production of 40,000 gallons; 14 full-time employee and six part-time employees; average of 25 visitors per day; average of 100 guests at special events;
- **Sodhani Winery** – 3283 St. Helena Highway, approximately 0.75 miles south of the project site; use permit update to produce 12,000 gallons annually; four full-time employees; No visitation or special events;
- **Davis Estates Winery** – 4060 Silverado Trail, approximately 2.30 miles northeast of the project site; use permit update to increase production to 100,000 gallons annually; 14 full-time employees; average of 200 visitors per day; maximum of 200 guests at special events;

Daily, weekday PM peak hour, and Saturday mid-day peak traffic volumes were generated for the above near-term projects based on the employee peaking factors and auto occupancy rates for visitors using recent winery research conducted by the Napa County Planning, Building, and Environmental Services Department.[10]

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[8] *Dowling Associates, Napa County General Plan Update, Technical Memorandum for Traffic and Circulation Supporting the Findings and Recommendations, February 9, 2008.*

[9] *Ms. Emily Hedge, Associate Planner, County of Napa, personal communication related to County development projects, May 5, 2017.*

[10] *County of Napa, Conservation, Development, and Planning Department, "Use Permit Application Package," Napa County Winery Traffic Generation Characteristics, 2012.*

In addition to individual Napa County approved pending projects, the City of St. Helena's General Plan 2035 was reviewed for local projects in the study area that would contribute to near-term traffic growth. Specifically, traffic growth projections from the City's recent Circulation Element were employed based on a 20-year growth horizon (2015-2035). Finally, the City of Calistoga's pending development list was reviewed for near-term projects and included the following based on discussions with City Planning staff:

- **Enchanted Resorts:** 411 Foothill Road, 13 single-family units, 20 multi-family units, 110 room resort hotel, and 100-seat restaurant;

- **Indian Springs Expansion:** 1712 Lincoln Avenue, 75-room resort accommodations, 6,000 square-foot restaurant, 3,200 square feet event center;

- **Silver Rose Resort:** 85-room resort hotel, 57,630 square feet resort amenities, 110-seat restaurant, 21 single-family units.

Weekday PM peak hour and weekend mid-day peak hour volumes for the above Calistoga near-term projects were taken from previous transportation studies conducted for the City of Calistoga.

With regard to near-term (no project) conditions, a three-year horizon window to the Year 2020 has been assumed. Based on the approved/pending projects reviewed by County staff, both weekday PM peak hour and weekend mid-day peak hour traffic volumes resulting from these projects were added to the street network.

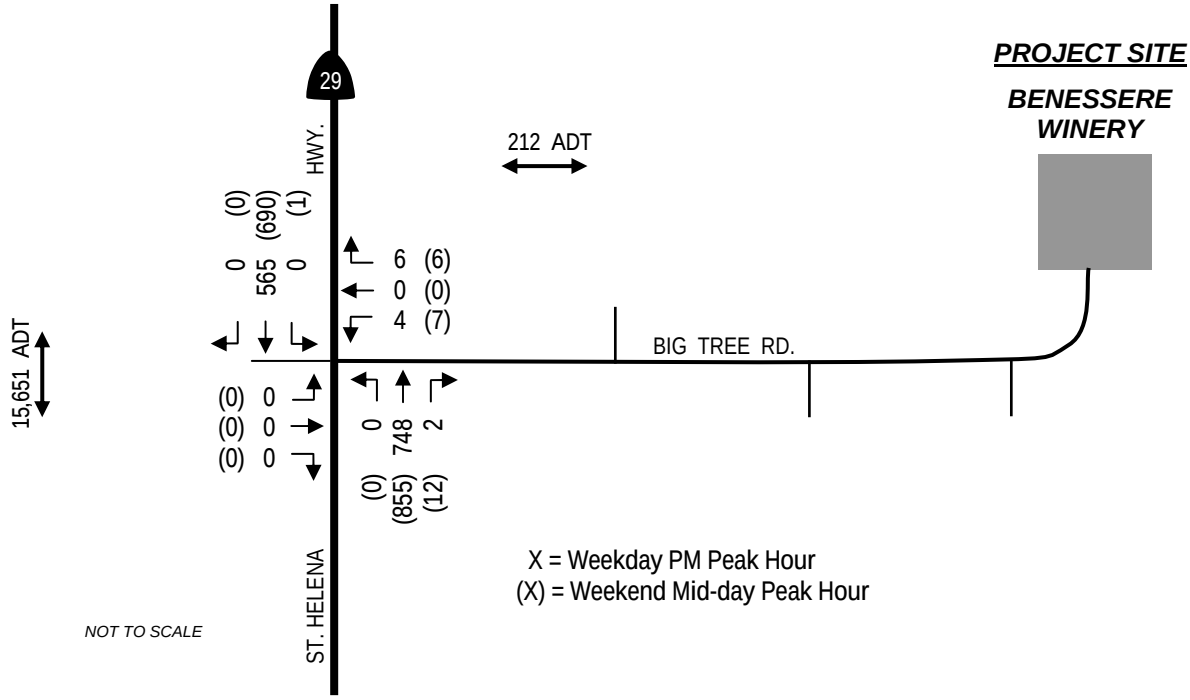
Near-term (no project) volumes for weekday PM peak hour and weekend mid-day peak hour have been shown in Figure 3.

Near-Term (No Project) Roadway/Intersection Operation

ADT on SR-29 would increase to 15,651 (LOS D) near Big Tree Road with near-term (no project) volumes. During the weekday PM peak hour and Saturday mid-day peak hour; volumes on SR-29 would increase to 1,315 vehicles and 1,558 vehicles respectively. These volume levels would reflect LOS C and LOS D operations during these same time periods.

With near-term (no project) volumes, study intersection LOS has been calculated and are shown in Table 2. The Big Tree Road/SR-29 intersection would experience increases in vehicle delays during the weekday PM peak hour and/or weekend mid-day peak hour. For the minor street outbound turning movements, LOS would continue to operate at LOS C (24.0 secs.) during the PM peak hour. However, during the weekend mid-day peak hour (Saturday) the existing LOS of D (32.4 secs.) would change to LOS E (43.5 secs.) with near-term (no project) traffic volumes. During the weekend mid-day peak hour, through-traffic on SR-29 tends to increase uniformly in each direction given additional tourist traffic during the peak months. This increase in near-term volumes results in less "gaps" in traffic volumes on SR-29 making it more difficult to merge to/from the minor street approaches. It is noted that traffic volumes on Big Tree Road are not likely to increase beyond current levels compared to expected growth along the SR-29 corridor.

Based on CAMUTCD peak hour signal warrant criteria (Warrant #3), Big Tree Road/SR-29 intersection would not qualify for signalization with near-term (no project) volumes. Minor street volumes are Big Tree Road are too low for the peak hour signal warrant (75 vehicles minimum—minor street approach).



Near-Term Weekday P.M. and (Weekend Mid-day) Peak Hour Volumes

North

omni-means

figure 3

4. Napa County Significance Criteria

The County of Napa's significance criteria has been based on a review of the Napa Valley Transportation Authority and Napa County General Plan documentation on roadway and intersection operations. In addition, updated criteria for unsignalized intersections based on adopted criteria in the Fehr and Peers "Guidelines for Interpretation of General Plan Circulation Policies on Significance Criteria" has been applied to arterials and minor street stop-sign controlled intersections. Specifically, the Circulation Element of the County's General Plan and new guidelines for significance criteria outline the following significance criteria specific to intersection operation:

Intersections

- The County shall seek to maintain a Level of Service D or better at all intersections, except where the level of service already exceeds this standard (i.e. Level of Service E or F) and where increased intersection capacity is not feasible without substantial additional right-of-way;
- No single level of service standard is appropriate for un-signalized intersections, which shall be evaluated on a case-by-case basis to determine if signal warrants are met;
- An unsignalized intersection operates at LOS A, B, C, or D during the selected peak hours without Project trips, the LOS deteriorates to LOS E or F with the addition of Project traffic, the peak hour signal warrant criteria should also be evaluated and presented for informational purposes; or
- An unsignalized intersection operates at LOS E or F during the selected peak hours without Project trips, and the project contributes one percent or more of the total entering traffic for all-way-stop-controlled intersections, or ten percent or more of the traffic on a side-street approach for side-street stop-controlled intersections; the peak hour signal warrant criteria should also be evaluated and presented for informational purposes.

  Example: The side-street approach at an intersection operates at LOS F during the peak hour without the Project. The existing volume on that approach is 200 vehicles during that peak hour. A Project is anticipated to add 10 vehicles to the stop-controlled approach during the peak hour. Therefore, the Project contribution percentage would be calculated as follows:

  10 trips / 200 existing side-street approach = 5% Project Contribution

Please note---the above example calculation would only be applied for any project study intersection operating at LOS E or F without Project traffic and the proposed project would be adding peak hour vehicle trips.

Further significance criteria are based on County and CEQA guidelines and apply mainly to intersection operation and access. A significant impact occurs if project traffic would result in the following:

- Cause an increase in traffic which is substantial in relation to existing traffic load and capacity of the street system (i.e. result in a substantial increase in either the number of vehicle trips, the volume capacity ratio on roads, or congestion at intersections);
- Exceed either individually or cumulatively, an LOS standard established by the county congestion management agency for designated roads or highways;

- Result in a change of traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- Substantially increase hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment);
- Result in inadequate emergency vehicle access;
- Project site or internal circulation on the site is not adequate to accommodate pedestrians and bicycles;

5. Proposed Project Impacts

Proposed Winery Use Modifications

The proposed Benessere Vineyards Winery Use Permit Modification project would consist of production, employment, visitation, and a marketing plan associated overall winery activities. Based on discussions with the project applicant, current visitation at the winery can sometimes exceed the pre-WDO entitlements/use permit approved 35 years ago. Proposed entitlement changes would ensure compliance with County regulations. With regard to employment, the use modification proposes up to 10 employees (weekday) and 4 employees (weekend). Tour and tasting visitation would include up to 60 guests per day (maximum-weekend) and 36 guests on a weekday (maximum) for a total of 300 weekly visitors. There would be a net increase in winery production to 44,000 gallon per year. In addition, the winery has included a marketing plan with up to 32 events per year.

Proposed project components can be described as follows:

Project Components (Winery Operations):

- Production Gallons: 54,000 (annually)
- Employees Weekday: 8 full-time, 2 part-time
  Weekend: 2 full-time, 2 part-time
- Visitors: Weekday: 36 visitors
  Weekend: 60 visitors
- Trucks: Weekday: 2 trucks per day
  Weekend: 2 trucks per day

Daily operations for the proposed Benessere Vineyards Winery project would involve an on-site winery operation with a maximum annual production of 44,000 gallons. All fruit would be processed on-site during the year with the majority occurring during the harvest/crush season. A weekday average up to 36 visitors is expected (maximum weekday daily visitors). A maximum 60 visitors would occur on a Saturday or Sunday. Visitor hours would be limited between 10:00 a.m. – 6:00 p.m. and would be by appointment only. It is noted that there is an existing single-family residence (occupied) on the site. Vehicle trips associated with this residence have been included in existing daily and peak hour counts conducted for proposed project analysis.

The proposed project's marketing plan can be described as follows:[11]

Project Components (Marketing):

- 24 events annually: maximum of 25 guests;
- Four (4) events annually: maximum of 80 guests;
- Four (4) events annually: maximum of 150 guests.

Project Trip Generation/Distribution

The Benessere Vineyards Winery total net increase in weekday and weekend peak hour and daily traffic volumes have been calculated and are shown in Table 3. Daily trip generation has been based on employee peaking factors and auto occupancy rates for visitors using recent winery research conducted by the Napa County Planning, Building, and Environmental Services Department.[12] Based on maximum employee, visitor/guest, and production data the proposed project would be expected to generate 57 weekday daily trips with 22 PM peak hour trips (6 in, 16 out). During a typical weekend (Saturday), the project would be expected to generate a maximum of 53 daily trips with 30 mid-day (afternoon) peak hour trips (15 in, 15 out).

During the approximate six-week harvest crush season, the proposed project is expected to generate a maximum of 63 Saturday daily trips. Based on the largest marketing event attendance of 150 persons, there would total generation of 125 event trips (unless shuttle buses/TDM is used).

To determine traffic conditions with the proposed project, the calculated project trips were added to existing volumes. Based on observed turning percentages at the Benessere Vineyards Winery driveway, the weekday PM peak hour project trips were distributed 50% to/from the north and 50% to/from the south on SR-29. Saturday mid-day peak hour project trip distribution was distributed with 35% to/from the north and 65% to/from the south on SR-29.

Existing plus project and near-term plus project volumes have been shown in Figure 4 and 5.

[11] Use Permit Modification Application, Project Description, Benessere Vineyards Winery, 1010 Big Tree Road, Napa County, 2017.

[12] County of Napa, Conservation, Development, and Planning Department, "Use Permit Application Package," Napa County Winery Traffic Generation Characteristics, 2012.

TABLE 3
PROPOSED BENESSERE VINEYARDS WINERY PROJECT: DAILY AND PEAK HOUR TRIP GENERATION

Weekday Daily Traffic:		
36 visitors/2.6 persons per vehicle x 2 one-way trips	=	28 daily trips
8 full-time employees x 3.05 one-way trips	=	24 daily trips
2 part-time employees x 1.90 one-way trips	=	4 daily trips
44,000 gallons/1,000 x .009 daily trucks x 2 o-w trips	=	1 daily trips
Total Weekday Daily Trips	**=**	**57 daily trips**
Weekday PM Peak Hour Traffic:		
57 daily trips x 0.38 trips PM Peak:	=	22 peak hour trips
Total Weekday PM Peak Hour Trips	**=**	**22 trips (6 in, 16 out)**
Maximum Weekend (Saturday) Daily Traffic:		
60 visitors/2.8 persons per vehicle x 2 one-way trips	=	43 daily trips
2 full-time employees x 3.05 one-way trips	=	6 daily trips
2 part-time employees x 1.90 one-way trips	=	4 daily trips
Total Weekend (Saturday) Daily Trips	**=**	**53 daily trips**
Maximum Weekend (Saturday) Peak Hour Traffic:		
53 daily trips x 0.57 trips MD Saturday Peak:	=	30 peak hour trips
Total Weekend (Saturday) Mid-Day Peak Hour Trips	**=**	**30 trips (15 in, 15 out)**
Maximum Weekend (Saturday) Daily Harvest/Crush Traffic:		
60 visitors/2.8 persons per vehicle x 2 one-way trips	=	43 daily trips
3 full time employees x 3.05 one-way trips	=	9 daily trips
3 part-time employees x 1.90 one-way trips	=	6 daily trips
44,000 gallons/1,000 x .009 daily trucks x 2 o-w trips	=	1 daily trips
266 annual ton grapes (o-h)/144 daily trucks x 2 o-w trips	=	4 daily trips
Total Weekend (Saturday) Daily Harvest/Crush Trips	**=**	**63 daily trips**
Maximum Weekend (Saturday) Daily Harvest/Crush Peak Hour Traffic:		
63 daily trips x 0.57 trips MD Saturday Peak:	=	36 peak hour trips
Total Weekend (Saturday) Mid-Day Peak Hour Trips	**=**	**36 trips (18 in, 18 out)**
Largest Marketing Event – Additional Traffic		
6 event staff x 2 one-way trips per person	=	12 event trips
150 visitors / 2.8 visitors per vehicle x 2 o-w trips	=	107 event trips
3 trucks x 2 one-way trips	=	6 event trips
Total Largest Event Marketing Trips:	**=**	**125 event trips**

Source: Production, employee, and visitor data provided by Mr. Mark Phillips (applicant representative), Use Permit Application, Benessere Vineyards Winery, 2016. Daily and peak hour calculations based on County of Napa, Conservation, Development, and Planning Department, "Use Permit Application Package," Napa County Winery Traffic Generation Characteristics, 2015

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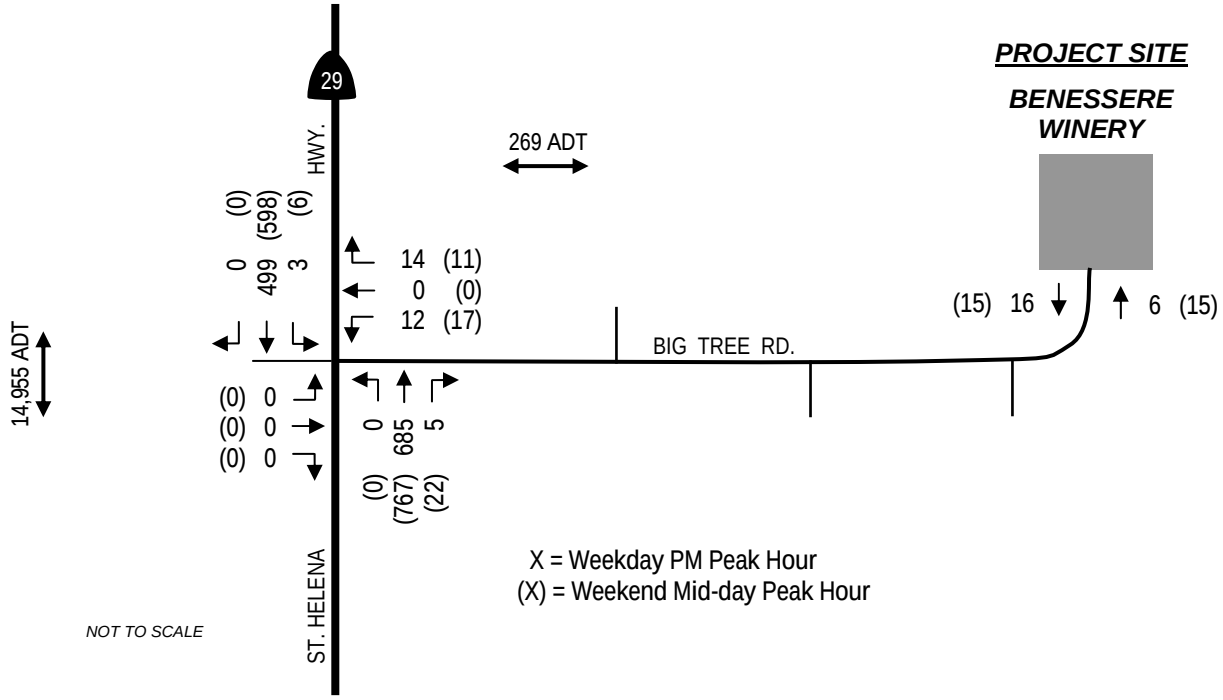

Existing + Project Weekday P.M. and (Weekend Mid-day) Peak Hour Volumes

North

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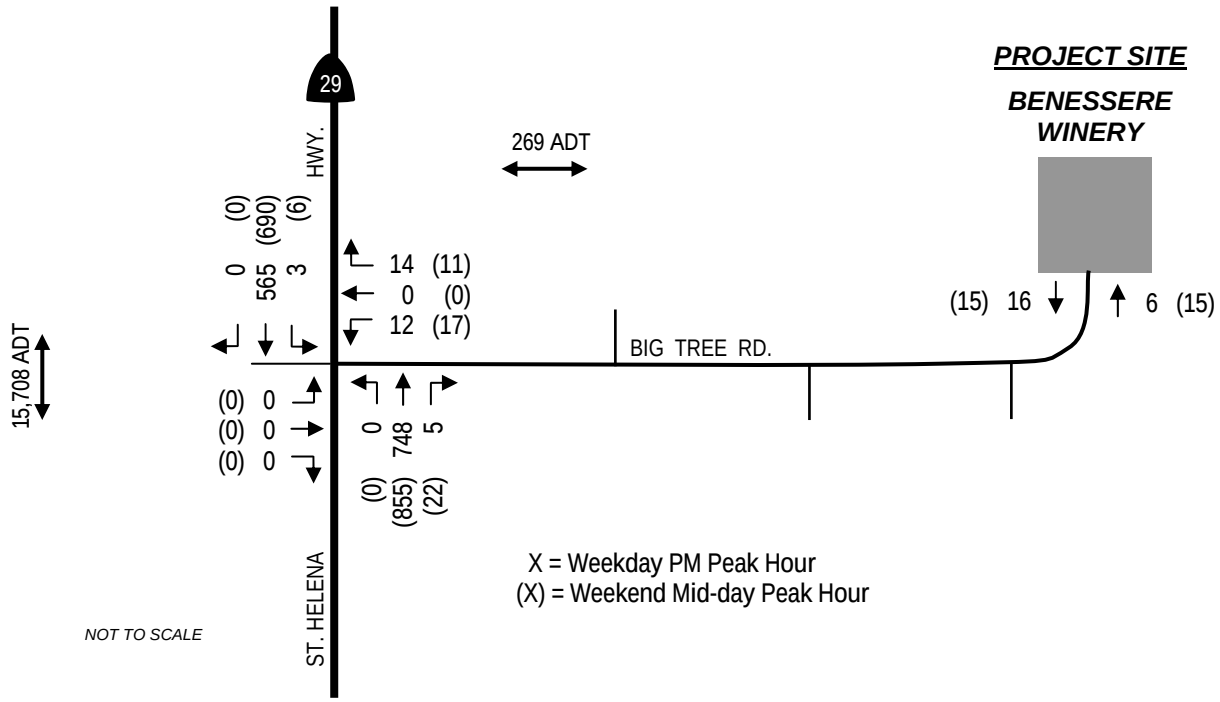
figure 4



Near-Term + Project Weekday P.M. and (Weekend Mid-day) Peak Hour Volumes

North

omni-means

figure 5

Project Effects on Roadway/Intersection Operation

Existing Plus Project Conditions

The proposed Benessere Winery Use Modification project would be expected to generate approximately 29 additional daily trips south of the site and 28 daily trips north of the site on SR-29. This would represent a net increase of less than one percent (0.004%) to the daily volumes on SR-29. The combined existing plus project volume of 14,957 daily trips would continue to operate equivalent to LOS 'D'. Big Tree Road would continue to operate at LOS A with a daily volume of 269 vehicles with proposed project traffic. During the weekday PM and Saturday mid-day peak hours, arterial volumes on SR-29 would increase to 1,208 vehicles and 1,408 vehicles, respectively. Arterial LOS would be maintained at LOS C during both time periods.

During the peak winery activity periods, the winery would be expected to generate 22 weekday PM peak hour trips and 30 Saturday mid-day peak hour project trips. Weekday PM peak hour and weekend mid-day peak hour intersection levels of service were evaluated with proposed project traffic and are shown in Table 4.

TABLE 4
EXISTING AND NEAR-TERM WITH PROJECT CONDITIONS: INTERSECTION LEVELS-OF-SERVICE
WEEKDAY PM PEAK AND WEEKEND MID-DAY PEAK HOUR[1]

			Wkdy. PM LOS/Delay		Wknd. Mid-Day LOS/Delay	
	Existing Conditions: Intersection	**Control Type**	**Existing (No Project)**	**Near-Term (No Project)**	**Existing (No Project)**	**Near-Term (No Project)**
1	Big Tree Road/State Route 29	Stop	C 20.8	C 24.0	D 32.4	**E 43.5**
			Wkdy. PM LOS/Delay		**Wknd. Mid-Day LOS/Delay**	
	Existing + Project Conditions: Intersection	**Control Type**	**Existing (W/ Project)**	**Near-Term (W/ Project)**	**Existing (W/ Project)**	**Near-Term (W/ Project)**
1	Big Tree Road/State Route 29	Stop	C 24.6	D 29.3	**E 46.4**	**F 79.1**

(1) Based on Highway Capacity Manual (HCM) 2010, Operations methodology for stop-sign controlled (unsignalized) intersections using Synchro-Simtraffic software. Intersection calculation yields an LOS and vehicle delay in seconds. Stated LOS refers to the minor street (stop-sign) controlled movement.

With existing plus project traffic volumes, project study intersection operation would change during the weekend peak period. During the weekend mid-day peak hour, the Big Tree Road/SR-29 intersection would change from LOS D (32.4 secs) to LOS E (46.4 secs). Finally, during the weekday PM peak hour period, the study intersection would be operating acceptably at LOS C (24.6 secs.)

> Based on updated County significance criteria for side-street stop controlled intersections; the intersection of Big Tree Road/SR-29 has been evaluated for proposed project impacts since the LOS changed from an acceptable level (LOS D) to unacceptable level (LOS E) with proposed project trips during the weekend (Saturday) mid-day peak hour. County criteria indicate this would be considered a significant impact with a change in intersection LOS from D to E. The guidelines go on to state "the peak hour signal warrant criteria should also be evaluated and presented for informational purposes." With proposed project traffic, the westbound approach volume on Big Tree Road would increase by 15 project trips to 28 vehicles (13 existing). The peak hour signal warrant requires a minimum minor street approach volume of 75 vehicles to qualify for potential signal installation. Therefore, the Big Tree Road/SR-29 intersection would not meet the peak hour signal warrant.

Napa County guidelines indicate potential mitigation could include adding a signal if conditions are appropriate, geometric modifications to the intersection configuration, changes to the Project to reduce its peak hour trip generation, or converting an intersection to a roundabout per Policy CIR-13.5. With the peak hour signal warrant not being met under existing plus project conditions; geometric modifications would not significantly improve intersection LOS. It is recommend that the proposed project strive to reduce visitor and employee trips during peak traffic flow periods (to the extent possible) to reduce proposed project impacts (see 8. Summary/Conclusions).

At the request of County Transportation staff, a regression analysis has been performed for the Big Tree Road/SR-29 intersection to determine how many proposed project trips would have to be reduced to allow the intersection to operate at acceptable levels. As shown in Table 4, the proposed project would cause the Big Tree Road/SR-29 intersection to change from LOS D (32.4 seconds) to LOS E (46.4 seconds) during the weekend (Saturday) mid-day peak hour under existing plus project conditions. During this time period, the proposed project would be adding 30 mid-day peak hour trips (15 in, 15 out). Please note, the LOS D range for unsignalized minor-street stop-control intersections ranges from 25-35 seconds. Therefore, there will be a relatively small amount of project trips that could be added to the intersection before overall LOS exceeds the LOS D range of 35 seconds. Based on the regression analysis, the proposed project could add ten (10) trips to the intersection and maintain LOS D operations (34.9 seconds of delay). Maintaining LOS D at the Big Tree Road/SR-29 intersection would require a reduction of 20 mid-day peak hour project trips from an overall trip generation of 30 trips during this same time period. It is noted that Big Tree Road has a very low mid-day peak hour volume (13 outbound trips) which results in a very low peak hour factor (PHF) of 0.50 for the westbound approach. The irony is that if existing volumes were higher on westbound Big Tree Road the PHF would be higher thus allowing a higher number of project trips to be added to the roadway. Assuming a very moderate PHF of 0.75 for the westbound Big Tree Road approach would allow approximately 50% of the project trips (16 trips---8 in, 8 out) to be added to the intersection and that would seem reasonable given the daily fluctuations in traffic volumes.

Near-Term plus Project Conditions

With near-term plus project conditions, daily traffic volumes on SR-29 would increase to 15,708 ADT. The combined near-term plus project volume of 15,708 daily trips would continue to operate equivalent to LOS 'D'. Big Tree Road would continue to operate at LOS A with approximately 270 ADT (very similar to existing plus project conditions). During the weekday PM and Saturday mid-day peak hours, arterial volumes on SR-29 would increase to 1,337 vehicles and 1,588 vehicles, respectively. Arterial LOS would be maintained at LOS C during the weekday PM peak hour and LOS D during the Saturday mid-day peak hour.

The Big Tree Road/SR-29 intersection is operating at LOS E (43.5 secs.) during the weekend (Saturday) mid-day peak hour under near-term (no project) conditions. With proposed project traffic, intersection LOS would change to LOS F (79.1 secs.) during the same time period.

> Based on updated County significance criteria for side-street stop controlled intersections; the intersection of Big Tree Road/SR-29 has been evaluated for proposed project impacts since the intersection operates at an unacceptable level (LOS E) under near-term (no project) conditions during the weekend (Saturday) mid-day peak hour. County criteria indicate that if a proposed project contributes 10 percent or more of the traffic on a side-street approach this would be considered a significant impact**.** The guidelines go on to state "the peak hour signal warrant criteria should also be evaluated and presented for informational purposes." With proposed project traffic, the westbound approach volume on

Big Tree Road would increase by 15 project trips to 28 vehicles (13 existing). 15 project trips / 13 existing trips = 115% and would be considered significant impact. Again, the peak hour signal warrant requires a minimum minor street approach volume of 75 vehicles to qualify for potential signal installation. Therefore, the Big Tree Road/SR-29 intersection would not meet the peak hour signal warrant.

As under existing plus project conditions, Napa County guidelines indicate potential mitigation could include adding a signal if conditions are appropriate, geometric modifications to the intersection configuration, changes to the Project to reduce its peak hour trip generation, or converting an intersection to a roundabout per Policy CIR-13.5. With the peak hour signal warrant not being met under near-term plus project conditions; geometric modifications would not significantly improve intersection LOS. It is recommend that the proposed project strive to reduce visitor and employee trips during peak traffic flow periods (to the extent possible) to reduce proposed project impacts (see 8. Summary/Conclusions).

6. Site Access/Design Parameters

Sight Distance

Vehicle sight distance at the existing Big Tree Road/SR-29 intersection was evaluated. The required vehicle visibility or "corner sight distance" is a function of travel speeds on SR-29 (St. Helena Highway). Caltrans design standards indicate that for appropriate corner sight distance, "a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the cross road and the driver of an approaching vehicle in the right lane of the main highway". Caltrans design guidelines also indicate that the minimum corner sight distance “shall be equal to the stopping sight distance” where possible.

Radar speed surveys of SR-29 in the project study area were conducted for the roadway in the project area.[13] The "critical" vehicle speed (the speed at which 85% of all surveyed vehicles travel at or below) along SR-29 was measured at 59 mph at the project driveway. The posted speed limit in the project driveway area is 50 mph. Caltrans’ design standards indicate that these vehicle speeds require a stopping sight distance of 430-580 feet both north and south of Big Tree Road measured along the travel lanes.[14] Based on field measurements, sight distance from Big Tree Road to the north on SR-29 is approximately 625 feet. Sight distance from the Big Tree Road to the south is in excess of 750-800 feet. Therefore, the sight distance recommendations would be met for the speed limit and measured vehicle speeds

Left-Turn Lane/Right-Turn Lane Warrants

No left-turn and/or right-turn lane warrant checks would be applicable with proposed use modification uses. As noted, the Benessere Vineyards Winery driveway is located at the very eastern end of Big Tree Road with end of the roadway (terminus) extending east onto the winery grounds. No turning movements are required from Big Tree Road to access the winery grounds. However, there would be roadway improvements to Benessere Vineyards Winery driveway and grounds as part of the overall use modification (see below).

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[13] Omni Means Engineers & Planners, Radar vehicle speed surveys, St. Helena Highway (SR-29), 2012.
[14] Caltrans, Highway Design Manual, Table 405.1A, Corner (Stopping) Sight Distance, March 7, 2014..

At the request of County Transportation staff, left-turn warrant checks have also been conducted for the Big Tree Road/SR-29 intersection. Under existing (no project) conditions, current ADT volumes on Big Tree Road and SR-29 exceed the County's minimum volume requirements for the installation of a southbound left-turn lane on SR-29 (see Appendices---Left-Turn Lane Warrant Graph). Current existing ADT volumes on Big Tree Road are 212 vehicles with SR-29 carrying 14,900 vehicles. The proposed project would add 57 daily trips to these roadways or 3.7% of the total daily traffic volume should the County determine a southbound left-turn lane is needed on southbound SR-29 at Big Tree Road.

Project Access and Circulation

The existing Benessere Vineyards Winery project driveway extends east from Big Tree Road approximately 2,165 feet from SR-29 and would be improved from existing conditions to County standards (see Project Site Plan---Figure 6). The main project driveway providing access to winery-related uses would extend north and be widened to a width of 22-feet to minimum County standards from the Big Tree Road ROW to the winery parking areas. The gravel driveway would be widened with additional gravel to maintain a 20-foot travel way with one-foot shoulders. This driveway configuration would extend for approximately 850-feet before reaching the winery grounds. At this junction, motorists would access a one-way paved loop road (turning west) to access parking areas on both the south and north sides of the winery complex. Upon leaving the winery grounds; guests would continue traveling around the north side of the winery until extending south back towards the main project driveway to Big Tree Road. Along this eastern portion of the winery driveway would be a large drivable gravel shoulder and/or parking area. The vehicle circulation area adjacent to the main winery buildings would allow access for emergency vehicles (fire trucks) and parking areas south, north, and east of the winery facilities. Vehicle travel way would vary between 12-21 feet depending on the combination of pavement and gravel areas.

The Napa Countywide Bicycle Plan has been completed and adopted by the Napa Valley Transportation Authority (NVTA) and the County.[15] The project would provide bicycle racks for visitors to the proposed winery.

Marketing Events

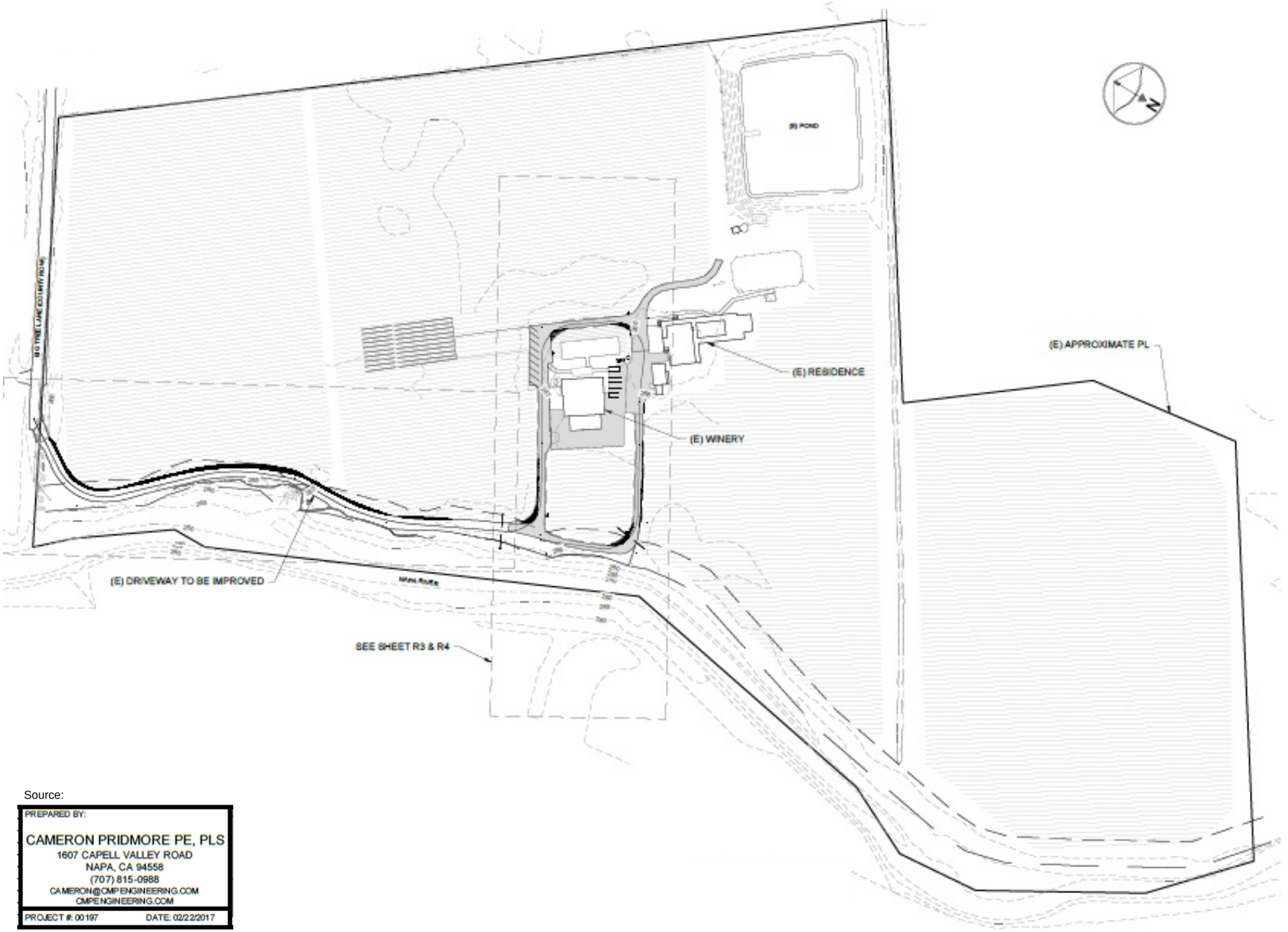
As noted in the project application, in addition to normal tours and tastings the winery proposes to host 32 marketing events that would range between 25-150 guests. These marketing events would include the following:

Proposed Benessere Vineyards Winery Marketing Events

- 24 events annually: maximum of 25 guests;
- Four (4) events annually: maximum of 80 guests;
- Four (4) event annually: maximum of 150 guests.

Based on standard County auto occupancy rates, the largest annual event of 150 guests would be expected to generate approximately 125 daily trips (63 in, 62 out) including visitors, winery staff, and delivery trucks (unless shuttle buses/TDM are used). These events are typically of sufficient duration in length that the inbound and outbound trips occur in separate hours, thus the number of trips on the street network at one time are half of the total volumes. These events are usually held

[15] *Napa County, Countywide Bicycle Plan (2012), Planning Area-North Valley, May 2012.*



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PROJECT #: 00197 DATE: 02/22/2017

Project Site Plan

North

outside of typical peak traffic periods (during the middle of the day or later than 6:00 p.m.) and therefore generally do not impact peak hour operations and no other visitation or events would occur during the annual events.

As a proposed project requirement, large marketing events should not start/end during the weekday PM peak period (4:00-6:00 p.m.) nor weekend mid-day peak period (2:00-4:00 p.m.). In addition, the winery should suspend visitation related to tours and tastings on the days when the winery hosts large marketing events (80 guests or larger) that are held during the afternoon period. These measures would reduce any traffic impacts related to large marketing events to ***less-than-significant*** levels.

7. Cumulative Conditions

Cumulative Year 2030 Projections

Model Forecast

As outlined in near-term (no project) conditions, cumulative (year 2030) volume projections for SR-29 were reviewed from the Napa Valley Transportation Authority's traffic volume forecasts found in the Napa County General Plan Update EIR.[16] The forecasted increase in volume-to-capacity (v/c) ratio from Year 2003 to Year 2030 on State Route 29 (adjacent to Big Tree Road) was applied to the Year 2003 peak hour two-way volumes (1,344 vehicles). This yielded a future volume of 2,896 weekday PM peak hour vehicles on SR-29 in the Year 2030. This would equate to a robust increase in traffic volumes of approximately 7.96% per year to the Year 2030 on SR-29. It is noted that traffic volumes on Big Tree Road are not likely to increase beyond current levels compared to expected growth along the SR-29 corridor.

Given the highly conservative Napa County GP Update EIR cumulative growth projections for SR-29; a comparison was made with historical Caltrans volume data on the same roadway. In the last 10 years, daily traffic volumes on SR-29 in the project study area have remained flat and/or unchanged.[17] Between the years of 2006-2015, annual average daily traffic volumes on SR-29 in the study area have remained at 13,700-13,900 daily vehicles. Given the wide discrepancy between Napa County GP Update EIR growth projections and historical volume growth based on Caltrans data, previous growth projections used for SR-29 were reviewed based on other transportation studies performed in the study area. Specifically, future traffic volumes for SR-29 were based on the Solano Transportation Authority (STA) travel demand forecast model for the years 2010-2030.[18] Based on PM peak hour link volumes, a more consistent traffic growth factor of 1.8 percent per year was applied to weekday PM peak hour and weekend mid-day peak hour volumes.

Since future volume traffic forecasts are only available for the weekday PM peak hour and not for a Saturday mid-day peak hour, volumes on SR-29 were uniformly increased by the same percentage as listed above as a conservative measure.

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[16] Dowling Associates, Napa County General Plan Update, Technical Memorandum for Traffic and Circulation Supporting the Findings and Recommendations, February 9, 2008.
[17] Caltrans Traffic Volumes on California State Highways, SR-29 south of Larkmead Lane, 2006-2015.
[18] W-Trans, Traffic Analysis for Larkmead Vineyards Expansion, Future Volumes, October 30, 2014.

Cumulative year 2030 (no project) and plus project volumes and for weekday PM peak hour and weekend mid-day peak hour have been shown in Figures 7 and 8.

Cumulative Operating Conditions

Year 2030 cumulative volume forecasts based on STA model forecasts are more conservative compared to historical traffic growth in the Napa Valley. However, applying the forecasted growth rate of 1.8% per year (or 23.4% for 13 years) to SR-29 yields LOS 'F' conditions (18,390 ADT). Big Tree Road ADT would continue to operate at LOS A under cumulative and with project conditions.

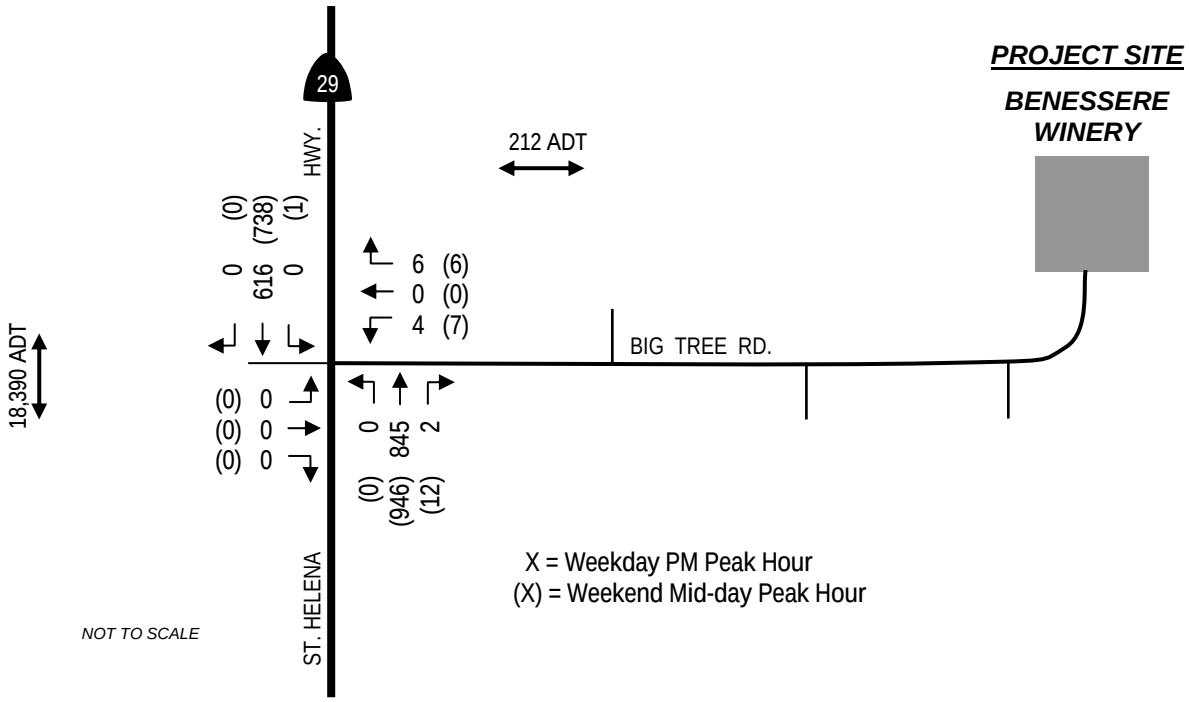
During the weekday PM and Saturday mid-day peak hours, cumulative (no project) arterial volumes on SR-29 would increase to 1,463 vehicles during the weekday PM peak hour and 1,697 vehicles during the Saturday mid-day peak hour. Arterial operations would be at LOS C during the weekday PM peak hour and LOS D during the Saturday mid-day peak hour.

With increases from cumulative traffic growth, Table 5 shows projected weekday PM peak hour and weekend mid-day peak hour intersection operation under cumulative year 2030 (no project) and with project conditions. As calculated, the increase in growth projected from STA forecasts would cause the Big Tree Road/SR-29 intersections to operate at LOS D and F during the weekday PM peak hour and Saturday mid-day peak hour under Year 2030 (no project) conditions (respectively).

Under Year 2030 plus project conditions, the addition of project trips would cause the Big Tree Road/SR-29 intersection to change from LOS D (29.0 secs) to LOS E (37.5 secs) during the weekday PM peak hour period. During the weekend Saturday mid-day peak hour, the intersection would continue to function at LOS F with proposed project traffic.

Based on updated County significance criteria for arterial segment operation, the segment of SR-29 at Big Tree Road has been evaluated for proposed project impacts since it would be operating at LOS F under cumulative conditions without proposed project trips (based on daily traffic volumes). Under cumulative conditions, County guidelines indicate that a significant impact would be found if the proposed project contributes five percent or more to the total growth in cumulative traffic. The proposed project's contribution to daily segment volumes has been calculated as follows:

Project Contribution % = 57 weekday daily trips / (18,447 ADT cumulative segment - 14,900 ADT existing segment = 3,547 net ADT cumulative segment increase) = 0.016 or 1.6%. County significance guidelines indicate a ***less-than-significant*** project impact based on less than five percent being added to the net increase in daily cumulative segment volumes on SR-29. During the weekday PM and Saturday mid-day peak hours, cumulative plus arterial volumes on SR-29 would increase to 1,485 vehicles during the weekday PM peak hour and 1,727 vehicles during the Saturday mid-day peak hour. Arterial operations would be maintained at LOS C during the weekday PM peak hour and LOS D during the Saturday mid-day peak hour.

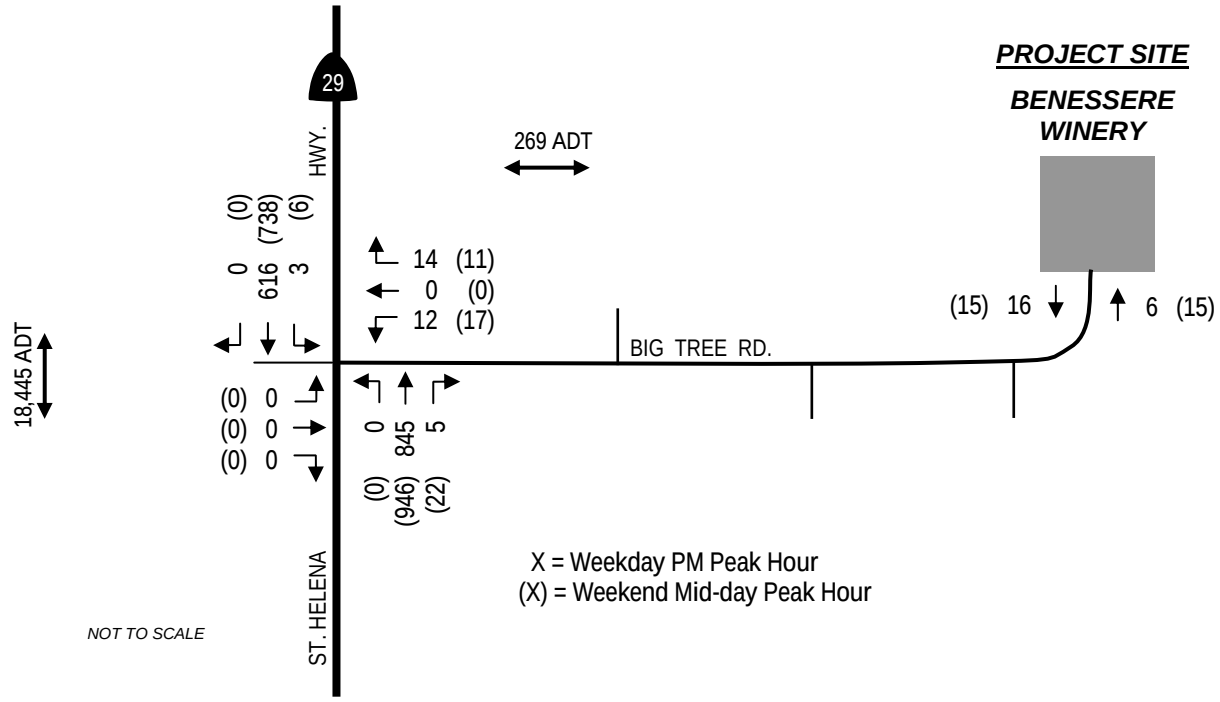


Cumulative Weekday P.M. and (Weekend Mid-day) Peak Hour Volumes

North

omni-means

figure 7



Cumulative + Project Weekday P.M. and (Weekend Mid-day) Peak Hour Volumes

North

omni-means

figure 8

TABLE 5
CUMULATIVE YEAR 2030 (NO PROJECT) AND PLUS PROJECT CONDITIONS:
INTERSECTION LEVEL OF SERVICE; WEEKDAY PM PEAK AND WEEKEND MID-DAY PEAK HOUR[1, 2]

	Intersection	Control Type	Wkdy. PM LOS/Delay		Wknd. Mid-Day LOS/Delay	
			Yr. 2030 (No Project)	Yr. 2030 (W/ Project)	Yr. 2030 (No Project)	Near-Term (W/ Project)
1	Big Tree Road/State Route 29	Stop	D 29.0	E 37.3	F 57.3	F 104.1

(1) Based on Highway Capacity Manual (HCM) 2010, Operations methodology for stop-sign controlled (unsignalized) intersections using Synchro-Simtraffic software. Intersection calculation yields an LOS and vehicle delay in seconds. Stated LOS refers to the minor street (stop-sign) controlled movement.

Using the updated County significance criteria for side-street stop controlled intersections; the intersection of Big Tree Road/SR-29 has been evaluated for proposed project impacts since it is operating at LOS F under Year 2030 cumulative plus project conditions. County guidelines indicate that a significant impact would be identified if the project would contribute five percent or more vehicle trips to the net increase in cumulative volumes at the intersection during the weekday PM peak hours. Under Year 2030 cumulative plus project conditions for the weekend mid-day peak hour, the project would contribute 8.6 percent to the net increase in cumulative volumes at the Big Tree Road/SR-29 intersection (30 project trips / 349 cumulative volumes = 8.6%). These findings are identified as a significant-impact based on County criteria.

The Big Tree Road/SR-29 intersection does not meet the peak hour signal warrant under any "with project" development conditions (existing, near-term or cumulative conditions). As with project impacts found under existing plus project and near-term plus project conditions; Napa County guidelines indicate potential mitigation could include adding a signal if conditions are appropriate, geometric modifications to the intersection configuration, changes to the Project to reduce its peak hour trip generation, or converting an intersection to a roundabout per Policy CIR-13.5. With the peak hour signal warrant not being met; geometric modifications would not significantly improve intersection LOS. It is recommend that the proposed project strive to reduce visitor and employee trips during peak traffic flow periods (to the extent possible) to reduce proposed project impacts. Additional improvements to the street network are anticipated and have been included in the General Plan's Improved 2030 Network model. As noted, the County has also adopted several measures identified in the General Plan to reduce vehicle trips through public transit and Transportation Demand Management (TDM) strategies: "The project should support programs to reduce single occupant vehicle use and encourage alternative travel modes."

- In keeping with the above policy, the winery project provides bicycle racks for visitors who may arrive by bike. The project should also promote the use of public transportation and carpooling of employees (by adjusting work schedules, etc.) to facilitate the use of other transportation modes. The use of existing Napa County shuttle, limousine, or hire-car by guests could help to reduce project trips at the Big Tree Road/SR-29 intersection.

8. Summary and Conclusions

Daily and Peak Hour Roadway Operations

The proposed use permit components associated with the Benessere Vineyards Winery project upon completion would generate up to 53-57 daily trips during the weekday and weekend periods (respectively). The project's daily traffic contribution would represent 0.4 percent of the existing ADT volumes on Silverado Trail which would operate at LOS D conditions (14,957 ADT) with proposed project traffic. Big Tree Road would continue to operate at (LOS A) with proposed project traffic.

With near-term plus project conditions, daily traffic volumes on SR-29 would increase to 15,708 ADT. The combined near-term plus project volume of 15,708 daily trips would continue to operate equivalent to LOS 'D'. Big Tree Road would continue to operate at LOS A with approximately 270 ADT (very similar to existing plus project conditions).

Under all "with project" scenarios including existing, near-term, and cumulative; an arterial evaluation during the weekday PM peak hour and Saturday mid-day peak hour indicates SR-29 is projected to operate at LOS C (weekday PM peak) and LOS D (Saturday mid-day peak hour).

Peak Hour Intersection Operations

During the PM peak hour winery activity periods the winery would generate 22 weekday PM peak hour trips. During the Saturday mid-day peak hour, the project would generate 30 total trips.

With existing plus project traffic volumes, project study intersection operation would change during the weekend peak period. During the weekend mid-day peak hour, the Big Tree Road/SR-29 intersection would change from LOS D (32.4 secs) to LOS E (46.4 secs). Finally, during the weekday PM peak hour period, the study intersection would be operating acceptably at LOS C (24.6 secs.)

> Based on updated County significance criteria for side-street stop controlled intersections; the intersection of Big Tree Road/SR-29 has been evaluated for proposed project impacts since the LOS changed from an acceptable level (LOS D) to unacceptable level (LOS E) with proposed project trips during the weekend (Saturday) mid-day peak hour. County criteria indicate this would be considered a significant impact with a change in intersection LOS from D to E. The guidelines go on to state "the peak hour signal warrant criteria should also be evaluated and presented for informational purposes." With proposed project traffic, the westbound approach volume on Big Tree Road would increase by 15 project trips to 28 vehicles (13 existing). The peak hour signal warrant requires a minimum minor street approach volume of 75 vehicles to qualify for potential signal installation. Therefore, the Big Tree Road/SR-29 intersection would not meet the peak hour signal warrant.

The same findings at the Big Tree Road/SR-29 conditions have been found under near-term plus project conditions. The proposed project would have a significant impact since it is adding more than 10% to the minor street approach of Big Tree Road.

Napa County guidelines indicate potential mitigation could include adding a signal if conditions are appropriate, geometric modifications to the intersection configuration, changes to the Project to reduce its peak hour trip generation, or converting an intersection to a roundabout per Policy CIR-13.5. With the peak hour signal warrant not being met under near-term plus project conditions;

geometric modifications would not significantly improve intersection LOS. It is recommend that the proposed project strive to reduce visitor and employee trips during peak traffic flow periods (to the extent possible) to reduce proposed project impacts.

- With proposed project trips causing a significant impact(s) at the Big Tree Road/SR-29 based on a change in intersection operation (LOS D to LOS E) and/or adding more than 10% to the minor street approach on Big Tree Road; it is recommend that the project applicant develop a TDM plan to reduce employee and visitation trips during the weekday PM commute period (4:00-6:00 pm) and weekend mid-day peak commute period (2:00-4:00 pm). Carpool, rideshare, hire car, limousine, Napa Valley Shuttle, and adjusting employment and visitation hours to reduce peak hour trips could all be used to reduce proposed project impacts. Scheduling employees to arrive before the peak commute periods and/or leave after the peak commute periods would help to reduce peak hour outbound project traffic. Proposed closing for tours and tastings appointments would be extended to 6:00 p.m. (10:00 a.m. – 6:00 p.m.) rather than 4:00 p.m. or 5:00 p.m. By extending the winery's closing time to 6:00 p.m., most outbound winery trips associated with visitation (and employment) would not impact operations at the Big Tree Road/SR-29 intersection since they would be leaving after the peak flows of traffic on weekdays.

At the request of County Transportation staff, a regression analysis has been performed for the Big Tree Road/SR-29 intersection to determine how many proposed project trips would have to be reduced to allow the intersection to operate at acceptable levels. As shown in Table 4, the proposed project would cause the Big Tree Road/SR-29 intersection to change from LOS D (32.4 seconds) to LOS E (46.4 seconds) during the weekend (Saturday) mid-day peak hour under existing plus project conditions. During this time period, the proposed project would be adding 30 mid-day peak hour trips (15 in, 15 out). Please note, the LOS D range for unsignalized minor-street stop-control intersections ranges from 25-35 seconds. Therefore, there will be a relatively small amount of project trips that could be added to the intersection before overall LOS exceeds the LOS D range of 35 seconds. Based on the regression analysis, the proposed project could add ten (10) trips to the intersection and maintain LOS D operations (34.9 seconds of delay). Maintaining LOS D at the Big Tree Road/SR-29 intersection would require a reduction of 20 mid-day peak hour project trips from an overall trip generation of 30 trips during this same time period. It is noted that Big Tree Road has a very low mid-day peak hour volume (13 outbound trips) which results in a very low peak hour factor (PHF) of 0.50 for the westbound approach. The irony is that if existing volumes were higher on westbound Big Tree Road the PHF would be higher thus allowing a higher number of project trips to be added to the roadway. Assuming a very moderate PHF of 0.75 for the westbound Big Tree Road approach would allow approximately 50% of the project trips (16 trips---8 in, 8 out) to be added to the intersection and that would seem reasonable given the daily fluctuations in traffic volumes.

Warrant and Vehicle Sight Distance

Vehicle sight distance at the existing Big Tree Road/SR-29 intersection was evaluated. The required vehicle visibility or "corner sight distance" is a function of travel speeds on SR-29 (St. Helena Highway). Caltrans design standards indicate that for appropriate corner sight distance, "a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the cross road and the driver of an approaching vehicle in the right lane of the main highway". Caltrans design guidelines also indicate that the minimum corner sight distance "shall be equal to the stopping sight distance" where possible.

Radar speed surveys of SR-29 in the project study area were conducted for the roadway in the project area.[19] The "critical" vehicle speed (the speed at which 85% of all surveyed vehicles travel at or below) along SR-29 was measured at 59 mph at the project driveway. The posted speed limit in the project driveway area is 50 mph. Caltrans' design standards indicate that these vehicle speeds require a stopping sight distance of 430-580 feet both north and south of Big Tree Road measured along the travel lanes.[20] Based on field measurements, sight distance from Big Tree Road to the north on SR-29 is approximately 625 feet. Sight distance from the Big Tree Road to the south is in excess of 750-800 feet. Therefore, the sight distance recommendations would be met for the speed limit and measured vehicle speeds.

At the request of County Transportation staff, County left-turn warrant evaluation has also been conducted for the Big Tree Road/SR-29 intersection. Under existing (no project) conditions, current ADT volumes on Big Tree Road and SR-29 exceed the County's minimum volume requirements for the installation of a southbound left-turn lane on SR-29 (see Appendices---Left-Turn Lane Warrant Graph). Current existing ADT volumes on Big Tree Road are 212 vehicles with SR-29 carrying 14,900 vehicles. The proposed project would add 57 daily trips to these roadways or 3.7% of the total daily traffic volume should the County determine a southbound left-turn lane is needed on southbound SR-29 at Big Tree Road.

Vehicle Circulation/Access

The existing Benessere Vineyards Winery project driveway extends east from Big Tree Road approximately 2,165 feet from SR-29 and would be improved from existing conditions to County standards (see Project Site Plan---Figure 6). The main project driveway providing access to winery-related uses would extend north and be widened to a width of 22-feet to minimum County standards from the Big Tree Road ROW to the winery parking areas. The gravel driveway would be widened with additional gravel to maintain a 20-foot travel way with one-foot shoulders. This driveway configuration would extend for approximately 850-feet before reaching the winery grounds. At this junction, motorists would access a one-way paved loop road (turning west) to access parking areas on both the south and north sides of the winery complex. Upon leaving the winery grounds; guests would continue traveling around the north side of the winery until extending south back towards the main project driveway to Big Tree Road. Along this eastern portion of the winery driveway would be a large drivable gravel shoulder and/or parking area. The vehicle circulation area adjacent to the main winery buildings would allow access for emergency vehicles (fire trucks) and parking areas south, north, and east of the winery facilities. Vehicle travel way would vary between 12-21 feet depending on the combination of pavement and gravel areas.

The Napa Countywide Bicycle Plan has been completed and adopted by the Napa Valley Transportation Authority (NVTA) and the County.[21] The plan encourages new developments to incorporate bicycle friendly design. The project would provide bicycle racks for visitors to the proposed winery.

Marketing Events

As noted in the project application, in addition to normal tours and tastings the winery proposes to host 32 marketing events that would range between 25-150 guests. These marketing events would include the following:

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[19] Omni Means Engineers & Planners, Radar vehicle speed surveys, St. Helena Highway (SR-29), 2012.
[20] Caltrans, Highway Design Manual, Table 405.1A, Corner (Stopping) Sight Distance, March 7, 2014.
[21] Napa County, Countywide Bicycle Plan (2012), Planning Area-North Valley, May 2012.

Proposed Benessere Vineyards Winery Marketing Events

- 24 events annually: maximum of 25 guests;
- Four (4) events annually: maximum of 80 guests;
- Four (4) event annually: maximum of 150 guests.

Based on standard County auto occupancy rates, the largest annual event of 150 guests would be expected to generate approximately 125 daily trips (63 in, 62 out) including visitors, winery staff, and delivery trucks (unless shuttle buses/TDM are used). These events are typically of sufficient duration in length that the inbound and outbound trips occur in separate hours, thus the number of trips on the street network at one time are half of the total volumes. These events are usually held outside of typical peak traffic periods (during the middle of the day or later than 6:00 p.m.) and therefore generally do not impact peak hour operations and no other visitation or events would occur during the annual events.

As a proposed project requirement, large marketing events should not start/end during the weekday PM peak period (4:00-6:00 p.m.) nor weekend mid-day peak period (2:00-4:00 p.m.). In addition, the winery should suspend visitation related to tours and tastings on the days when the winery hosts large marketing events (80 guests or larger) that are held during the afternoon period. These measures would reduce any traffic impacts related to large marketing events to ***less-than-significant*** levels.

Cumulative Year 2030 Conditions

Under Year 2030 plus project conditions, the addition of project trips would cause the Big Tree Road/SR-29 intersection to change from LOS D (29.0 secs) to LOS E (37.5 secs) during the weekday PM peak hour period. During the weekend Saturday mid-day peak hour, the intersection would continue to function at LOS F with proposed project traffic.

Based on updated County significance criteria for arterial segment operation, the segment of SR-29 at Big Tree Road has been evaluated for proposed project impacts since it would be operating at LOS F under cumulative conditions without proposed project trips (based on daily traffic volumes). Under cumulative conditions, County guidelines indicate that a significant impact would be found if the proposed project contributes five percent or more to the total growth in cumulative traffic. The proposed project's contribution to daily segment volumes has been calculated as follows:

Project Contribution % = 57 weekday daily trips / (18,447 ADT cumulative segment - 14,900 ADT existing segment = 3,547 net ADT cumulative segment increase) = 0.016 or 1.6%. County significance guidelines indicate a ***less-than-significant*** project impact based on less than five percent being added to the net increase in daily cumulative segment volumes on SR-29.

Using the updated County significance criteria for side-street stop controlled intersections; the intersection of Big Tree Road/SR-29 has been evaluated for proposed project impacts since it is operating at LOS F under Year 2030 cumulative plus project conditions. County guidelines indicate that a significant impact would be identified if the project would contribute five percent or more vehicle trips to the net increase in cumulative volumes at the intersection during the weekday PM peak hours. Under Year 2030 cumulative plus project

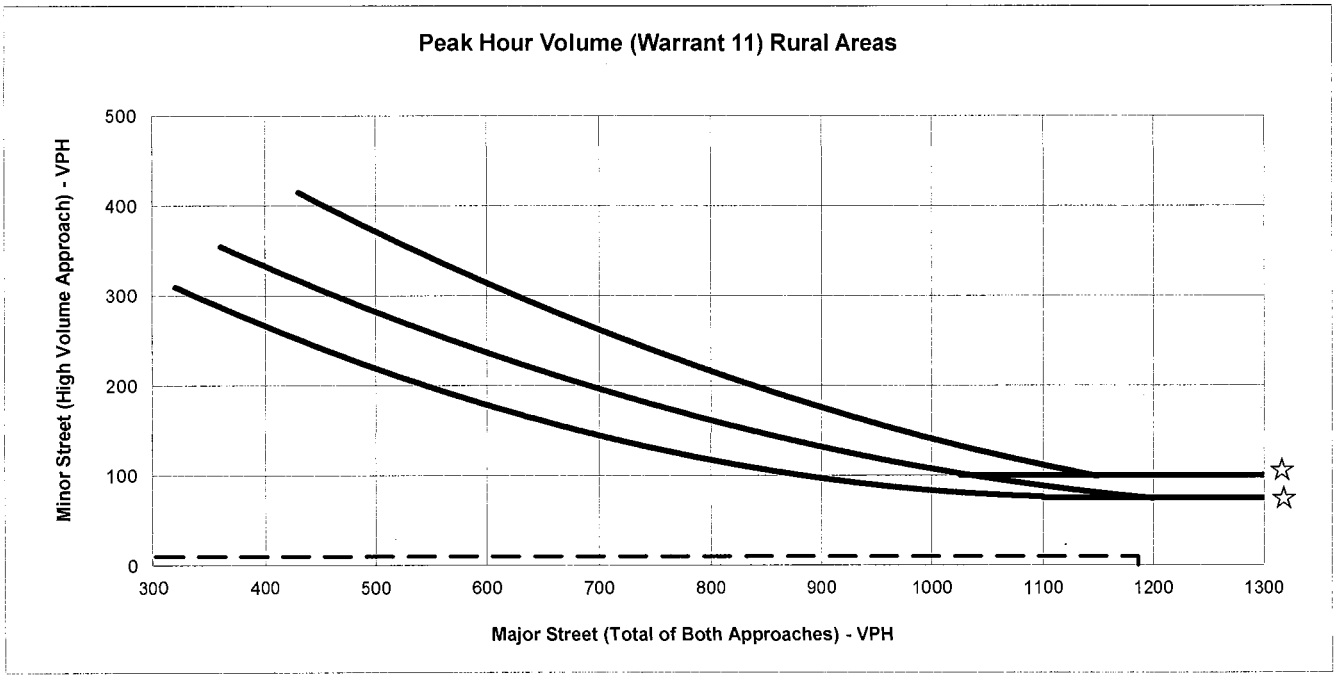
conditions for the weekend mid-day peak hour, the project would contribute 8.6 percent to the net increase in cumulative volumes at the Big Tree Road/SR-29 intersection (30 project trips / 349 cumulative volumes = 8.6%). These findings are identified as a significant-impact based on County criteria.

The Big Tree Road/SR-29 intersection does not meet the peak hour signal warrant under any "with project" development conditions (existing, near-term or cumulative conditions). As with project impacts found under existing plus project and near-term plus project conditions; Napa County guidelines indicate potential mitigation could include adding a signal if conditions are appropriate, geometric modifications to the intersection configuration, changes to the Project to reduce its peak hour trip generation, or converting an intersection to a roundabout per Policy CIR-13.5. With the peak hour signal warrant not being met; geometric modifications would not significantly improve intersection LOS. It is recommend that the proposed project strive to reduce visitor and employee trips during peak traffic flow periods (to the extent possible) to reduce proposed project impacts. Additional improvements to the street network are anticipated and have been included in the General Plan's Improved 2030 Network model. As noted, the County has also adopted several measures identified in the General Plan to reduce vehicle trips through public transit and Transportation Demand Management (TDM) strategies: "The project should support programs to reduce single occupant vehicle use and encourage alternative travel modes."

- In keeping with the above policy, the winery project provides bicycle racks for visitors who may arrive by bike. The project should also promote the use of public transportation and carpooling of employees (by adjusting work schedules, etc.) to facilitate the use of other transportation modes. The use of existing Napa County shuttle, limousine, or hire-car by guests could help to reduce project trips at the Big Tree Road/SR-29 intersection.

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

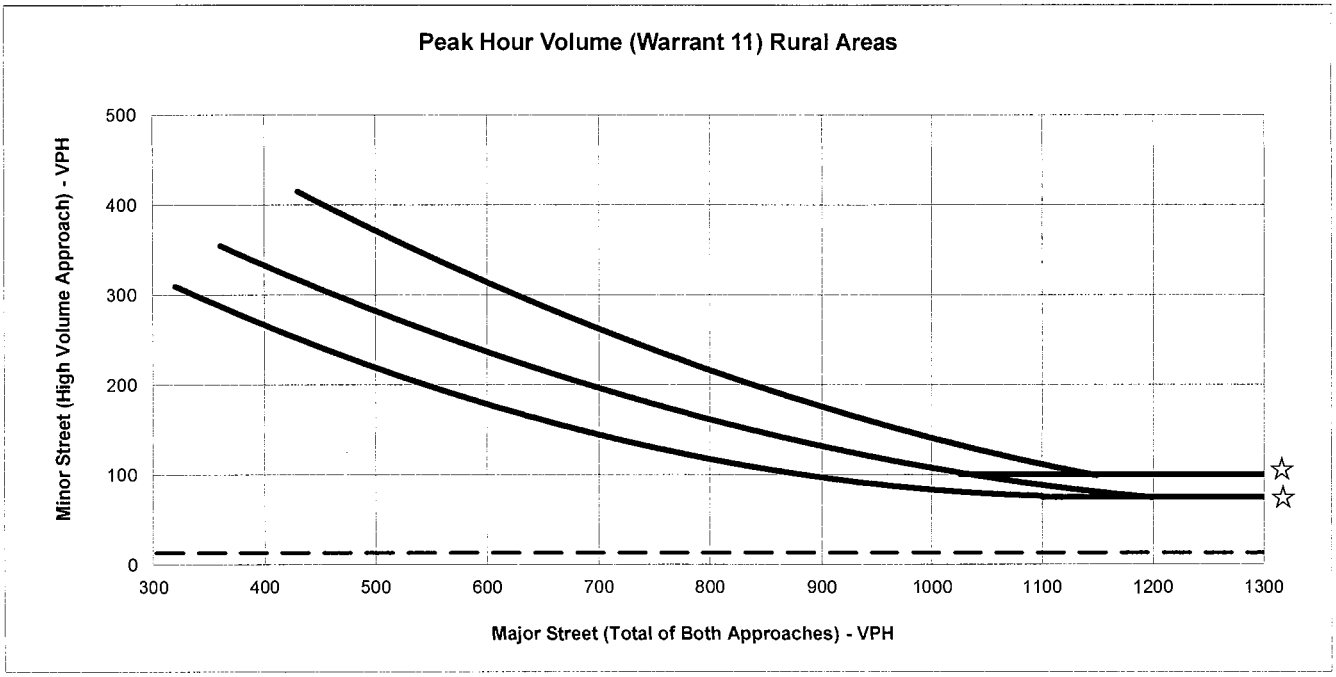


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Big Tree Road / State Route 29
Scenario:	Existing PM Peak Hour Conditions
Minor St. Volume:	10
Major St. Volume:	1186
Warrant Met?:	**NO**

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

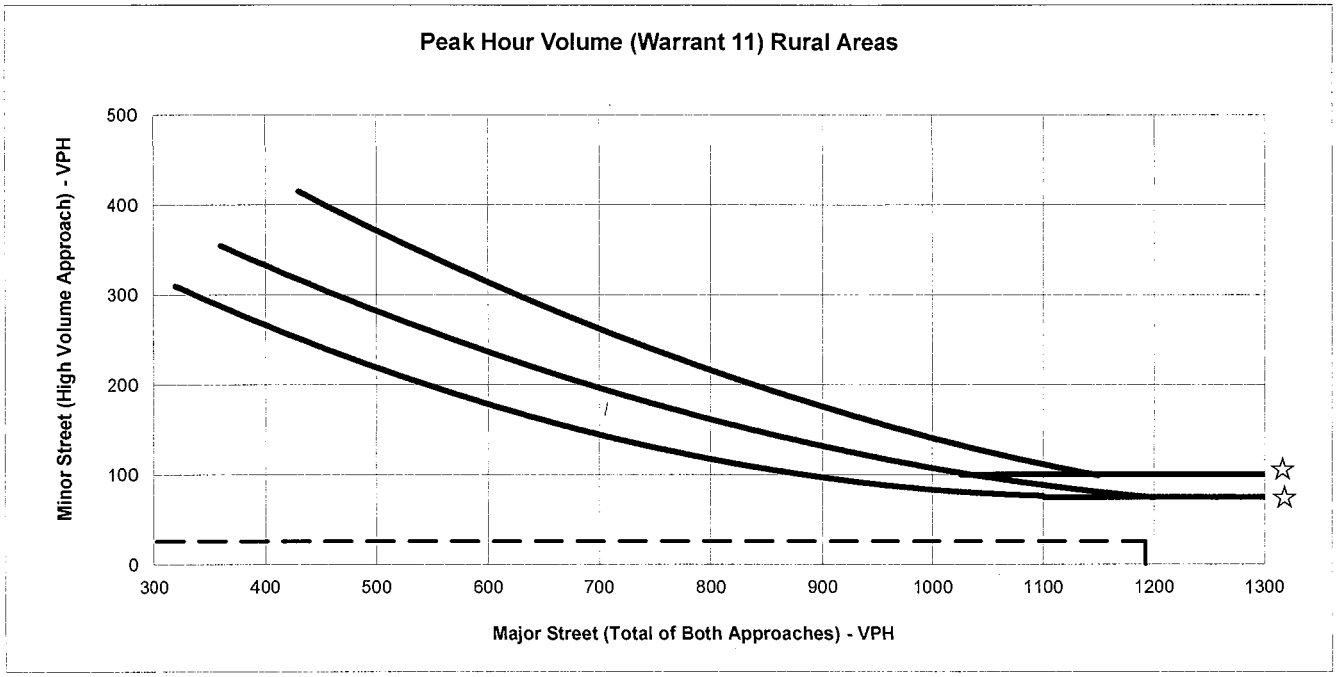


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection: Big Tree Road / State Route 29
Scenario: Existing Saturday Mid-Day Peak Hour Conditions
Minor St. Volume: 13
Major St. Volume: 1378
Warrant Met?: **NO**

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

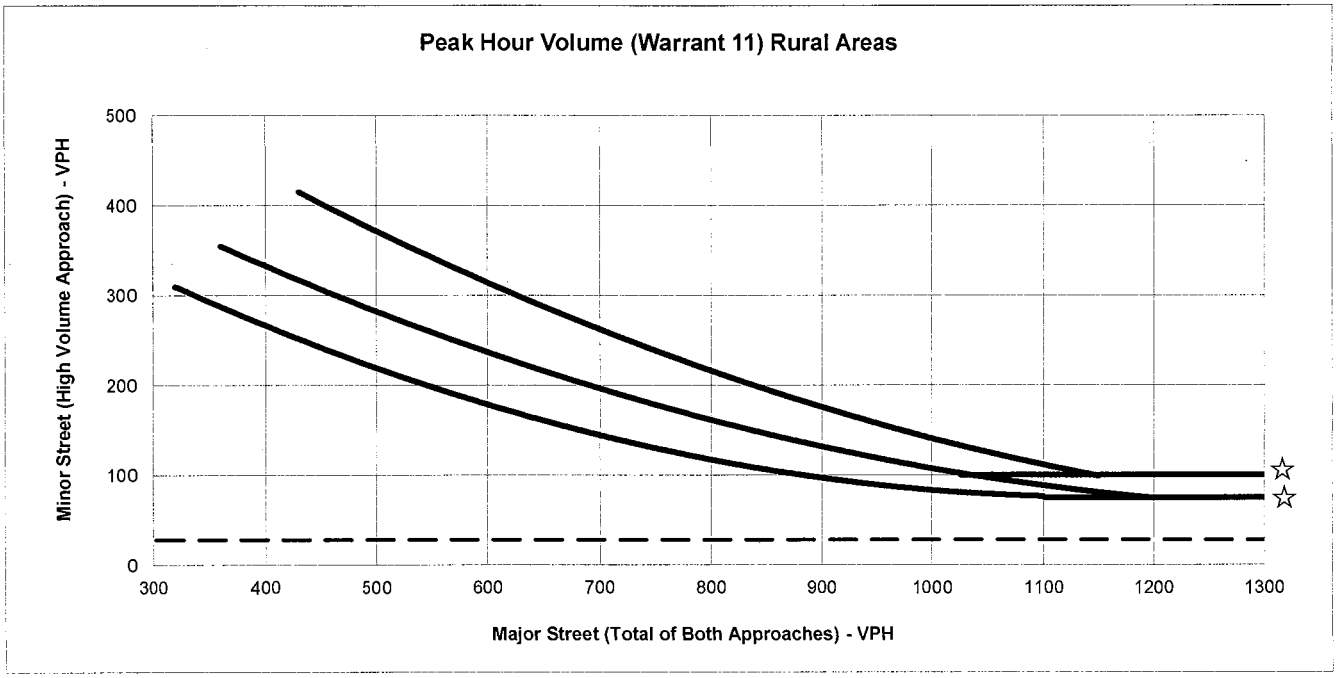


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Big Tree Road / State Route 29
Scenario:	Existing + Project PM Peak Hour Conditions
Minor St. Volume:	26
Major St. Volume:	1192
Warrant Met?:	**NO**

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Big Tree Road / State Route 29
Scenario:	Existing + Project Saturday Mid-Day Peak Hour Conditions
Minor St. Volume:	28
Major St. Volume:	1393
Warrant Met?:	**NO**

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	4	0	6	0	685	2	0	499	0
Future Vol, veh/h	0	0	0	4	0	6	0	685	2	0	499	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	63	63	63	95	95	95	96	96	96
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	6	0	10	0	721	2	0	520	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1247	1243	520	1242	1242	722	520	0	0	723	0	0
Stage 1	520	520	-	722	722	-	-	-	-	-	-	-
Stage 2	727	723	-	520	520	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	148	172	550	149	172	422	1031	-	-	866	-	-
Stage 1	534	527	-	413	427	-	-	-	-	-	-	-
Stage 2	411	426	-	534	527	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	145	172	550	149	172	422	1031	-	-	866	-	-
Mov Cap-2 Maneuver	145	172	-	149	172	-	-	-	-	-	-	-
Stage 1	534	527	-	413	427	-	-	-	-	-	-	-
Stage 2	402	426	-	534	527	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	20.8	0	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1031	-	-	-	244	866	-	-
HCM Lane V/C Ratio	-	-	-	-	0.065	-	-	-
HCM Control Delay (s)	0	-	-	0	20.8	0	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	7	0	6	0	767	12	1	598	0
Future Vol, veh/h	0	0	1	7	0	6	0	767	12	1	598	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	14	0	12	0	816	13	1	629	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1460	1461	629	1456	1454	822	629	0	0	829	0	0
Stage 1	632	632	-	822	822	-	-	-	-	-	-	-
Stage 2	828	829	-	634	632	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	105	127	477	106	128	369	939	-	-	790	-	-
Stage 1	463	469	-	364	384	-	-	-	-	-	-	-
Stage 2	361	381	-	462	469	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	101	127	477	105	128	369	939	-	-	790	-	-
Mov Cap-2 Maneuver	101	127	-	105	128	-	-	-	-	-	-	-
Stage 1	463	468	-	364	384	-	-	-	-	-	-	-
Stage 2	349	381	-	457	468	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	32.4	0	0
HCM LOS	B	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	939	-	-	477	157	790	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.166	0.001	-	-
HCM Control Delay (s)	0	-	-	12.6	32.4	9.6	0	-
HCM Lane LOS	A	-	-	B	D	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.6	0	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	4	0	6	0	748	2	0	565	0
Future Vol, veh/h	0	0	0	4	0	6	0	748	2	0	565	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	63	63	63	95	95	95	96	96	96
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	6	0	10	0	787	2	0	589	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1382	1378	589	1377	1377	788	589	0	0	789	0	0
Stage 1	589	589	-	788	788	-	-	-	-	-	-	-
Stage 2	793	789	-	589	589	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	119	143	503	120	143	386	972	-	-	818	-	-
Stage 1	489	491	-	380	398	-	-	-	-	-	-	-
Stage 2	378	398	-	489	491	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	116	143	503	120	143	386	972	-	-	818	-	-
Mov Cap-2 Maneuver	116	143	-	120	143	-	-	-	-	-	-	-
Stage 1	489	491	-	380	398	-	-	-	-	-	-	-
Stage 2	369	398	-	489	491	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	24	0	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	972	-	-	-	205	818	-	-
HCM Lane V/C Ratio	-	-	-	-	0.077	-	-	-
HCM Control Delay (s)	0	-	-	0	24	0	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	7	0	6	0	855	12	1	690	0
Future Vol, veh/h	0	0	1	7	0	6	0	855	12	1	690	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	14	0	12	0	910	13	1	726	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1650	1650	726	1646	1644	916	726	0	0	922	0	0
Stage 1	728	728	-	916	916	-	-	-	-	-	-	-
Stage 2	922	922	-	730	728	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	78	97	420	78	98	326	863	-	-	728	-	-
Stage 1	410	424	-	322	347	-	-	-	-	-	-	-
Stage 2	320	345	-	409	424	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	75	97	420	77	98	326	863	-	-	728	-	-
Mov Cap-2 Maneuver	75	97	-	77	98	-	-	-	-	-	-	-
Stage 1	410	423	-	322	347	-	-	-	-	-	-	-
Stage 2	308	345	-	404	423	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	43.5	0	0
HCM LOS	B	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	863	-	-	420	119	728	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.218	0.001	-	-
HCM Control Delay (s)	0	-	-	13.7	43.5	10	0	-
HCM Lane LOS	A	-	-	B	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.8	0	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	12	0	14	0	685	5	3	499	0
Future Vol, veh/h	0	0	0	12	0	14	0	685	5	3	499	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	63	63	63	95	95	95	96	96	96
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	19	0	22	0	721	5	3	520	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1261	1252	520	1250	1250	724	520	0	0	726	0	0
Stage 1	526	526	-	724	724	-	-	-	-	-	-	-
Stage 2	735	726	-	526	526	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	145	170	550	147	170	421	1031	-	-	863	-	-
Stage 1	530	524	-	412	426	-	-	-	-	-	-	-
Stage 2	407	425	-	530	524	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	137	169	550	146	169	421	1031	-	-	863	-	-
Mov Cap-2 Maneuver	137	169	-	146	169	-	-	-	-	-	-	-
Stage 1	530	521	-	412	426	-	-	-	-	-	-	-
Stage 2	386	425	-	527	521	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	24.6	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1031	-	-	-	225	863	-	-
HCM Lane V/C Ratio	-	-	-	-	0.183	0.004	-	-
HCM Control Delay (s)	0	-	-	0	24.6	9.2	0	-
HCM Lane LOS	A	-	-	A	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.7	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	17	0	11	0	767	22	6	598	0
Future Vol, veh/h	0	0	1	17	0	11	0	767	22	6	598	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	34	0	22	0	816	23	6	629	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1481	1481	629	1472	1470	828	629	0	0	839	0	0
Stage 1	642	642	-	828	828	-	-	-	-	-	-	-
Stage 2	839	839	-	644	642	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	102	123	477	103	125	366	939	-	-	783	-	-
Stage 1	458	464	-	361	381	-	-	-	-	-	-	-
Stage 2	356	377	-	456	464	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	95	122	477	101	124	366	939	-	-	783	-	-
Mov Cap-2 Maneuver	95	122	-	101	124	-	-	-	-	-	-	-
Stage 1	458	458	-	361	381	-	-	-	-	-	-	-
Stage 2	335	377	-	447	458	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	46.4	0	0.1
HCM LOS	B	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	939	-	-	477	141	783	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.397	0.008	-	-
HCM Control Delay (s)	0	-	-	12.6	46.4	9.6	0	-
HCM Lane LOS	A	-	-	B	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	1.7	0	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	12	0	14	0	748	5	3	565	0
Future Vol, veh/h	0	0	0	12	0	14	0	748	5	3	565	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	63	63	63	95	95	95	96	96	96
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	19	0	22	0	787	5	3	589	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1396	1388	589	1385	1385	790	589	0	0	793	0	0
Stage 1	595	595	-	790	790	-	-	-	-	-	-	-
Stage 2	801	793	-	595	595	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	117	141	503	119	141	385	972	-	-	815	-	-
Stage 1	486	488	-	379	397	-	-	-	-	-	-	-
Stage 2	374	396	-	486	488	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	110	140	503	119	140	385	972	-	-	815	-	-
Mov Cap-2 Maneuver	110	140	-	119	140	-	-	-	-	-	-	-
Stage 1	486	486	-	379	397	-	-	-	-	-	-	-
Stage 2	352	396	-	484	486	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	29.3	0	0
HCM LOS	A	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	972	-	-	-	189	815	-	-
HCM Lane V/C Ratio	-	-	-	-	0.218	0.004	-	-
HCM Control Delay (s)	0	-	-	0	29.3	9.4	0	-
HCM Lane LOS	A	-	-	A	D	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.8	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	17	0	11	0	855	22	6	690	0
Future Vol, veh/h	0	0	1	17	0	11	0	855	22	6	690	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	34	0	22	0	910	23	6	726	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1671	1672	726	1662	1660	921	726	0	0	933	0	0
Stage 1	739	739	-	921	921	-	-	-	-	-	-	-
Stage 2	932	933	-	741	739	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	75	94	420	76	96	324	863	-	-	721	-	-
Stage 1	404	419	-	320	345	-	-	-	-	-	-	-
Stage 2	316	341	-	403	419	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	69	93	420	74	95	324	863	-	-	721	-	-
Mov Cap-2 Maneuver	69	93	-	74	95	-	-	-	-	-	-	-
Stage 1	404	413	-	320	345	-	-	-	-	-	-	-
Stage 2	295	341	-	394	413	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	71.9	0	0.1
HCM LOS	B	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	863	-	-	420	106	721	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.528	0.009	-	-
HCM Control Delay (s)	0	-	-	13.7	71.9	10	0	-
HCM Lane LOS	A	-	-	B	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0	2.4	0	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	4	0	6	0	845	2	0	616	0
Future Vol, veh/h	0	0	0	4	0	6	0	845	2	0	616	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	63	63	63	95	95	95	96	96	96
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	6	0	10	0	889	2	0	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1537	1534	642	1533	1533	891	642	0	0	892	0	0
Stage 1	642	642	-	891	891	-	-	-	-	-	-	-
Stage 2	895	892	-	642	642	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	93	115	469	94	115	337	928	-	-	748	-	-
Stage 1	458	464	-	333	357	-	-	-	-	-	-	-
Stage 2	331	356	-	458	464	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	90	115	469	94	115	337	928	-	-	748	-	-
Mov Cap-2 Maneuver	90	115	-	94	115	-	-	-	-	-	-	-
Stage 1	458	464	-	333	357	-	-	-	-	-	-	-
Stage 2	322	356	-	458	464	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	29	0	0
HCM LOS	A	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	928	-	-	-	166	748	-	-
HCM Lane V/C Ratio	-	-	-	-	0.096	-	-	-
HCM Control Delay (s)	0	-	-	0	29	0	-	-
HCM Lane LOS	A	-	-	A	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	7	0	6	0	946	12	1	738	0
Future Vol, veh/h	0	0	1	7	0	6	0	946	12	1	738	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	14	0	12	0	1006	13	1	777	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1798	1798	777	1794	1792	1013	777	0	0	1019	0	0
Stage 1	779	779	-	1013	1013	-	-	-	-	-	-	-
Stage 2	1019	1019	-	781	779	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	61	79	392	61	79	286	826	-	-	669	-	-
Stage 1	384	402	-	284	313	-	-	-	-	-	-	-
Stage 2	282	311	-	383	402	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	58	79	392	60	79	286	826	-	-	669	-	-
Mov Cap-2 Maneuver	58	79	-	60	79	-	-	-	-	-	-	-
Stage 1	384	401	-	284	313	-	-	-	-	-	-	-
Stage 2	270	311	-	378	401	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.3	57.3	0	0
HCM LOS	B	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	826	-	-	392	94	669	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.277	0.002	-	-
HCM Control Delay (s)	0	-	-	14.3	57.3	10.4	0	-
HCM Lane LOS	A	-	-	B	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0	1	0	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	12	0	14	0	845	5	3	616	0
Future Vol, veh/h	0	0	0	12	0	14	0	845	5	3	616	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	63	63	63	95	95	95	96	96	96
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	19	0	22	0	889	5	3	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1551	1543	642	1540	1540	892	642	0	0	895	0	0
Stage 1	648	648	-	892	892	-	-	-	-	-	-	-
Stage 2	903	895	-	648	648	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	91	113	469	93	114	336	928	-	-	746	-	-
Stage 1	454	461	-	332	356	-	-	-	-	-	-	-
Stage 2	328	355	-	454	461	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	85	112	469	93	113	336	928	-	-	746	-	-
Mov Cap-2 Maneuver	85	112	-	93	113	-	-	-	-	-	-	-
Stage 1	454	458	-	332	356	-	-	-	-	-	-	-
Stage 2	306	355	-	451	458	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	37.3	0	0
HCM LOS	A	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	928	-	-	-	152	746	-	-
HCM Lane V/C Ratio	-	-	-	-	0.272	0.004	-	-
HCM Control Delay (s)	0	-	-	0	37.3	9.8	0	-
HCM Lane LOS	A	-	-	A	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	1	0	-	-

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	17	0	11	0	946	22	6	738	0
Future Vol, veh/h	0	0	1	17	0	11	0	946	22	6	738	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	34	0	22	0	1006	23	6	777	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1818	1819	777	1809	1807	1018	777	0	0	1030	0	0
Stage 1	789	789	-	1018	1018	-	-	-	-	-	-	-
Stage 2	1029	1030	-	791	789	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	59	76	392	60	78	284	826	-	-	663	-	-
Stage 1	379	398	-	283	311	-	-	-	-	-	-	-
Stage 2	279	307	-	378	398	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	54	75	392	59	77	284	826	-	-	663	-	-
Mov Cap-2 Maneuver	54	75	-	59	77	-	-	-	-	-	-	-
Stage 1	379	392	-	283	311	-	-	-	-	-	-	-
Stage 2	257	307	-	368	392	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.3	104.1	0	0.1
HCM LOS	B	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	826	-	-	392	86	663	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.651	0.01	-	-
HCM Control Delay (s)	0	-	-	14.3	104.1	10.5	0	-
HCM Lane LOS	A	-	-	B	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0	3.1	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	10	0	9	0	767	15	2	598	0
Future Vol, veh/h	0	0	1	10	0	9	0	767	15	2	598	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	50	50	50	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	20	0	18	0	816	16	2	629	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1467	1466	629	1460	1458	824	629	0	0	832	0	0
Stage 1	634	634	-	824	824	-	-	-	-	-	-	-
Stage 2	833	832	-	636	634	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	104	126	477	105	128	368	939	-	-	788	-	-
Stage 1	462	468	-	363	383	-	-	-	-	-	-	-
Stage 2	359	380	-	461	468	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	99	125	477	104	127	368	939	-	-	788	-	-
Mov Cap-2 Maneuver	99	125	-	104	127	-	-	-	-	-	-	-
Stage 1	462	466	-	363	383	-	-	-	-	-	-	-
Stage 2	341	380	-	455	466	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	34.9	0	0
HCM LOS	B	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	939	-	-	477	158	788	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.241	0.003	-	-
HCM Control Delay (s)	0	-	-	12.6	34.9	9.6	0	-
HCM Lane LOS	A	-	-	B	D	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.9	0	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	12	0	9	0	767	17	4	598	0
Future Vol, veh/h	0	0	1	12	0	9	0	767	17	4	598	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	25	75	75	75	94	94	94	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	4	16	0	12	0	816	18	4	629	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1469	1472	629	1465	1463	825	629	0	0	834	0	0
Stage 1	638	638	-	825	825	-	-	-	-	-	-	-
Stage 2	831	834	-	640	638	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	104	125	477	105	127	368	939	-	-	786	-	-
Stage 1	460	466	-	362	383	-	-	-	-	-	-	-
Stage 2	360	379	-	459	466	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	100	124	477	103	126	368	939	-	-	786	-	-
Mov Cap-2 Maneuver	100	124	-	103	126	-	-	-	-	-	-	-
Stage 1	460	462	-	362	383	-	-	-	-	-	-	-
Stage 2	348	379	-	452	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	34.7	0	0.1
HCM LOS	B	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	939	-	-	477	149	786	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.188	0.005	-	-
HCM Control Delay (s)	0	-	-	12.6	34.7	9.6	0	-
HCM Lane LOS	A	-	-	B	D	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.7	0	-	-

BIG TREE ROAD / SR-29

LEFT TURN LANE WARRANT GRAPH

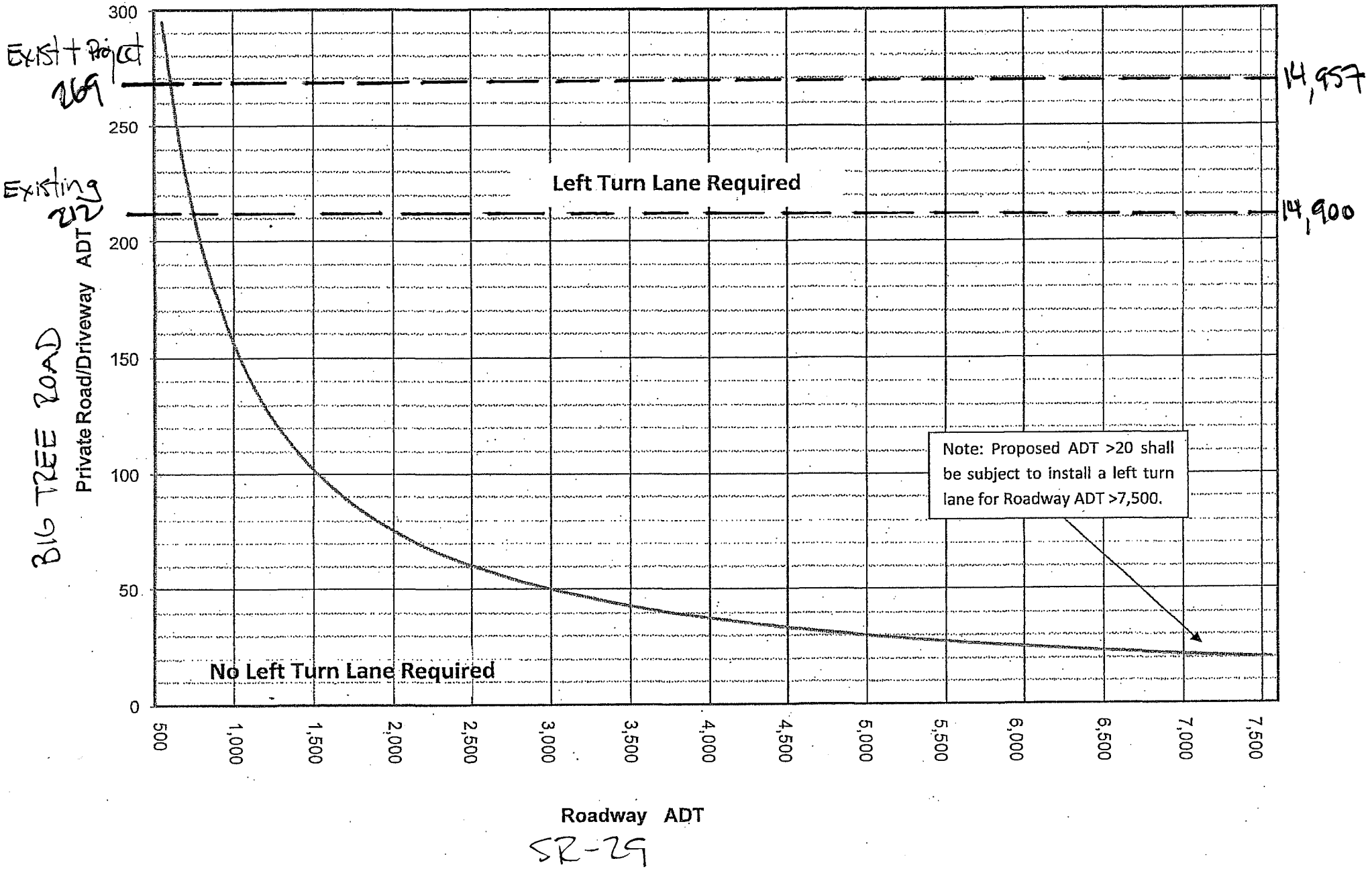


TABLE 2

Generalized **Annual Average Daily** Volumes for Florida's **Transitioning Areas** and **Areas Over 5,000 Not In Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	14,400	16,200	**
4	Divided	*	34,000	35,500	**
6	Divided	*	52,100	53,500	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	6,500	13,300	14,200
4	Divided	*	9,900	28,800	31,600
6	Divided	*	16,000	44,900	47,600

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	2,600	6,100	19,500
50-84%	1,900	5,500	18,400	>19,500
85-100%	7,500	19,500	>19,500	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	2,800	9,400
50-84%	*	1,600	8,600	15,600
85-100%	3,800	10,500	17,100	>19,500

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	44,100	57,600	68,900	71,700
6	65,100	85,600	102,200	111,000
8	85,100	113,700	135,200	150,000
10	106,200	141,700	168,800	189,000

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	9,200	17,300	24,400	33,300
4	Divided	35,300	49,600	62,900	69,600
6	Divided	52,800	74,500	94,300	104,500

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1] Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 5

Generalized **Peak Hour Two-Way** Volumes for Florida's **Transitioning** and **Areas Over 5,000 Not In Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	1,300	1,460	**
4	Divided	*	3,060	3,200	**
6	Divided	*	4,690	4,820	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	580	1,200	1,280
4	Divided	*	890	2,590	2,850
6	Divided	*	1,440	4,040	4,280

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	3,970	5,190	6,200	6,460
6	5,860	7,710	9,190	9,990
8	7,660	10,230	12,170	13,500
10	9,550	12,750	15,190	17,010

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 1,800	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	820	1,550	2,190	2,990
4	Divided	3,170	4,460	5,660	6,260
6	Divided	4,750	6,700	8,480	9,400

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	140	550	1,760
50-84%	170	500	1,650	>1,760
85-100%	670	1,760	>1,760	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	250	850
50-84%	*	150	780	1,410
85-100%	340	950	1,540	>1,760

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

[1] Values shown are presented as peak hour two-way volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm