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Traffic Study

Behrens Family Winery P15-00203-MOD & P15-00341-VAR
Planning Commission Hearing Date April 5, 2017

TRAFFIC IMPACT REPORT

PROPOSED BEHRENS FAMILY WINERY
ALONG SPRING MOUNTAIN ROAD
IN THE NAPA VALLEY NORTH OF
THE CITY OF ST. HELENA

September 7, 2015

Prepared for: **Behrens Family Winery**

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I. INTRODUCTION

This report has been prepared to satisfy requirements of Napa County staff to determine if the proposed Behrens Family Winery along Spring Mountain Road will result in any significant circulation system impacts in the vicinity of the project entrance along the shared use private driveway system serving the project area, at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection or at the SR 29/Madrona Avenue-Fulton Lane intersection in the City of St. Helena. Analysis has been provided for harvest Friday and Saturday PM peak hour conditions for existing, year 2020 and cumulative (year 2030 general plan buildout) horizons.

II. SUMMARY OF FINDINGS

A. "WITHOUT PROJECT" OPERATING CONDITIONS

1. The Spring Mountain Road/St. Helena Road/shared use private driveway intersection at the Napa/Sonoma County line now has higher traffic volumes entering the intersection during a Friday PM peak traffic hour compared to a Saturday afternoon peak traffic hour (104 two-way peak hour vehicles on Friday versus 73 two-way peak hour vehicles on Saturday). At the SR 29/Madrona Avenue-Fulton Lane intersection in St. Helena, volumes entering the intersection are similar during the Friday and Saturday PM peak hours (1,681 versus 1,690 two-way vehicles). During the ambient peak traffic hours on Spring Mountain Road the project driveway had 0 vehicles during the Friday PM peak traffic hour and 2 vehicles during the Saturday PM peak traffic hour.

2. During 2015 harvest conditions, the SR 29/Madrona Avenue-Fulton Lane signalized intersection would be expected to have acceptable levels of service (LOS B) during both the Friday and Saturday PM peak traffic hours, while the unsignalized Spring Mountain Road/St. Helena Road/shared use private driveway intersection would be expected to have acceptable levels of service (LOS A) during both peak traffic hours.

3. By 2020, the SR 29/Madrona Avenue-Fulton Lane intersection is still projected to be experiencing acceptable levels of service (LOS B) during both the harvest Friday and Saturday PM peak traffic hours, while the unsignalized Spring Mountain Road/St. Helena Road/shared use private driveway intersection would also be expected to maintain acceptable levels of service (LOS A) during both peak traffic hours..

4. By the cumulative time horizon (2030), the SR 29/Madrona Avenue-Fulton Lane intersection would still be expected to be experiencing acceptable levels of service (LOS C) during both the harvest Friday and Saturday PM peak traffic hours, while the unsignalized Spring Mountain Road/St. Helena Road/shared use private driveway intersection would also be expected to maintain acceptable levels of service (LOS A) during both peak traffic hours..

5. The Behrens driveway connects to the shared use private driveway system serving all the properties in the project area. The Behrens driveway is shared with one other property (Sherwin Family Vineyards) before connecting to the private driveway system. Sight lines at the project's and Sherwin Family Vineyards driveway connection to the local area private driveway system are acceptable.

6. The Spring Mountain Road/St. Helena Road/shared use private driveway intersection is lacking stop sign control on all three intersection approaches. In addition, signing is lacking indicating the names of the two roads and the fact that the north leg of the intersection is a private driveway.

B. PROJECT IMPACTS

1. The project will result in 2 inbound and 2 outbound trips during the harvest Friday PM peak traffic hour at the SR 29/Madrona Avenue-Fulton Lane intersection (3:15 to 4:15), with about 2 inbound and 2 outbound trips during the harvest Saturday PM peak traffic hour (3:30 to 4:30). Project trips during both the Friday and Saturday afternoon peak traffic hours will be visitors by appointment. It is also possible that there will be no visitor traffic during these hours. This will be dependent upon the appointment schedules.

2. Project traffic during harvest will not produce any significant operational impacts (level of service or delay) at the SR 29/Madrona Avenue-Fulton Lane intersection in St. Helena during harvest Friday or Saturday PM peak traffic conditions for Existing, near term (year 2020) or the cumulative (year 2030) analysis horizons. The intersection will maintain acceptable LOS B or C operation during both the Friday and Saturday PM peak traffic hours with the addition of up to four new project vehicles each hour. Likewise, the project will not produce any significant level of service impacts at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection during any analyzed time period for Existing, 2020 or cumulative (year 2030) conditions. Operation will remain LOS A for all time periods.

3. Behrens drivers will experience acceptable sight lines when they turn right from the project's and Sherwin Family Vineyards shared use driveway connection to the local area private driveway system.

4. The lack of adequate signing indicating which private driveway routing should be used to access the project within a half mile of the project site may lead to confusion for first time winery visitors. Also, the lack of stop sign control on at least one approach to the Spring Mountain Road/St. Helena Road/shared use private driveway intersection could lead to safety concerns for drivers not familiar with the local roadway network.

C. CONCLUSIONS & RECOMMENDATIONS

The project would result in no significant off-site circulation system level of service impacts at the SR 29/Madrona Avenue-Fulton Lane intersection in St. Helena or at the Spring Mountain

Road/St. Helena Road/shared use private driveway intersection at the Napa/Sonoma County line. In addition, sight lines at the project's and Sherwin Family Vineyards shared use driveway connection to the local area private driveway system are acceptable. However, the lack of signing indicating which of many similar-looking private driveways in the project vicinity is really the access route to the project, and the lack of stop sign control on any leg of the Spring Mountain Road/St. Helena Road/shared use private driveway intersection could cause confusion as well as safety concerns (at the St. Helena Road intersection) for first-time visitor traffic.

The only recommended mitigations would be placement of at least two to three additional and larger identification signs for Behrens Family Winery starting at the St. Helena Road intersection (and going north) as well as provision of a stop sign on the southbound private driveway approach to the Spring Mountain Road/St. Helena Road intersection.

III. PROJECT LOCATION & DESCRIPTION

The Behrens Family Winery will be located along a private driveway on the north side of Spring Mountain Road about 6.3 miles west of the SR 29/Madrona Avenue-Fulton Lane intersection (in St. Helena) and 0.8 mile from the Spring Mountain Road/St. Helena Road/shared use private driveway intersection at the Napa/Sonoma County line (see **Figure 1**). The Behrens residence is now on the project site. The Behrens driveway is shared with one other property owner (the Sherwin Family Vineyards and residence) before intersecting the local area shared use private roadway system.

The proposed Behrens Family Winery will have the following yearly production and visitor/special event levels.

- 20,000 gallons per year production.
- Employees: 5 full time and 2 part time during harvest only; 4 full time the rest of the year.
- Bottling on-site.
- 100 percent of the grapes will be grown off site. About 85 percent will come via St. Helena and Spring Mountain Road.
- Tours and tasting by appointment only – 7 days per week from 10:00 AM to 6:00 PM, maximum 32 visitors per day during harvest and 15 visitors per day during the rest of the year.
- Marketing events
  - 1 per year with 60 guests using about 22 vehicles (Saturday 6:00-10:00 PM)
  - 4 per year with 20 guests using about 8 vehicles (Saturdays 10:00 AM-2:00 PM or 6:00-10:00 PM).
  - 1 per year with 300 guests using shuttle vans (Saturday 2:00-10:00 PM).

IV. EXISTING CIRCULATION SYSTEM OPERATION

A. ANALYSIS LOCATIONS

The following locations have been evaluated in this study.

- SR 29/Madrona Avenue-Fulton Lane signalized intersection in St. Helena
- Spring Mountain Road/St. Helena Road/shared use private driveway unsignalized intersection at the Napa/Sonoma County line.
- The Behrens and Sherwin Family Vineyards shared use driveway connection to the private driveway system serving the project area.

Figure 2 presents approach geometrics and control at each analysis intersection.

B. VOLUMES

Friday 3:00 to 6:00 PM and Saturday 1:00 to 6:00 PM turn movement counts were conducted by Crane Transportation Group (CTG) in early August 2015 at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection and at the Behrens driveway, while June 2014 counts at the SR 29/Madrona Avenue-Fulton Lane intersection were obtained from a previous study for the Vineyard 3646 Winery along Spring Mountain Road. On Friday the peak traffic hours were determined to be 3:15-4:15 at the SR 29/Madrona Avenue-Fulton Lane intersection and 3:45-4:45 at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection, while on Saturday the PM peak traffic hours were determined to be 3:30-4:30 at the SR 29/Madrona Avenue-Fulton Lane intersection and 2:00-3:00 at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection. Resultant peak hour counts are presented in **Figure 3**. Overall, two-way PM peak hour volumes passing through the Spring Mountain Road/St. Helena Road shared use private driveway intersection were higher on Friday than on Saturday (104 vehicles per hour [vph] on Friday versus 73 vph on Saturday). At SR 29/ Madrona Avenue-Fulton Lane, total volumes entering the intersection were similar during the Friday and Saturday PM peak hours (1,681 versus 1,690 vehicles per hour, respectively). More than 90 percent of all traffic using the shared use private driveway north of the Spring Mountain Road/St. Helena Road tee intersection turns to or from the east (i.e. to or from St. Helena).

The Behrens property driveway had minimal or no traffic during all count hours: from 0 to 2 vehicles per hour on Friday between 3:00 and 6:00 and from 0 to 2 vehicles per hour on Saturday afternoon between 1:00 and 6:00. Three of the five counted hours on Saturday had no traffic.

June peak hour traffic counts at the SR 29/Madrona Avenue-Fulton Lane intersection were seasonally adjusted to reflect September harvest conditions based upon monthly adjustment factors utilized in other Napa Valley jurisdictions, Caltrans PeMS seasonal traffic count data for SR29 as well as a recent traffic study in St. Helena.[1] Overall, June PM peak hour volumes in St. Helena would be expected to increase by about 3 percent on Friday and 9 percent on Saturday to

[1] Hunter Subdivision Draft EIR, May 29, 2012.

reflect fall harvest conditions. Year 2014 Friday and Saturday PM peak hour volumes were then increased to harvest 2015 conditions projecting straight line growth between 2014 and 2030 cumulative volumes. The August 2015 counts at the Spring Mountain Road/St. Helena Road/private driveway intersection were factored to harvest conditions using the same analysis methodology. August Friday counts were increased by 1 percent, while August Saturday counts were increased by 2 percent to reflect harvest conditions. Resultant harvest 2015 Friday and Saturday PM peak hour volumes are presented in **Figure 4**.

C. ROADWAYS

Roadway descriptions are based upon the assumption that Spring Mountain Road runs in a general east-west direction through the project area and SR 29 runs in a north-south direction.

Spring Mountain Road is a narrow two-lane rural road with centerline striping extending westerly from the City of St. Helena to the Sonoma County line. At the County line, Spring Mountain Road has a "tee" intersection with St. Helena Road. The east leg is Spring Mountain Road, the west leg is St. Helena Road and the north leg is a shared use private driveway serving a large number of properties, including the Behrens family residence. There is no signing indicating any roadway names. St. Helena Road extends westerly to Santa Rosa. The private shared use driveway extends north of the intersection for about 0.3 miles as a well-paved two-lane road. It then begins to split into a variety of one-lane roadways that each serve one or more properties. The driveway serving the Behrens property (4078 Spring Mountain Road) is located about half a mile along one of the one-lane road segments. The Behrens driveway also provides access to the Sherwin Family Vineyards and residence. Overall, the project driveway is about 6.3 miles from the SR 29/Madrona Avenue-Fulton Lane intersection in St. Helena.

Spring Mountain Road has an uphill grade from the City of St. Helena until about 0.4 miles from the Sonoma County line. There are numerous horizontal and vertical curves along the entire roadway and shoulders are lacking in most all locations. Observed vehicle speeds ranged from 15 to 35 miles per hour, with several curves having posted 15 or 20 mph speed limits. At one point the road has a 15 mph speed limit and narrows to one lane to fit between two large trees. The posted speed limit along Spring Mountain Road in the City of St. Helena is 25 mph.

Neither Spring Mountain Road, St. Helena Road, or the shared use private driveway are stop sign controlled on the approaches to their Tee intersection.

D. INTERSECTION LEVEL OF SERVICE

1. Analysis Methodology

Transportation engineers and planners commonly use a grading system called level of service (LOS) to measure and describe the operational status of the local roadway network. LOS is a description of the quality of a roadway facility's operation, ranging from LOS A (indicating free-flow traffic conditions with little or no delay) to LOS F (representing oversaturated conditions where traffic flows exceed design capacity, resulting in long queues and delays).

Intersections, rather than roadway segments between intersections, are almost always the capacity controlling locations for any circulation system.

Signalized Intersections. For signalized intersections, the 2000 *Highway Capacity Manual* (Transportation Research Board, National Research Council) methodology was utilized. With this methodology, operations are defined by the level of service and average control delay per vehicle (measured in seconds) for the entire intersection. For a signalized intersection, control delay is the portion of the total delay attributed to traffic signal operation. This includes delay associated with deceleration, acceleration, stopping, and moving up in the queue. **Table 1** summarizes the relationship between delay and LOS for signalized intersections.

Unsignalized Intersections. For unsignalized (all-way stop-controlled and side-street stop-controlled) intersections, the 2010 *Highway Capacity Manual* (Transportation Research Board, National Research Council) methodology for unsignalized intersections was utilized. For side-street stop-controlled intersections, operations are defined by the level of service and average control delay per vehicle (measured in seconds), with delay reported for the stop sign controlled approaches or turn movements, although overall delay is also typically reported for intersections along state highways. For all-way stop-controlled intersections, operations are defined by the average control delay for the entire intersection (measured in seconds per vehicle). The delay at an unsignalized intersection incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. **Table 2** summarizes the relationship between delay and LOS for unsignalized intersections.

2. Minimum Acceptable Operation

The City of St. Helena's 1993 General Plan establishes two guiding policies (policies 5.4.1 and 5.4.2) on traffic service standards. Policy 5.4.1 states that LOS C shall be maintained at all signalized intersections in St. Helena, except along Main Street, where service level LOS D shall be permitted. Exceptions to this policy are that lower service levels shall be permitted at any location where the existing service level does not meet this standard. In these locations, the service level shall not be lower than the existing traffic conditions indicated in the General Plan. The City Council may also allow an exception to this policy if it finds overriding circumstances that make maintenance of the policy impractical or infeasible. There is no established LOS standard for unsignalized intersections, however, General Plan Policy 5.4.2 states that LOS C is a goal at stop-sign-controlled intersections.

Napa County has no published minimum level of service standards for unsignalized public road or private driveway intersections. The County General Plan (Policy CIR-16) states that the County shall seek to maintain an arterial Level of Service D or better on all County roadways except where maintaining this desired level of service would require installation of more travel lanes than shown on the Circulation Map. For this study, LOS D has been used for unsignalized intersections as the poorest acceptable operation for the entire intersection, with LOS E as the poorest acceptable operation for a side street stop sign controlled intersection approach. The reason for use of LOS E as the criteria for individual movements and LOS D as the criteria for the overall intersection is that the poorest operation at an unsignalized intersection is typically a specific stop sign controlled movement, unless side street volumes are high, in which case both

the overall intersection and stop sign controlled movement are LOS F. Stop sign controlled intersections along Silverado Trail with low volumes of side street traffic tend to have poor stop sign controlled levels of service, but good to acceptable overall operation. As side street volumes increase, overall intersection operation also tends to degrade, but will usually remain one or more levels of service better than the stop sign controlled movement. When overall operation also degrades to LOS E or F operation, it is an indication of large volumes on the stop sign controlled approach, and the potential need for intersection signalization. The combined use of both criteria allows the County to identify those stop sign controlled intersections that have unacceptable delay for side street traffic as well as a sufficient amount of side street traffic that may meet signal warrant criteria levels.

3. Existing Harvest Operation

Table 3 shows that during the 2015 harvest season, operation of the SR 29/Madrona Avenue-Fulton Lane intersection would be an acceptable LOS B during both the Friday and Saturday harvest peak traffic hours. In addition, operation of the southbound private driveway approach to the Spring Mountain Road/St. Helena Road intersection would be LOS A during both the Friday and Saturday harvest peak traffic hours.

E. PLANNED IMPROVEMENTS

There are no planned and funded capacity improvements along Spring Mountain Road in Napa County.[2]

V. FUTURE HORIZON CIRCULATION SYSTEM OPERATION WITHOUT THE PROJECT

A. TRAFFIC MODELING PROJECTIONS

1. Napa County (Spring Mountain Road)

Project traffic impacts have been determined for near and long term horizons. The near term horizon is required to be 2020, while the long term cumulative horizon reflects the County's general plan buildout year, which is 2030. Future horizon year volumes along Spring Mountain Road have been first obtained from the traffic modeling projections for the year 2030 from the County's General Plan Circulation Element. However, due to the unreliability of the County traffic model projections on low volume rural roads, the extremely high increases were considered unrealistic (up to an additional 900 vehicles per hour expected by 2030 on a road that now only has about 100 vehicles per hour). After discussion with County Public Works, the traffic consultant preparing this report projected at most a 100 percent increase in traffic on Spring Mountain Road between 2014 and 2030. Little growth in traffic would be expected on the private roadway system in the vicinity of the proposed project, at most a 1 percent per year

[2] Mr. Paul Wilkinson, Napa County Public Works Department, May 2015.

increase. Year 2015 and 2020 volumes were then developed projecting straight line growth between 2014 and 2030. Projecting straight-line traffic growth for analysis purposes, this translated into about a 32 percent growth in harvest PM peak hour traffic between Santa Rosa and St. Helena as well as a 5 percent growth in traffic along the private driveway system north of the Spring Mountain Road/St. Helena Road intersection from 2015 to the year 2020.

2. City of St. Helena (SR 29/Madrona Avenue-Fulton Lane Intersection)

Within St. Helena, year 2030 harvest traffic projections for the SR 29/Madrona Avenue-Fulton Lane intersection were obtained from a recent EIR for the Hunter subdivision.[3] Year 2020 projections were developed assuming straight line growth between 2015 and 2030.

B. YEAR 2020 WITHOUT PROJECT EVALUATION

1. Volumes

Year 2020 "Without Project" Friday and Saturday PM peak hour harvest volumes are presented in **Figure 5**.

2. Intersection Level of Service

Table 4 shows that in 2020 during harvest season, "Without Project" operation of the SR 29/Madrona Avenue-Fulton Lane intersection would be at acceptable LOS B during both the Friday and Saturday PM peak traffic hours. In addition, without project operation of the southbound shared use private driveway approach to the Spring Mountain Road/St. Helena Road intersection would be an acceptable LOS A during both peak traffic hours.

C. CUMULATIVE (YEAR 2030) WITHOUT PROJECT EVALUATION

1. Volumes

Year 2030 "Without Project" Friday and Saturday PM peak hour harvest volumes are presented in **Figure 6**.

2. Intersection Level of Service

Table 5 shows that in 2030 during harvest season, "Without Project" operation of the SR 29/Madrona Avenue-Fulton Lane signalized intersection would be at acceptable LOS C conditions during both the Friday and Saturday PM peak traffic hours. In addition, without project operation of the southbound shared use private driveway approach to the Spring Mountain Road/St. Helena Road intersection would be an acceptable LOS A during both peak traffic hours.

[3] Hunter Subdivision Draft EIR, May 29, 2012.

VI. PROJECT IMPACTS

A. SIGNIFICANCE CRITERIA

The following criteria were developed for recent traffic impact analyses in the County. These same criteria have been utilized in this study to determine the significance of impacts due to the project. An impact is considered to be significant if any of the following conditions are met.

COUNTY OF NAPA

- If sight lines at the project entrance do not meet stopping sight distance criteria as detailed in *A Policy on Geometric Design of Highways and Streets*, 2011, 6th Edition, by AASHTO.

- If the addition of project traffic increases volumes at the project access intersection to exceed County warrant criteria for purposes of a left turn lane on the uncontrolled County roadway intersection approach.

- If "without" project volumes at the private driveway intersection already exceed County left turn lane warrant criteria, project traffic produces any increase in total peak hour volumes passing through the intersection, particularly left turns.

CITY OF ST. HELENA

Based on the City of St. Helena's current transportation impact criteria and the state of the practice for evaluating impacts on the transportation system, CEQA guideline significance criteria have been interpreted as follows in evaluating the proposed project.

City Roadway and Intersection Impact Criteria. The City's current LOS standard is LOS D for signalized intersections on SR 29 (Main Street) and LOS C elsewhere. Based on existing CEQA and City of St. Helena standards, traffic impacts are identified as significant if implementation of the project would cause:

- Operations of a signalized intersection along SR 29-128 (Main Street) to deteriorate from LOS D under conditions without the project to LOS E or F.

- The LOS to deteriorate to LOS F for signalized intersections that operate at LOS E under conditions without the project.

- The average intersection delay to increase by more than five seconds for signalized intersections that operate at LOS E or F under conditions without the project.

- If, in the opinion of the registered traffic engineer conducting this study, certain project-related traffic changes would substantially increase safety or operational concerns, the impact is considered significant and would require mitigation.

B. TRIP GENERATION

Friday and Saturday afternoon trip generation projections were developed with the assistance of the project applicant and their representative for all components of the employee and visitor activities at the proposed Behrens Family Winery (see worksheets in the **Appendix**). Results are presented on an hourly basis in **Tables 6** and **7** for Friday and Saturday afternoon harvest conditions. During the Friday PM peak traffic hour, there would be a projected 2 inbound and 2 outbound project trips, while during the Saturday afternoon PM peak traffic hour, there would also be a projected 2 inbound and 2 outbound project trips. However, depending upon the scheduling of visitor tours, there could be no visitor vehicles during these hours. As shown, winery administrative and production employees would not be expected on the local roadway network during harvest Friday or Saturday PM peak hour conditions. The visitor-serving employee would also be working until 6:00 PM every day, as tours and tasting by appointment would close at 6:00 PM. Therefore, the only winery-related traffic expected on the local roadway network during both the Friday and Saturday harvest PM peak traffic hours would be visitor related. Assuming average size groups of about 3 people, this could result in 1-2 visitor-related vehicles accessing the winery during any given traffic hour between 10:00 AM and 6:00 PM. It would be expected that more visitors would be coming to the winery during the afternoon than during the morning.

C. TRIP DISTRIBUTION

Project traffic was distributed to Spring Mountain Road and SR 29/Madrona Avenue-Fulton Lane intersection in St. Helena in a pattern reflective of existing distribution patterns at the SR 29/Madrona Avenue-Fulton Lane intersection as well as at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection. Virtually all visitor and employee traffic would be expected to travel to/from the east on Spring Mountain Road.

The Friday and Saturday project traffic increments expected on Spring Mountain Road and at the SR 29/Madrona Avenue-Fulton Lane intersection during times of ambient PM peak traffic flow are presented in **Figure 7**, while Friday and Saturday "With Project" PM peak hour volumes for 2015, 2020 and 2030 are presented in **Figures 8, 9** and **10,** respectively.

D. PLANNED ROADWAY IMPROVEMENTS

There are no planned and funded capacity increasing roadway improvements by the City of St. Helena or the County on this local roadway network serving the project site.[4]

[4] Paul Wilkinson, Napa County Public Works Department & Hunter Subdivision Draft EIR.

E. EXISTING + PROJECT INTERSECTION IMPACTS

1. Level of Service

Project traffic would not produce a significant level of service impact at the SR 29/Madrona Avenue-Fulton Lane intersection during either the harvest Friday or Saturday year 2015 PM peak traffic hours along SR 29. Project traffic would not change acceptable LOS B operation during either the Friday or Saturday PM peak traffic hours. At the Spring Mountain Road/St. Helena Road/shared use private driveway intersection, LOS A operation would be maintained with the addition of project traffic during both the harvest Friday and Saturday PM peak traffic hours.

F. YEAR 2020 INTERSECTION IMPACTS

1. Level of Service

Project traffic would not produce a significant level of service impact at the SR 29/Madrona Avenue-Fulton Lane intersection during either the harvest Friday or Saturday year 2020 PM peak traffic hours along SR 29. Project traffic would not change acceptable LOS B operation during either the Friday or Saturday PM peak traffic hours. At the Spring Mountain Road/St. Helena Road/shared use private driveway intersection, LOS A operation would be maintained with the addition of project traffic during both the harvest Friday and Saturday PM peak traffic hours.

G. YEAR 2030 INTERSECTION IMPACTS

1. Level of Service

Project traffic would not produce a significant level of service impact at the SR 29/Madrona Avenue-Fulton Lane intersection during either the harvest Friday or Saturday year 2030 PM peak traffic hours along SR 29. Project traffic would not change acceptable LOS C operation during either the Friday or Saturday PM peak traffic hours. At the Spring Mountain Road/St. Helena Road/shared use private driveway intersection, LOS A operation would be maintained with the addition of project traffic during both the harvest Friday and Saturday PM peak traffic hours.

H. SIGHT LINE ADEQUACY

The Behrens driveway that is shared with the Sherwin Family Vineyards intersects the outside of a 90-degree curve on the local shared use driveway system. The local shared use driveway extends to the west and south. Sight lines are acceptable to the west and south for drivers turning from the Behrens/Sherwin driveway. Sight lines to the south are about 250 feet, while sight lines to the west are about 150 feet. Based upon travel speeds along the local driveway of 20 to 25 miles per hour, the required stopping sight distances would be 125-150 feet.[5] Therefore,

[5] *A Policy on Geometric Design of Highways and Streets*, 2011, AASHTO.

available sight lines are equal to or greater than minimum required stopping sight distances to both the west and south.

I. MINOR SAFETY CONCERNS

The Spring Mountain Road/St. Helena Road/shared use private driveway Tee intersection has no stop sign control on any approach. The vast majority of traffic passing through the intersection travels between St. Helena Road (the west leg) and Spring Mountain Road (the east leg) (i.e. between Santa Rosa and the Napa Valley). While residents know to slow down on the southbound shared use private driveway intersection approach, project visitors will not be aware of the predominant flow patterns at the intersection and may proceed through the intersection at a higher than safe speed since there is no stop sign control.

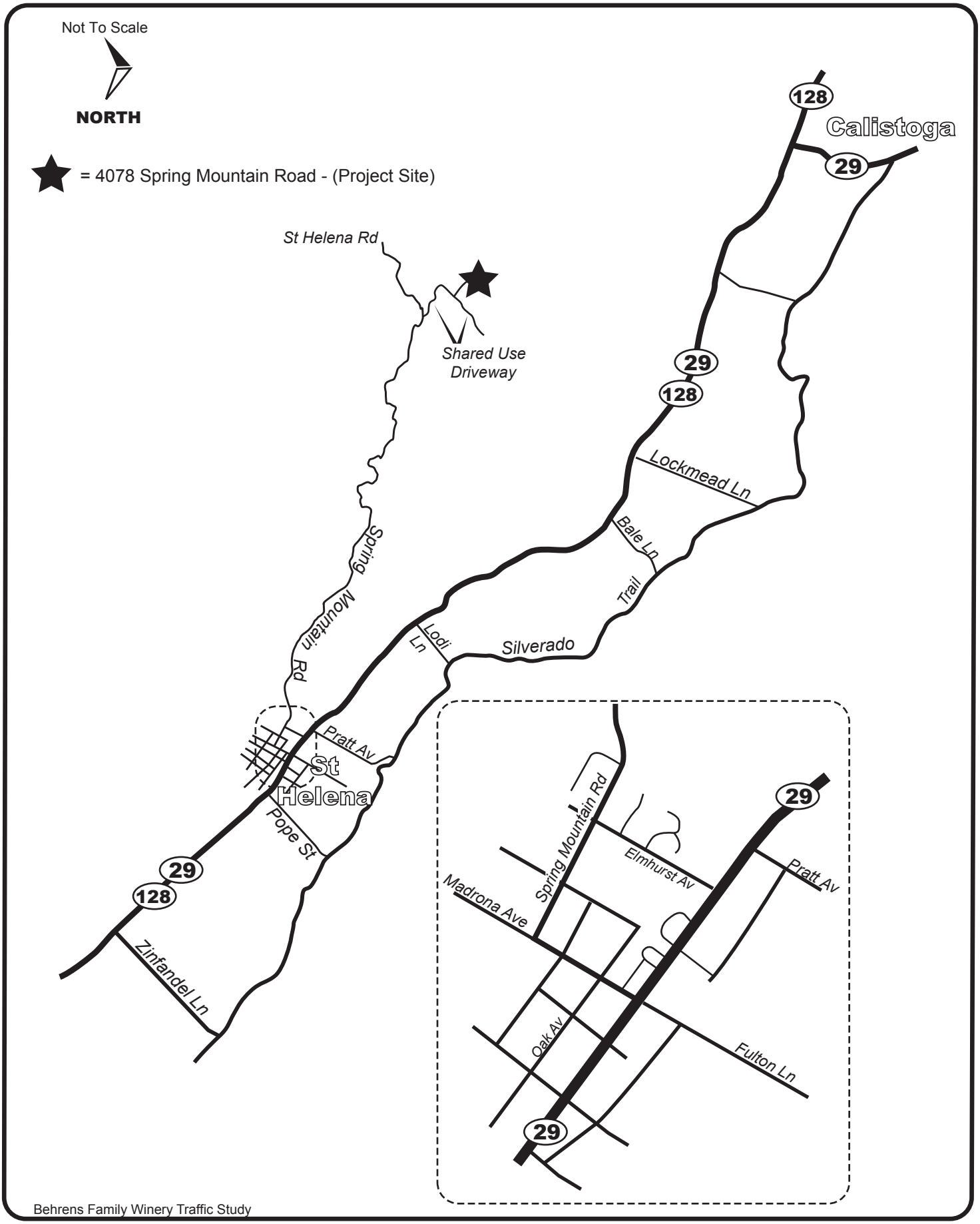
Also, the lack of adequate signing showing which private driveway routing north of the Spring Mountain Road/St. Helena Road intersection should be used to access the project (at many similar-looking intersections) will present confusion to some visitors.

VII. CONCLUSIONS & RECOMMENDATIONS

The project would result in no significant off-site circulation system level of service impacts at the SR 29/Madrona Avenue-Fulton Lane intersection in St. Helena or at the Spring Mountain Road/St. Helena Road/shared use private driveway intersection at the Napa/Sonoma County line. In addition, sight lines at the project's and Sherwin Family Vineyards shared use driveway connection to the local area private driveway system are acceptable. However, the lack of signing indicating which of many similar-looking private driveways in the project vicinity is really the access route to the project, and the lack of stop sign control on any leg of the Spring Mountain Road/St. Helena Road/shared use private driveway intersection could cause confusion as well as safety concerns (at the St. Helena Road intersection) for first-time visitor traffic.

The only recommended mitigations would be placement of at least two to three additional and larger identification signs for Behrens Family Winery starting at the St. Helena Road intersection (and going north) as well as provision of a stop sign on the southbound private driveway approach to the Spring Mountain Road/St. Helena Road intersection.

Figures



Behrens Family Winery Traffic Study

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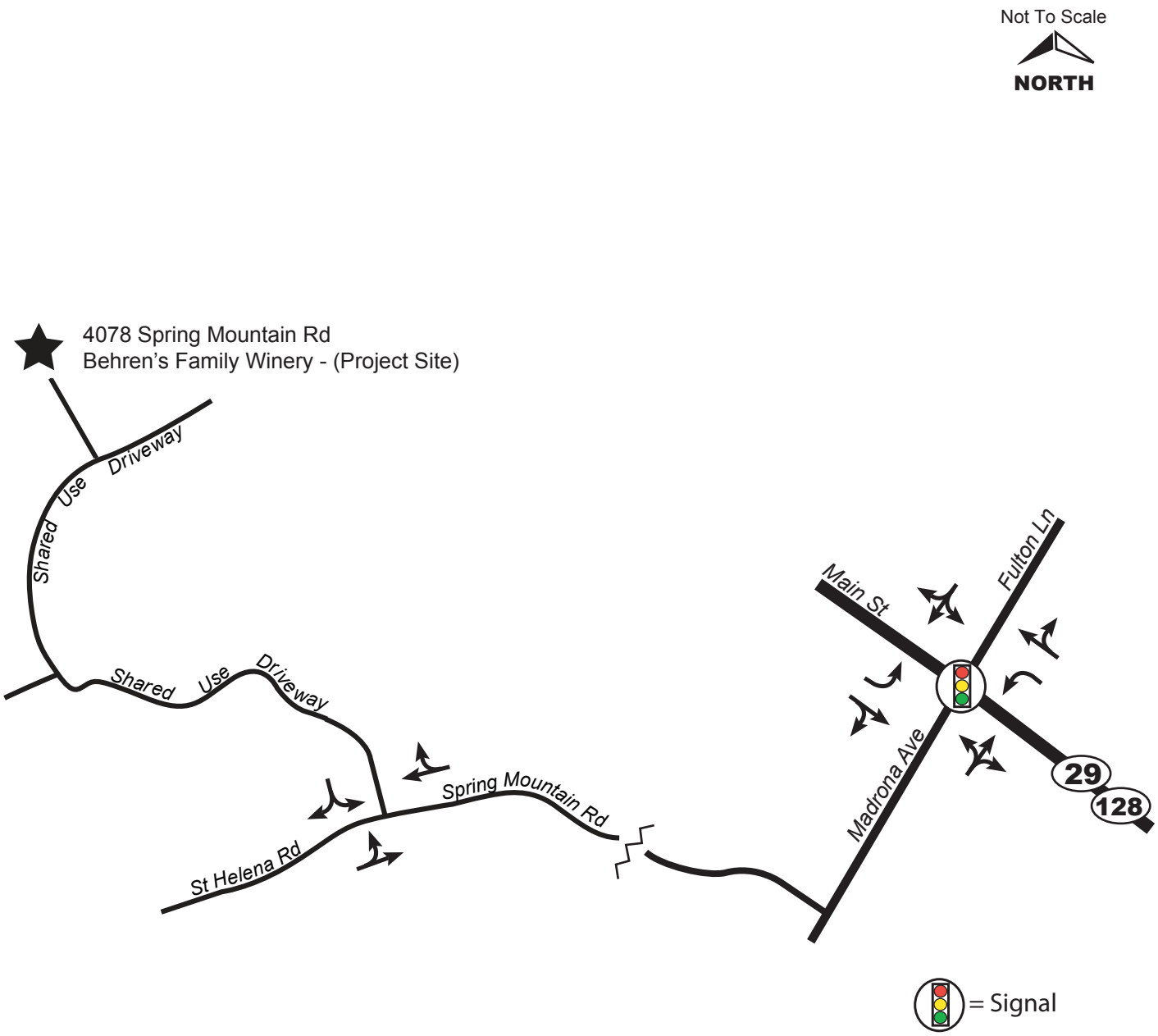
Figure 1

Area Map

Behrens Family Winery



Behrens Family Winery Traffic Study

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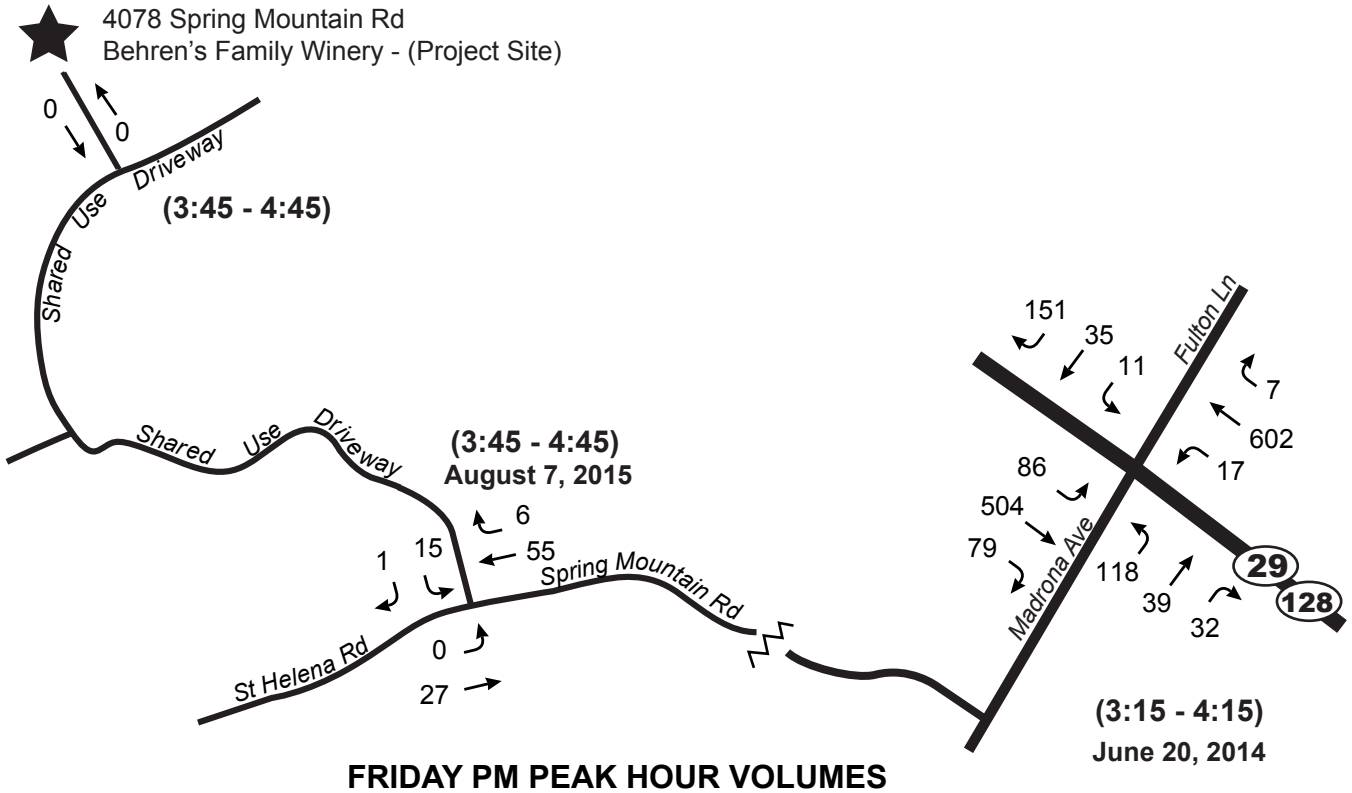
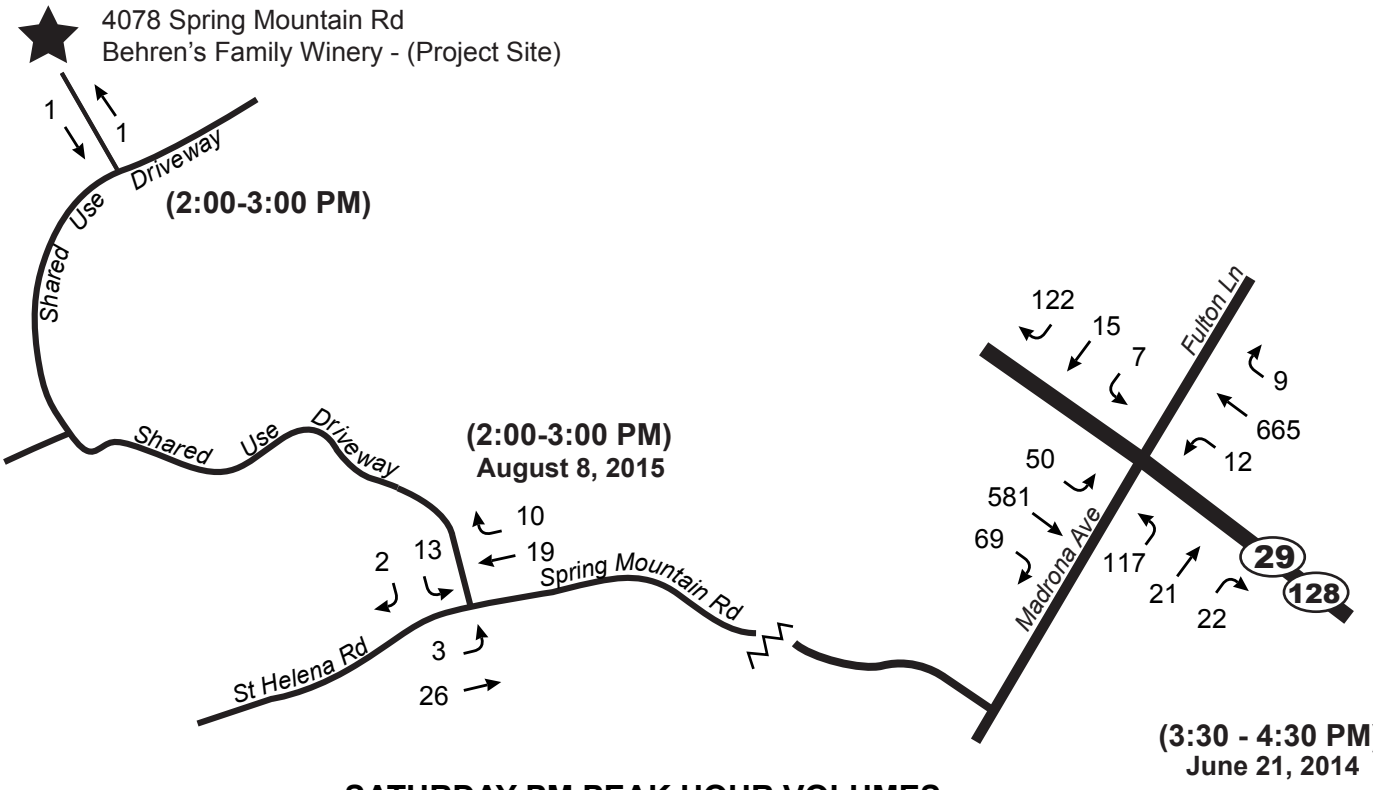
Figure 2

Existing Lane Geometrics and Intersection Control



FRIDAY PM PEAK HOUR VOLUMES



SATURDAY PM PEAK HOUR VOLUMES

Behrens Family Winery Traffic Study

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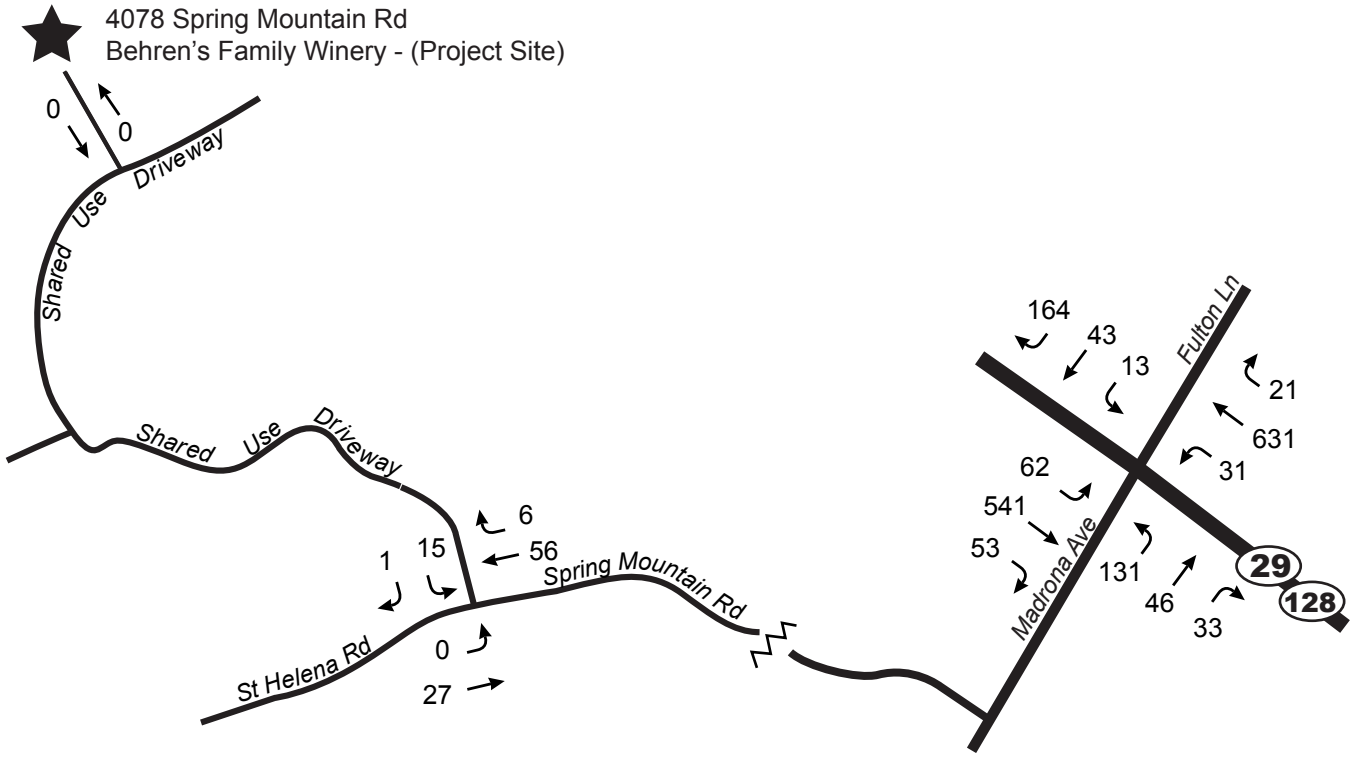
Figure 3

Friday and Saturday PM Peak Hour Volumes
June 2014 and August 2015



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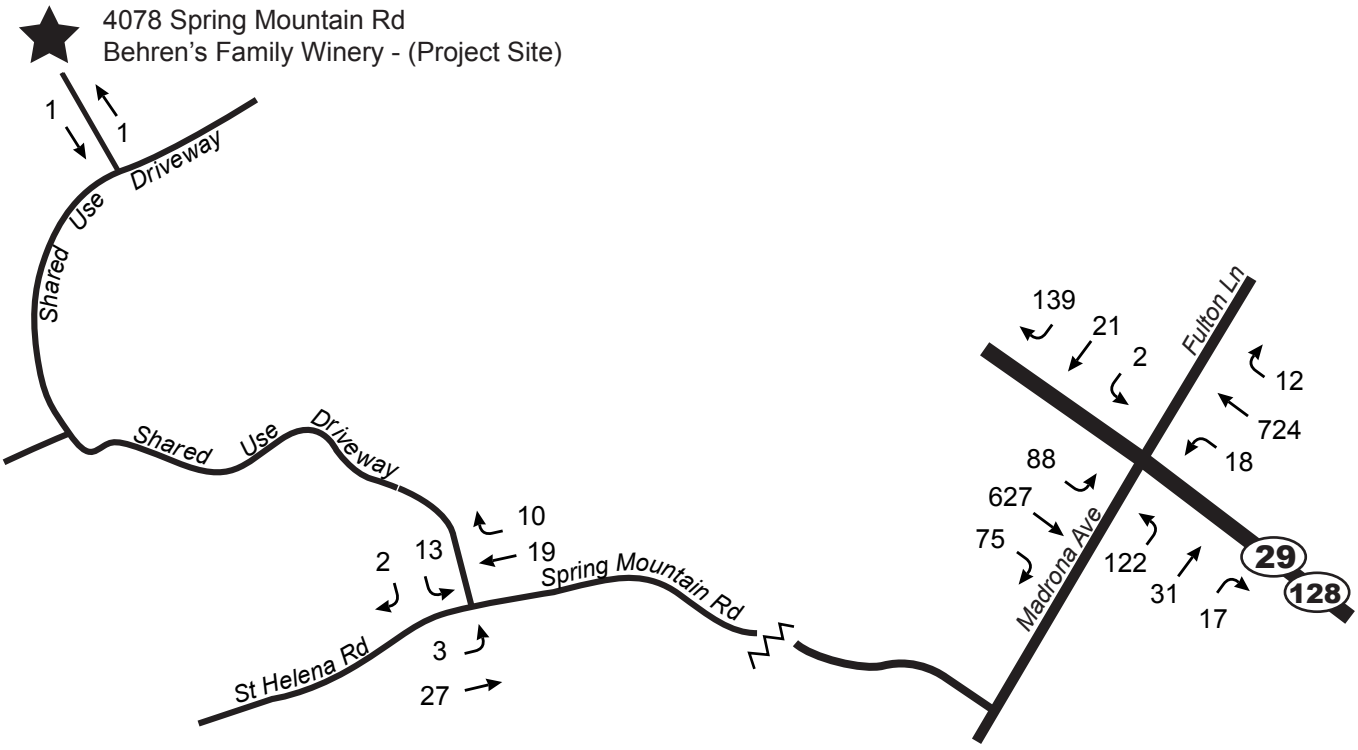

SATURDAY PM PEAK HOUR VOLUMES

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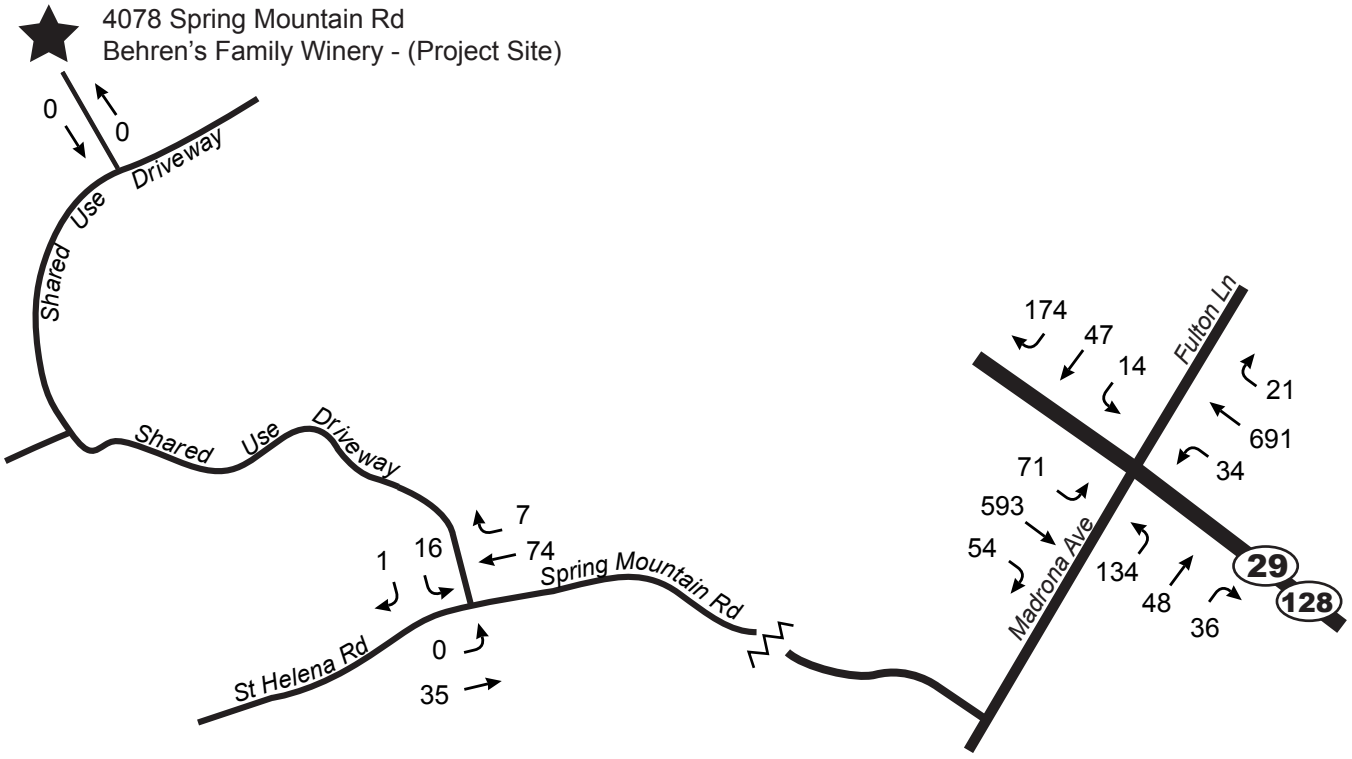
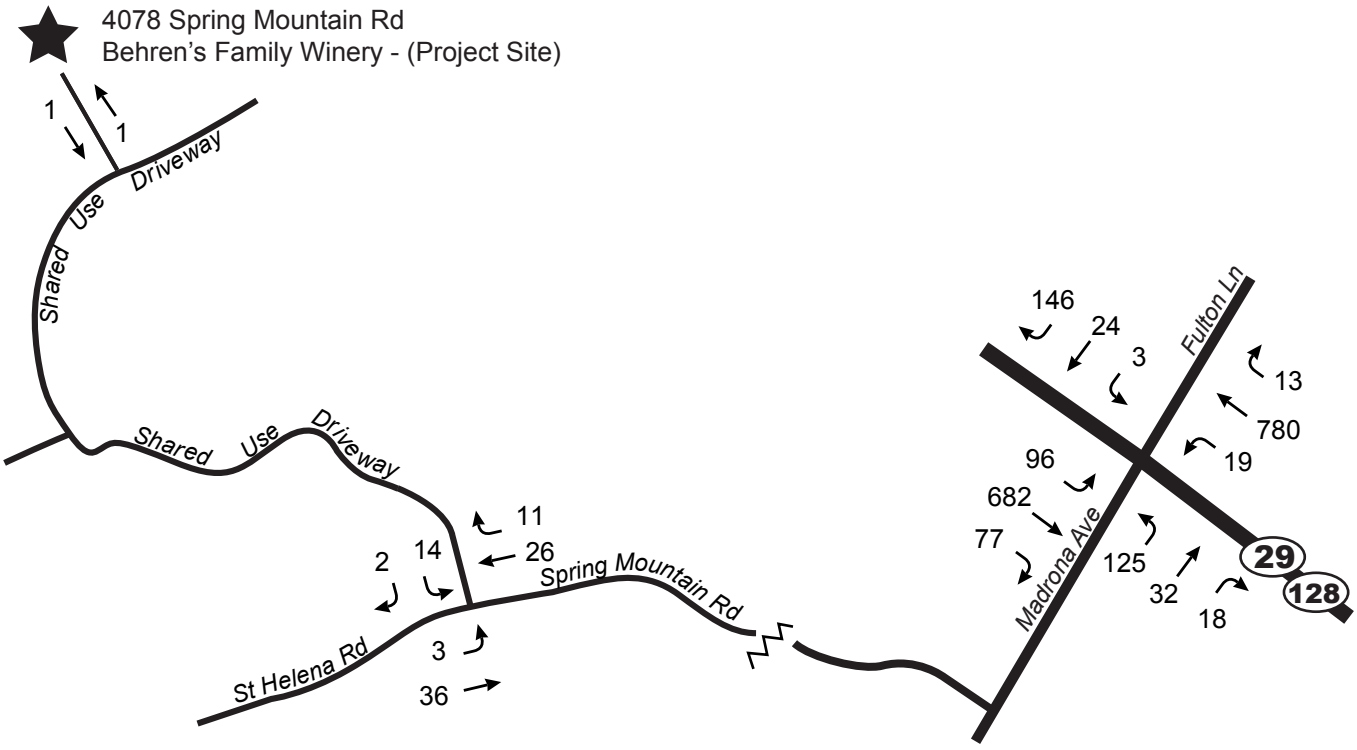
Figure 4
Existing (2015) Harvest (without Project)
Friday and Saturday PM Peak Hour Volumes



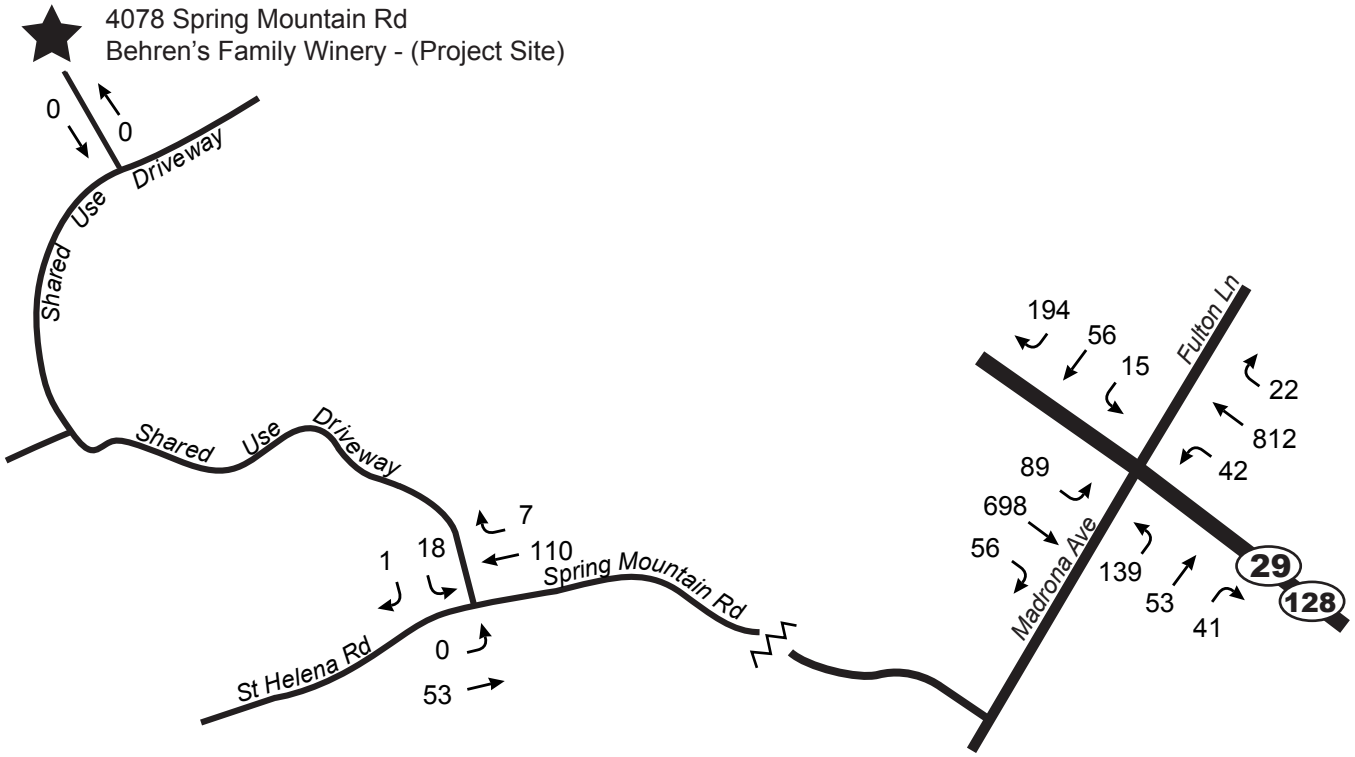
FRIDAY PM PEAK HOUR VOLUMES



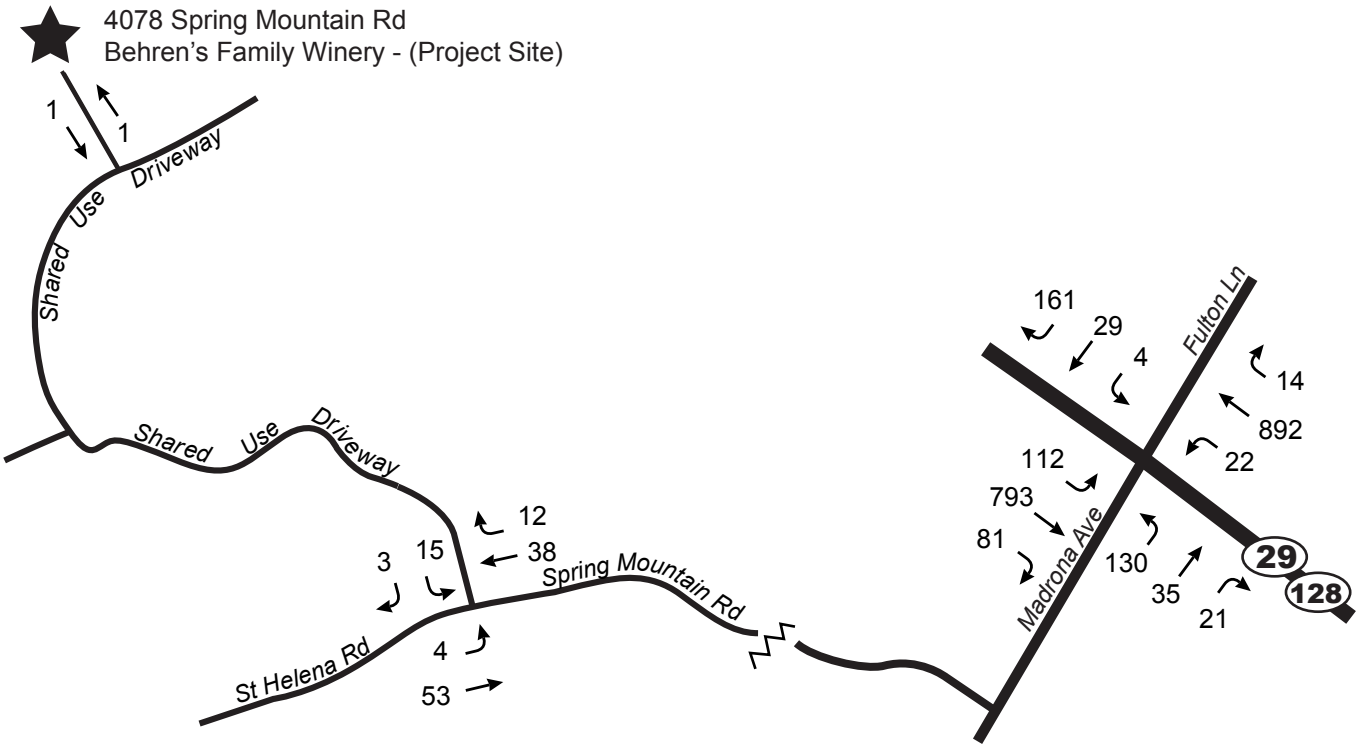
SATURDAY PM PEAK HOUR VOLUMES

CRANE TRANSPORTATION GROUP

Figure 5
Year 2020 Harvest (without Project)
Friday and Saturday PM Peak Hour Volumes



FRIDAY PM PEAK HOUR VOLUMES

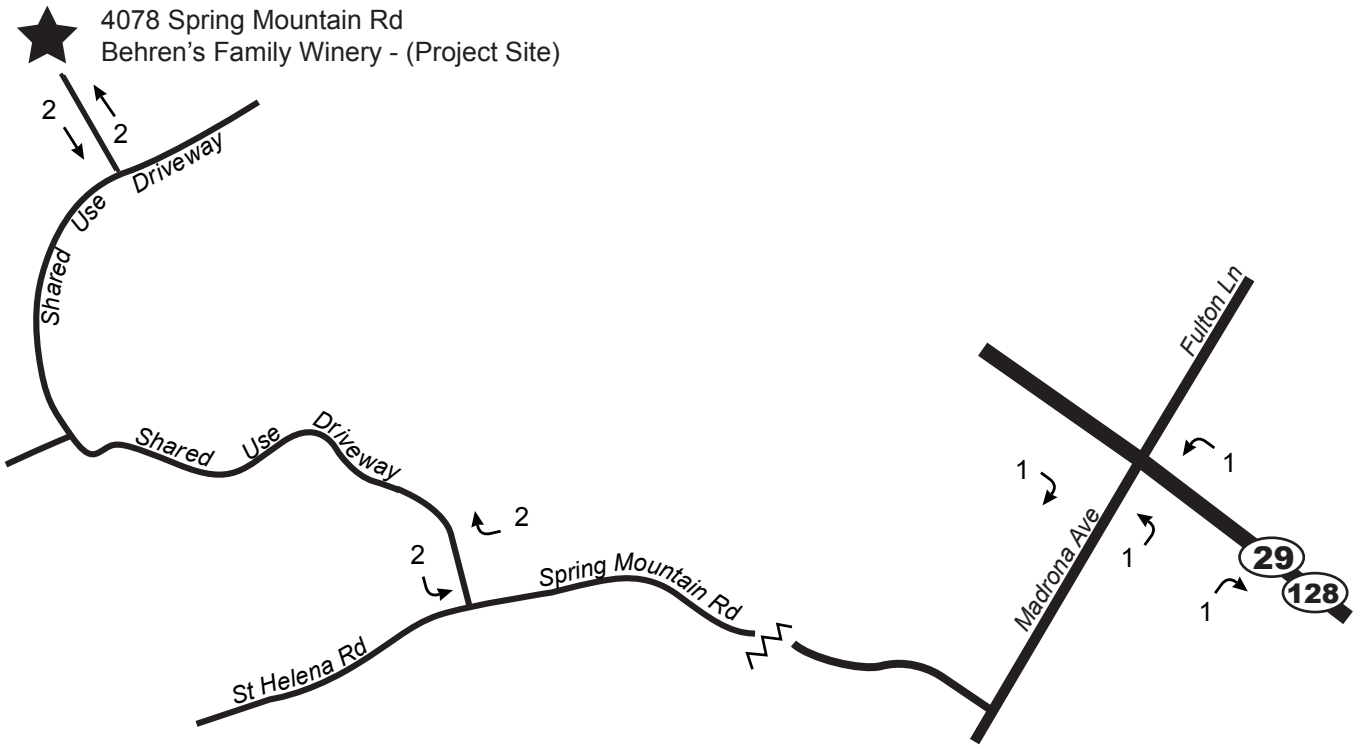


SATURDAY PM PEAK HOUR VOLUMES

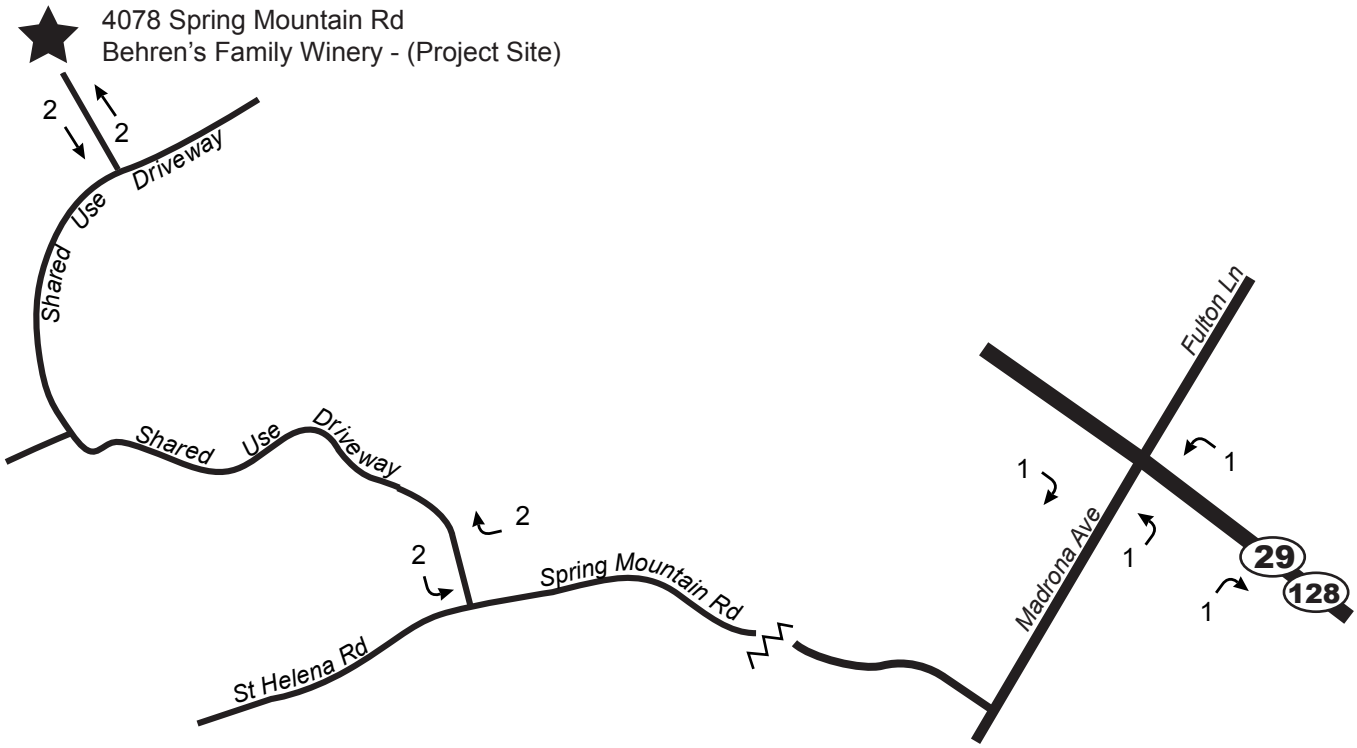
Behrens Family Winery Traffic Study

CRANE TRANSPORTATION GROUP

Figure 6
Year 2030 Harvest (without Project)
Friday and Saturday PM Peak Hour Volumes



FRIDAY PM PEAK HOUR VOLUMES



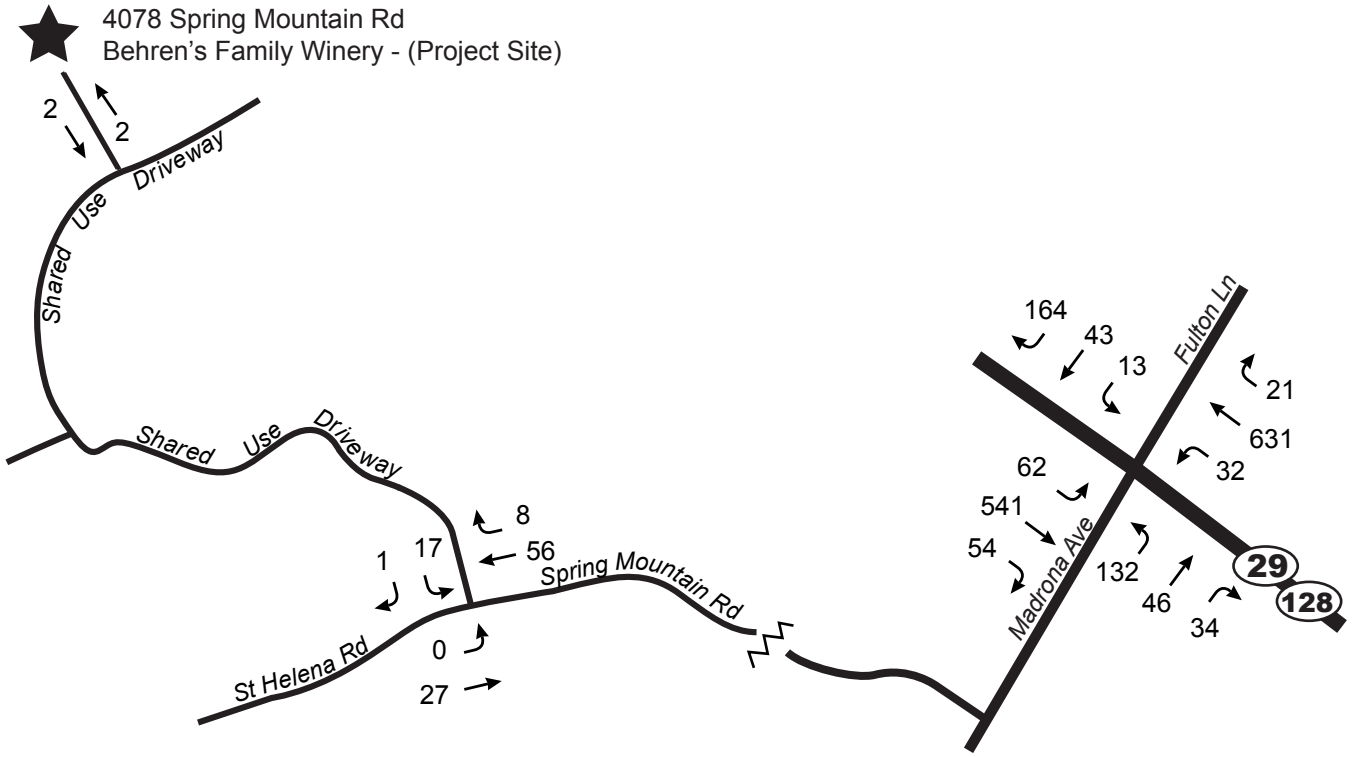
SATURDAY PM PEAK HOUR VOLUMES

Behrens Family Winery Traffic Study

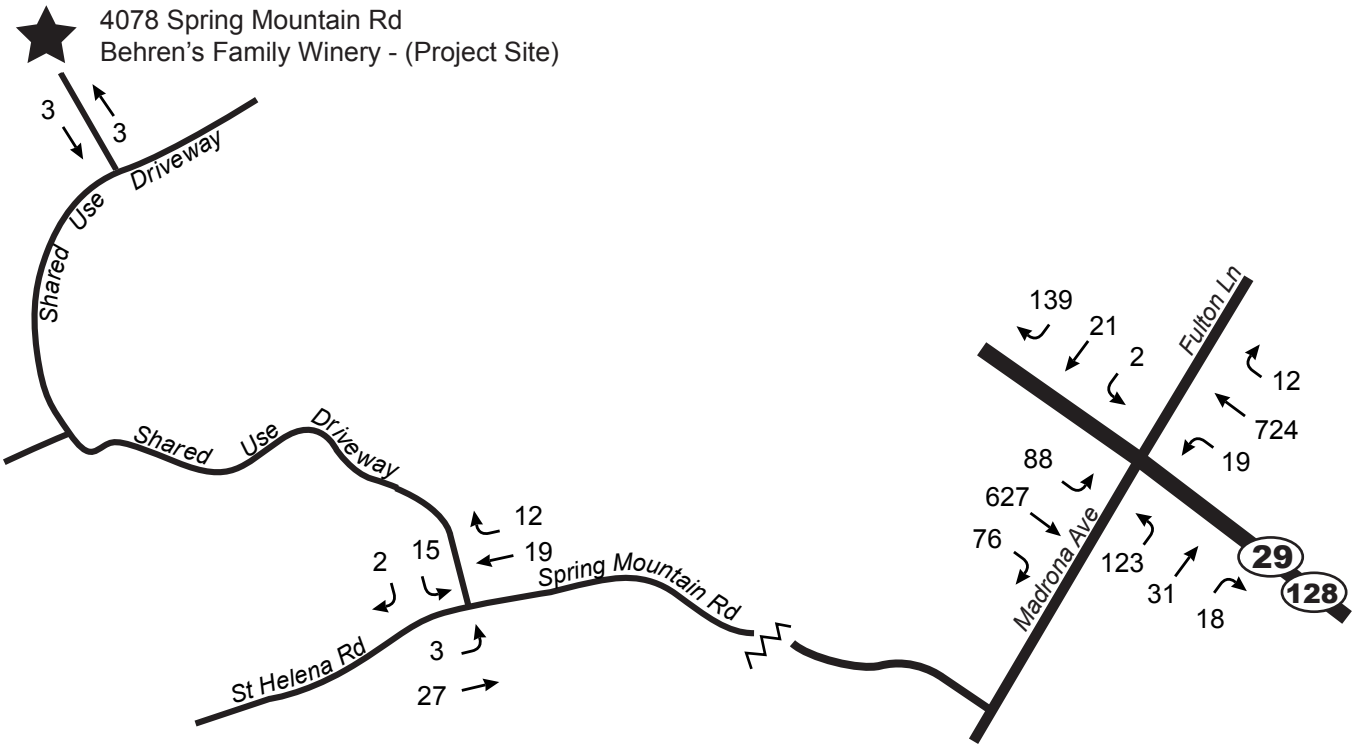
CRANE TRANSPORTATION GROUP

Figure 7

Harvest Project Traffic Increment Friday and Saturday PM Peak Hours Traffic Volumes



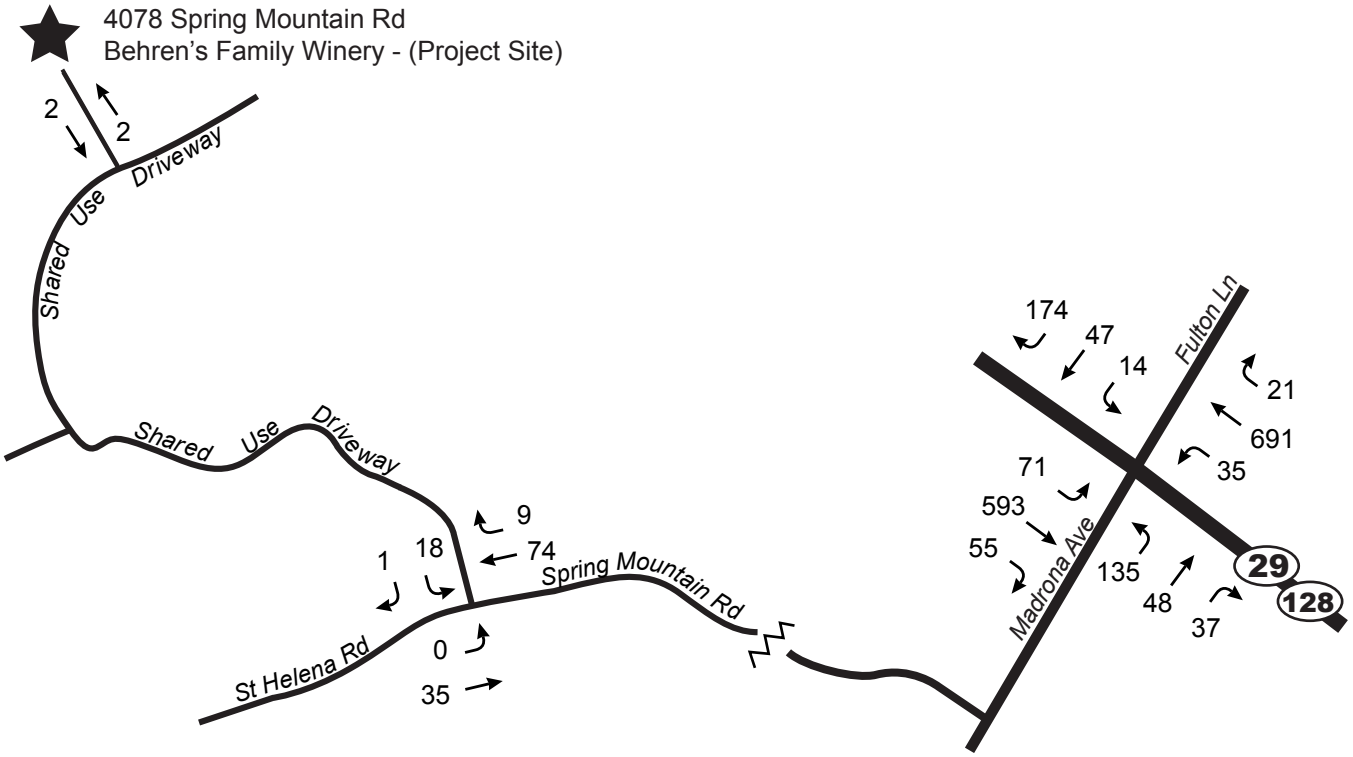
FRIDAY PM PEAK HOUR VOLUMES



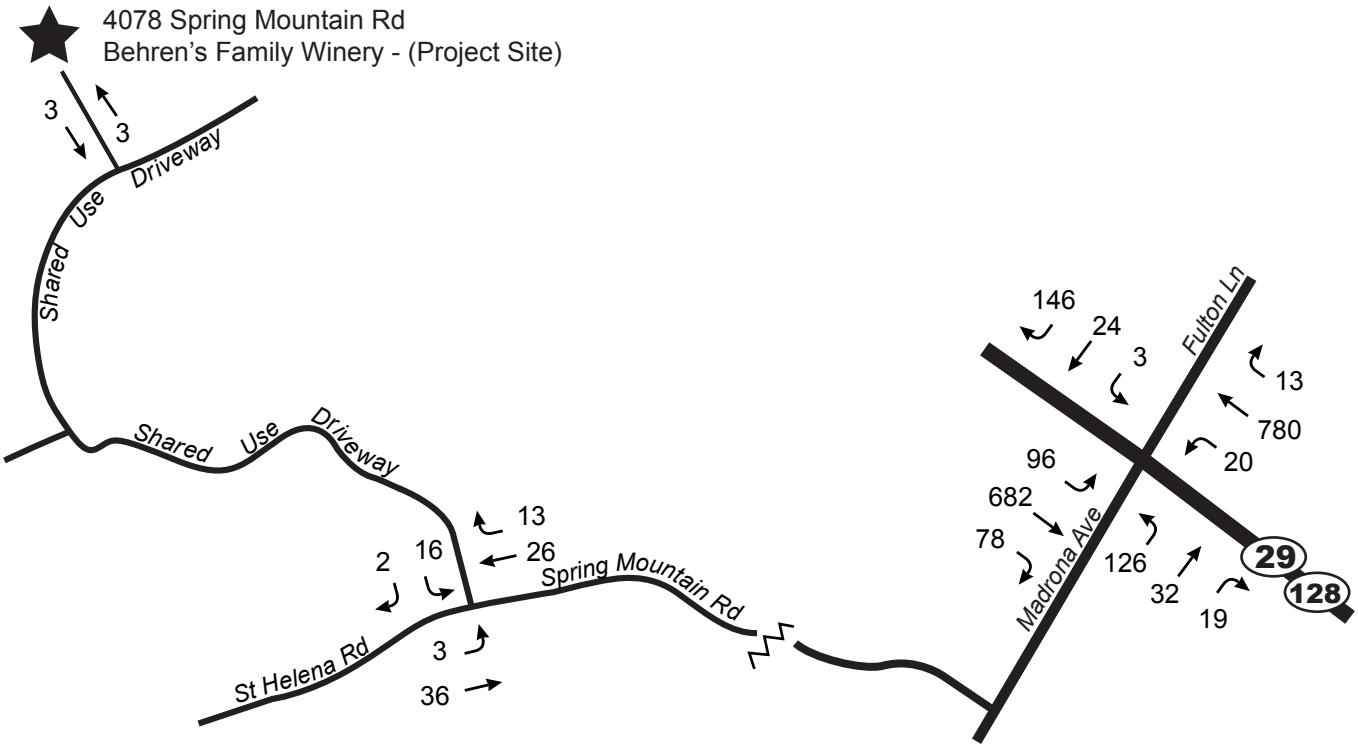
SATURDAY PM PEAK HOUR VOLUMES

CRANE TRANSPORTATION GROUP

Figure 8
Existing (2015) Harvest with Project
Friday and Saturday PM Peak Hour Volumes



FRIDAY PM PEAK HOUR VOLUMES

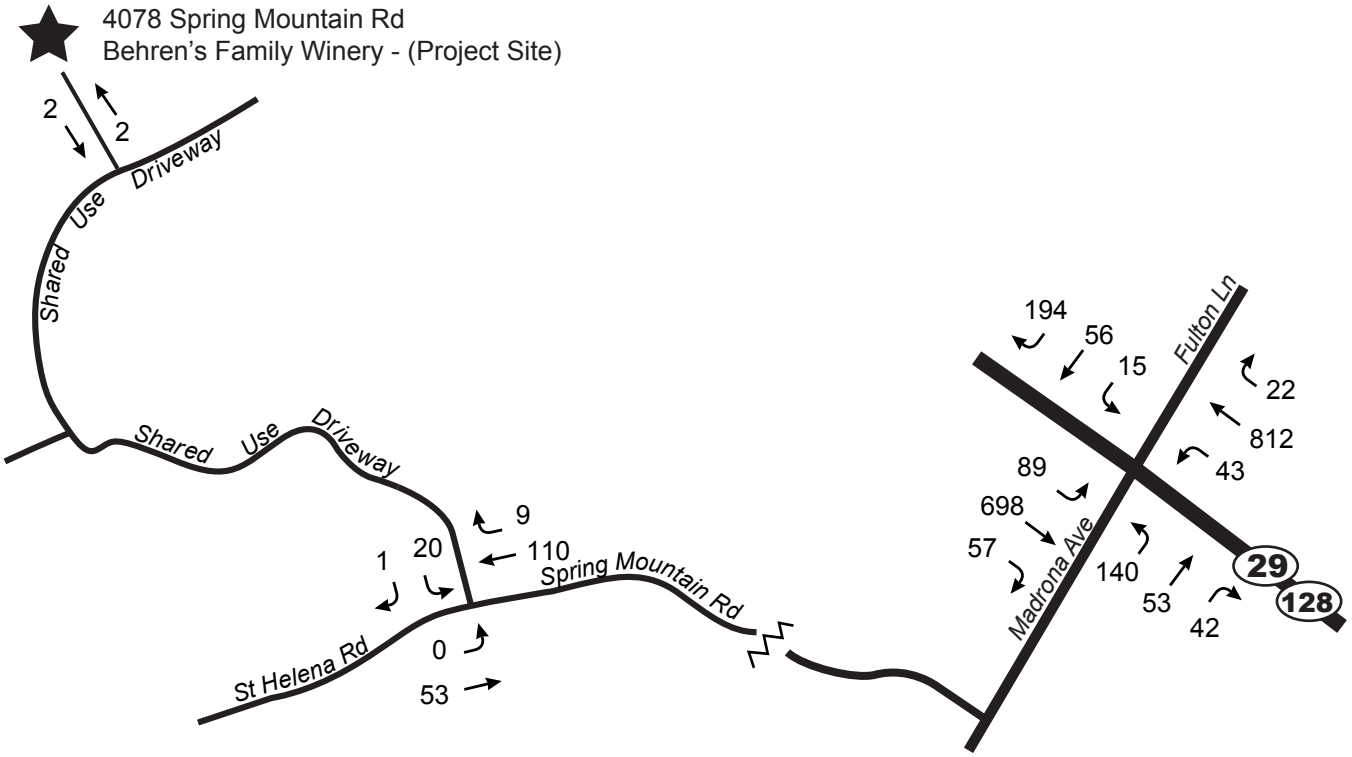


SATURDAY PM PEAK HOUR VOLUMES

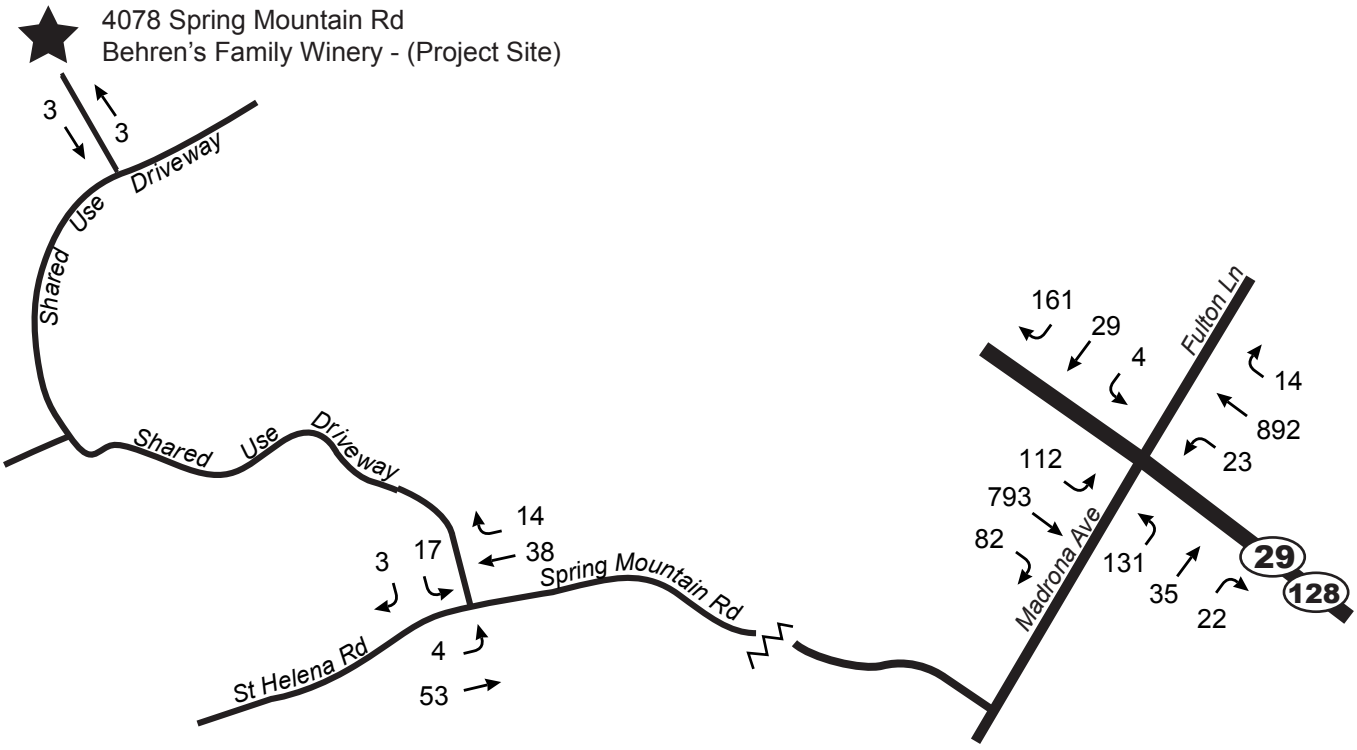
Behrens Family Winery Traffic Study

CRANE TRANSPORTATION GROUP

Figure 9
Year 2020 Harvest with Project
Friday and Saturday PM Peak Hour Volumes



FRIDAY PM PEAK HOUR VOLUMES



SATURDAY PM PEAK HOUR VOLUMES

Behrens Family Winery Traffic Study

CRANE TRANSPORTATION GROUP

Figure 10
Year 2030 Harvest with Project
Friday and Saturday PM Peak Hour Volumes

Tables

Table 1

SIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Average Control Delay (Seconds Per Vehicle)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 to 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 to 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and/or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.1 to 80.0
F	Operation with delays unacceptable to most drivers occurring due to oversaturation, poor progression, or very long cycle lengths.	> 80.0

Source: 2000 Highway Capacity Manual (Transportation Research Board).

Table 2

UNSIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Average Control Delay (Seconds Per Vehicle)
A	Little or no delays	≤ 10.0
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded (for an all-way stop), or with approach/turn movement capacity exceeded (for a side street stop controlled intersection)	> 50.0

Source: 2010 Highway Capacity Manual (Transportation Research Board).

Table 3

INTERSECTION LEVEL OF SERVICE

EXISTING – 2015

HARVEST

LOCATION	FRIDAY PM PEAK HOUR (3:15-4:15)		SATURDAY PM PEAK HOUR (3:30-4:30)	
	W/O PROJECT	WITH PROJECT	W/O PROJECT	WITH PROJECT
SR29/Fulton/Madrona (signal)	B-17.6 (1)	B-17.7	B-15.0	B-15.1
Spring Mountain Rd/ St Helena Rd/Shared Use Private Driveway (unsignalized)*	A-9.0 (2)	A-9.0	A-8.8	A-8.9

(1) Signalized level of service – control delay in seconds.
(2) Unsignalized level of service – control delay in seconds –Southbound shared use private driveway approach

* There are no stop signs on any of the three approaches to this intersection. The southbound shared use private driveway Tee approach has been evaluated as stop controlled based upon observations of traffic flow at the intersection.

Highway Capacity Manual (HCM) Analysis Methodology
Source: Crane Transportation Group

Table 4

INTERSECTION LEVEL OF SERVICE

YEAR 2020

HARVEST

LOCATION	FRIDAY PM PEAK HOUR (3:15-4:15)		SATURDAY PM PEAK HOUR (3:30-4:30)	
	W/O PROJECT	WITH PROJECT	W/O PROJECT	WITH PROJECT
SR29/Fulton/Madrona (signal)	B-18.6 (1)	B-18.7	B-16.0	B-16.1
Spring Mountain Rd/ St Helena Rd/Shared Use Private Driveway (unsignalized)*	A-9.2 (2)	A-9.2	A-9.0	A-9.0

(1) Signalized level of service – control delay in seconds.
(2) Unsignalized level of service – control delay in seconds –Southbound shared use private driveway approach

* There are no stop signs on any of the three approaches to this intersection. The southbound shared use private driveway Tee approach has been evaluated as stop controlled based upon observations of traffic flow at the intersection.

Highway Capacity Manual (HCM) Analysis Methodology
Source: Crane Transportation Group

Table 5

INTERSECTION LEVEL OF SERVICE

CUMULATIVE (YEAR 2030)

HARVEST

LOCATION	FRIDAY PM PEAK HOUR (3:15-4:15)		SATURDAY PM PEAK HOUR (3:30-4:30)	
	W/O PROJECT	WITH PROJECT	W/O PROJECT	WITH PROJECT
SR29/Fulton/Madrona (signal)	C-22.1 (1)	C-22.3	C-22.6	C-23.5
Spring Mountain Rd/ St Helena Rd/Shared Use Private Driveway (unsignalized)*	A-9.6 (2)	A-9.6	A-9.1	A-9.1

(1) Signalized level of service – control delay in seconds.
(2) Unsignalized level of service – control delay in seconds –Southbound shared use private driveway approach

* There are no stop signs on any of the three approaches to this intersection. The southbound shared use private driveway Tee approach has been evaluated as stop controlled based upon observations of traffic flow at the intersection.

Highway Capacity Manual (HCM) Analysis Methodology
Source: Crane Transportation Group

Table 6

BEHRENS FAMILY WINERY
NET NEW TRIP GENERATION ON LOCAL ROADWAY SYSTEM

HARVEST FRIDAY

			PM TRIPS									
			2-3PM		3-4PM		4-5PM		5-6PM		PM PEAK 3:15-4:15*	
CATEGORY	NUMBER	HOURS	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Admin Employees	0	--	0	0	0	0	0	0	0	0	0	0
Production Employees-Full Time	4	8AM-8PM	0	0	0	0	0	0	0	0	0	0
Production Employees-Part Time	2	9AM-5PM	0	0	0	0	0	0	0	0	0	0
Tours/Tasting Employees	1	10AM-6PM	0	0	0	0	0	0	0	2	0	0
Grape Delivery Trucks (100% grown off-site)	3/week	8AM-Noon	0	0	0	0	0	0	0	0	0	0
Visitors	32 total 13 vehicles**	10AM-6PM	2	2	2	2	3	2	0	3	2	2
TOTAL			2	2	2	2	3	2	0	5	2	2

* Peak traffic hour at SR29/Madrona Avenue-Fulton Avenue intersection.
** 2.6 visitors/vehicle average on weekdays per County data.

Source: Crane Transportation Group

Table 7

BEHRENS FAMILY WINERY
NET NEW TRIP GENERATION ON LOCAL ROADWAY SYSTEM

HARVEST SATURDAY

			PM TRIPS									
			2-3PM		3-4PM		4-5PM		5-6PM		PM PEAK 3:30-4:30*	
CATEGORY	NUMBER	HOURS	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Admin Employees	0	--	0	0	0	0	0	0	0	0	0	0
Production Employees-Full Time	4	8AM-8PM	0	0	0	0	0	0	0	0	0	0
Production Employees-Part Time	0	--	0	0	0	0	0	0	0	0	0	0
Tours/Tasting Employees	1	10AM-6PM	0	0	0	0	0	0	0	0	0	0
Grape Delivery Trucks (100% grown off-site)	1/week	8AM-Noon	0	0	0	0	0	0	0	0	0	0
Visitors	32 total 12 vehicles**	10AM-6PM	2	2	2	2	2	2	0	2	2	2
TOTAL			2	2	2	2	2	2	0	2	2	2

* Peak traffic hour at SR29/Madrona Avenue-Fulton Avenue intersection.
** 2.8 visitors/vehicle average on weekdays per County data.

Source: Crane Transportation Group

Table 8

BEHRENS FAMILY WINERY
PEAK HOUR TRIP GENERATION

HARVEST

FRIDAY PM PEAK HOUR* (3:15-4:15)		SATURDAY PM PEAK HOUR* (3:30-4:30)	
INBOUND TRIPS	**OUTBOUND TRIPS**	**INBOUND TRIPS**	**OUTBOUND TRIPS**
2	2	2	2

* Peak hour at SR 29/Madrona Avenue-Fulton Avenue intersection.
Source: Crane Transportation Group

Table 9

BEHRENS FAMILY WINERY
MARKETING EVENT TRAFFIC DETAILS

MARKETING EVENTS	STAFF/GUEST CATEGORY	# OF PEOPLE	# OF VEHICLES	TIMES	REGULAR VISITATION ELIMINATED DURING MARKETING EVENT?
1 per year	Guests	60	12 and/or Shuttle vans	6:00-10:00 PM Saturday	Yes
	Extra winery staff	0	0		
	Caterers	1	1		
	Entertainers	0	0		
	Delivery vehicles	0	0		
4 per year	Guests	20	12	10:00 AM-2:00 PM or 6:00-10:00 PM Saturdays	No
	Extra winery staff	0	0		
	Caterers	1	1		
	Entertainers	0	0		
	Delivery vehicles	0	0		
1 per year	Guests	300	Shuttle vans	2:00-10:00 PM Saturday	Yes
	Extra winery staff	6	3		
	Caterers	2	2		
	Entertainers	0	0		
	Delivery vehicles	1	1		

Source: Behrens Family Winery applicant

Appendix

Appendix

BEHRENS FAMILY WINERY
EXPECTED PROJECT TRAFFIC ACTIVITY DETAILS

Gallons/Year Production: 20,000
1st Year of Expected Full Production: 2016

	HARVEST CONDITIONS	NON-HARVEST CONDITIONS
A.	**Full-time admin employees** # on Weekdays __0__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday _____ to ____ Saturday _____ to ____ Sunday _____ to _____	**Full-time admin employees** # on Weekdays __0__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday _____ to ____ Saturday _____ to ____ Sunday _____ to _____
B.	**Full-time production employees** # on Weekdays __4__ # on Saturday __4__ # on Sunday __2__ Work hours: Weekday 8:00 AM to 8:00 PM Saturday 8:00 AM to 8:00 PM Sunday 8:00 AM to 8:00 PM	**Full-time production employees** # on Weekdays __3__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday 9:00 AM to 5:00 PM Saturday NA Sunday NA
C.	**Part-time production employees** # on Weekdays __2__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday 9:00 AM to 5:00 PM Saturday NA Sunday NA	**Part-time production employees** # on Weekdays __0__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday NA Saturday NA Sunday NA
D.	**Tours & tasting employees** # on Weekdays __1__ # on Saturday __1__ # on Sunday __1__ Work hours: Weekday 10:00 AM to 6:00 PM Saturday 10:00 AM to 6:00 PM Sunday 10:00 AM to 6:00 PM	**Tours & tasting employees** # on Weekdays __1__ # on Saturday __1__ # on Sunday __1__ Work hours: Weekday 10:00 AM to 6:00 PM Saturday 10:00 AM to 6:00 PM Sunday 10:00 AM to 6:00 PM

Appendix

BEHRENS FAMILY WINERY
EXPECTED PROJECT TRAFFIC ACTIVITY DETAILS

	HARVEST CONDITIONS	NON-HARVEST CONDITIONS
E.	**Grape delivery trucks** # on Weekdays 3/week # on Saturday __1___ # on Sunday __0__ Delivery hours: Weekday 8:00 AM to 12:00 PM Saturday 8:00 Am to 12:00 PM Sunday NA # days of grape delivery: 4 deliveries per week for 6 weeks	No grape delivery
F.	**Maximum daily tours/tasting visitors** # on Weekdays __32__ # on Saturday ___32__ # on Sunday ___32__ Tasting hours: Weekday 10:00 AM to 6:00 PM Saturday 10:00 AM to 6:00 PM Sunday 10:00 AM to 6:00 PM	**Maximum daily tours/tasting visitors** # on Weekdays __15__ # on Saturday ___15__ # on Sunday __15___ Tasting hours: Weekday 10:00 AM to 4:00 PM Saturday 10:00 AM to 4:00 PM Sunday 10:00 AM to 4:00 PM
G.	**Other employees** # on Weekdays __0__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday _____ to ____ Saturday _____ to ____ Sunday _____ to _____	**Other employees** # on Weekdays __0__ # on Saturday __0__ # on Sunday __0__ Work hours: Weekday _____ to ____ Saturday _____ to ____ Sunday _____ to _____
H.	**Other trucks** # on Weekdays 2/week # on Saturday _____ # on Sunday _____ Delivery hours: Weekday 12:00-3:00 PM Saturday _____ to ____ Sunday _____ to _____ **Please Detail:** FedEx/UPS; winery-related trucks ±1/week	**Other trucks** # on Weekdays 2/week # on Saturday _____ # on Sunday _____ Delivery hours: Weekday _____ to ____ Saturday _____ to ____ Sunday _____ to _____ **Please Detail:** FedEx/UPS; winery-related trucks 2-3 per month

Appendix

BEHRENS FAMILY WINERY
EXPECTED PROJECT TRAFFIC ACTIVITY DETAILS

I. Grape Source & Trucks

Percent grapes grown on site: 0%

Grapes grown off site – access route to winery entrance
From the west: 14%
From the east (Napa Valley): 86%

J. Marketing Events

1 per year	maximum # people/event: 60 typical days: Saturday typical hours: 6:00 to 10:00 PM
4 per year	# people/event: 20 typical day: Saturday typical hours: 10:00 AM-2:00 PM or 6:00-10:00 PM
1 per year	# people/event: 300 typical day: Saturday typical hours: 2:00-10:00 PM

K. Bottling

On-site bottling.

TECHNICAL APPENDIX

Capacity Worksheets

Weekday PM
Existing w-o Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.625
Loss Time (sec):	6	Average Delay (sec/veh):	17.6
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	31	631	21	62	541	53	131	46	33	13	43	164
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	31	631	21	62	541	53	131	46	33	13	43	164
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	34	686	23	67	588	58	142	50	36	14	47	178
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	34	686	23	67	588	58	142	50	36	14	47	178
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	34	686	23	67	588	58	142	50	36	14	47	178
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.27	0.99	0.98	0.24	0.98	0.97	0.57	0.57	0.57	0.88	0.88	0.86
Lanes:	1.00	0.97	0.03	1.00	0.91	0.09	0.62	0.22	0.16	0.06	0.19	0.75
Final Sat.:	522	1811	60	455	1690	166	675	237	170	97	322	1228
Capacity Analysis Module:												
Vol/Sat:	0.06	0.38	0.38	0.15	0.35	0.35	0.21	0.21	0.21	0.15	0.15	0.15
Crit Moves:		****						****				
Green/Cycle:	0.61	0.61	0.61	0.61	0.61	0.61	0.34	0.34	0.34	0.34	0.34	0.34
Volume/Cap:	0.11	0.62	0.62	0.24	0.57	0.57	0.62	0.62	0.62	0.43	0.43	0.43
Delay/Veh:	8.9	14.3	14.3	10.1	13.3	13.3	32.9	32.9	32.9	27.8	27.8	27.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	8.9	14.3	14.3	10.1	13.3	13.3	32.9	32.9	32.9	27.8	27.8	27.8
LOS by Move:	A	B	B	B	B	B	C	C	C	C	C	C
HCM2kAvgQ:	13	371	371	31	320	318	179	180	180	157	157	154

Note: Queue reported is the distance per lane in feet.

Existing Volumes
Saturday without Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.635
Loss Time (sec):	6	Average Delay (sec/veh):	15.0
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0 1	0	1 0	0 1	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	18	724	12	88	627	75	122	31	17	2	21	139
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	18	724	12	88	627	75	122	31	17	2	21	139
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	20	787	13	96	682	82	133	34	18	2	23	151
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	20	787	13	96	682	82	133	34	18	2	23	151
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	20	787	13	96	682	82	133	34	18	2	23	151
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.25	0.99	0.99	0.23	0.97	0.97	0.56	0.56	0.56	0.88	0.88	0.87
Lanes:	1.00	0.98	0.02	1.00	0.89	0.11	0.72	0.18	0.10	0.01	0.13	0.86
Final Sat.:	471	1847	31	436	1653	198	766	195	107	20	215	1423
Capacity Analysis Module:												
Vol/Sat:	0.04	0.43	0.43	0.22	0.41	0.41	0.17	0.17	0.17	0.11	0.11	0.11
Crit Moves:		****						****				
Green/Cycle:	0.67	0.67	0.67	0.67	0.67	0.67	0.27	0.27	0.27	0.27	0.27	0.27
Volume/Cap:	0.06	0.64	0.64	0.33	0.61	0.61	0.64	0.64	0.64	0.39	0.39	0.39
Delay/Veh:	6.1	11.1	11.1	8.0	10.7	10.7	38.5	38.5	38.5	31.9	31.9	31.9
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	6.1	11.1	11.1	8.0	10.7	10.7	38.5	38.5	38.5	31.9	31.9	31.9
LOS by Move:	A	B	B	A	B	B	D	D	D	C	C	C
HCM2k95thQ:	14	668	668	85	627	626	305	306	305	239	239	237

Note: Queue reported is the distance per lane in feet.

Weekday PM
Existing with Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.627
Loss Time (sec):	6	Average Delay (sec/veh):	17.7
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	32	631	21	62	541	54	132	46	34	13	43	164
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	32	631	21	62	541	54	132	46	34	13	43	164
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	35	686	23	67	588	59	143	50	37	14	47	178
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	35	686	23	67	588	59	143	50	37	14	47	178
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	35	686	23	67	588	59	143	50	37	14	47	178
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.27	0.99	0.98	0.24	0.98	0.97	0.57	0.57	0.57	0.88	0.88	0.86
Lanes:	1.00	0.97	0.03	1.00	0.91	0.09	0.62	0.22	0.16	0.06	0.19	0.75
Final Sat.:	518	1811	60	452	1685	168	675	235	174	97	322	1228
Capacity Analysis Module:												
Vol/Sat:	0.07	0.38	0.38	0.15	0.35	0.35	0.21	0.21	0.21	0.15	0.15	0.15
Crit Moves:		****						****				
Green/Cycle:	0.60	0.60	0.60	0.60	0.60	0.60	0.34	0.34	0.34	0.34	0.34	0.34
Volume/Cap:	0.11	0.63	0.63	0.25	0.58	0.58	0.63	0.63	0.63	0.43	0.43	0.43
Delay/Veh:	9.1	14.5	14.5	10.2	13.5	13.5	32.8	32.8	32.8	27.6	27.6	27.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.1	14.5	14.5	10.2	13.5	13.5	32.8	32.8	32.8	27.6	27.6	27.6
LOS by Move:	A	B	B	B	B	B	C	C	C	C	C	C
HCM2kAvgQ:	14	373	373	31	323	321	180	182	181	156	156	154

Note: Queue reported is the distance per lane in feet.

Existing Volumes
Saturday with Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.637
Loss Time (sec):	6	Average Delay (sec/veh):	15.1
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	19	724	12	88	627	76	123	31	18	2	21	139
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	19	724	12	88	627	76	123	31	18	2	21	139
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	21	787	13	96	682	83	134	34	20	2	23	151
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	21	787	13	96	682	83	134	34	20	2	23	151
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	21	787	13	96	682	83	134	34	20	2	23	151
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.25	0.99	0.99	0.23	0.97	0.97	0.56	0.57	0.56	0.88	0.88	0.87
Lanes:	1.00	0.98	0.02	1.00	0.89	0.11	0.72	0.18	0.10	0.01	0.13	0.86
Final Sat.:	469	1847	31	434	1650	200	765	193	112	20	215	1423
Capacity Analysis Module:												
Vol/Sat:	0.04	0.43	0.43	0.22	0.41	0.41	0.17	0.17	0.17	0.11	0.11	0.11
Crit Moves:		****						****				
Green/Cycle:	0.67	0.67	0.67	0.67	0.67	0.67	0.27	0.27	0.27	0.27	0.27	0.27
Volume/Cap:	0.07	0.64	0.64	0.33	0.62	0.62	0.64	0.64	0.64	0.39	0.39	0.39
Delay/Veh:	6.2	11.2	11.2	8.1	10.8	10.8	38.4	38.4	38.4	31.8	31.8	31.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	6.2	11.2	11.2	8.1	10.8	10.8	38.4	38.4	38.4	31.8	31.8	31.8
LOS by Move:	A	B	B	A	B	B	D	D	D	C	C	C
HCM2k95thQ:	15	672	671	86	632	630	307	309	308	239	239	236

Note: Queue reported is the distance per lane in feet.

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Weekday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2015 w-o Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	27			56	6
Peak-Hour Factor, PHF	0.87	0.87			0.87	0.87
Hourly Flow Rate, HFR	0	31			64	6
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				15	0	1
Peak Hour Factor, PHF				0.87	1.00	0.87
Hourly Flow Rate, HFR				17	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	0						18	
C(m) (vph)	1544						911	
v/c	0.00						0.02	
95% queue length	0.00						0.06	
Control Delay	7.3						9.0	
LOS	A						A	
Approach Delay							9.0	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.:
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2015 w-o Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	27			19	10
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	3	32			22	12
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				13	0	2
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				15	0	2
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	3						17	
C(m) (vph)	1591						954	
v/c	0.00						0.02	
95% queue length	0.01						0.05	
Control Delay	7.3						8.8	
LOS	A						A	
Approach Delay							8.8	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.:
Date Performed: 26/08/2015
Analysis Time Period: Weekday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2015 Harvest with Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	27			56	8
Peak-Hour Factor, PHF	0.87	0.87			0.87	0.87
Hourly Flow Rate, HFR	0	31			64	9
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				17	0	1
Peak Hour Factor, PHF				0.87	1.00	0.87
Hourly Flow Rate, HFR				19	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	0						20	
C(m) (vph)	1540						909	
v/c	0.00						0.02	
95% queue length	0.00						0.07	
Control Delay	7.3						9.0	
LOS	A						A	
Approach Delay							9.0	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2015 with Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	27			19	12
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	3	32			22	14
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				15	0	2
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				18	0	2
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	3						20	
C(m) (vph)	1588						951	
v/c	0.00						0.02	
95% queue length	0.01						0.06	
Control Delay	7.3						8.9	
LOS	A						A	
Approach Delay							8.9	
Approach LOS							A	

Weekday PM
Year 2020 w-o Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.673
Loss Time (sec):	6	Average Delay (sec/veh):	18.6
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	34	691	14	71	593	54	134	48	36	14	47	174
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	34	691	14	71	593	54	134	48	36	14	47	174
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	37	751	15	77	645	59	146	52	39	15	51	189
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	37	751	15	77	645	59	146	52	39	15	51	189
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	37	751	15	77	645	59	146	52	39	15	51	189
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.24	0.99	0.99	0.21	0.98	0.97	0.55	0.55	0.55	0.88	0.88	0.86
Lanes:	1.00	0.98	0.02	1.00	0.92	0.08	0.62	0.22	0.16	0.06	0.20	0.74
Final Sat.:	457	1838	37	392	1702	155	643	230	173	98	330	1220
Capacity Analysis Module:												
Vol/Sat:	0.08	0.41	0.41	0.20	0.38	0.38	0.23	0.23	0.23	0.16	0.16	0.16
Crit Moves:		****						****				
Green/Cycle:	0.61	0.61	0.61	0.61	0.61	0.61	0.34	0.34	0.34	0.34	0.34	0.34
Volume/Cap:	0.13	0.67	0.67	0.32	0.62	0.62	0.67	0.67	0.67	0.46	0.46	0.46
Delay/Veh:	9.1	15.4	15.4	11.0	14.3	14.3	35.2	35.2	35.2	28.2	28.2	28.2
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.1	15.4	15.4	11.0	14.3	14.3	35.2	35.2	35.2	28.2	28.2	28.2
LOS by Move:	A	B	B	B	B	B	D	D	D	C	C	C
HCM2kAvgQ:	15	424	424	40	368	366	195	196	196	171	171	168

Note: Queue reported is the distance per lane in feet.

Year 2020 Volumes
Saturday without Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.683
Loss Time (sec):	6	Average Delay (sec/veh):	16.0
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	19	780	13	96	682	77	125	32	18	3	24	146
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	19	780	13	96	682	77	125	32	18	3	24	146
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	21	848	14	104	741	84	136	35	20	3	26	159
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	21	848	14	104	741	84	136	35	20	3	26	159
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	21	848	14	104	741	84	136	35	20	3	26	159
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.22	0.99	0.99	0.20	0.98	0.97	0.54	0.54	0.54	0.88	0.88	0.87
Lanes:	1.00	0.98	0.02	1.00	0.90	0.10	0.72	0.18	0.10	0.02	0.14	0.84
Final Sat.:	413	1846	31	378	1664	188	732	187	105	29	230	1400
Capacity Analysis Module:												
Vol/Sat:	0.05	0.46	0.46	0.28	0.45	0.45	0.19	0.19	0.19	0.11	0.11	0.11
Crit Moves:		****						****				
Green/Cycle:	0.67	0.67	0.67	0.67	0.67	0.67	0.27	0.27	0.27	0.27	0.27	0.27
Volume/Cap:	0.07	0.68	0.68	0.41	0.66	0.66	0.68	0.68	0.68	0.42	0.42	0.42
Delay/Veh:	6.1	12.1	12.1	9.0	11.6	11.6	41.4	41.4	41.4	32.3	32.3	32.3
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	6.1	12.1	12.1	9.0	11.6	11.6	41.4	41.4	41.4	32.3	32.3	32.3
LOS by Move:	A	B	B	A	B	B	D	D	D	C	C	C
HCM2k95thQ:	15	754	754	105	709	708	327	329	328	258	258	255

Note: Queue reported is the distance per lane in feet.

Weekday PM
Year 2020 with Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.675
Loss Time (sec):	6	Average Delay (sec/veh):	18.7
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	35	691	14	71	593	55	135	48	37	14	47	174
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	35	691	14	71	593	55	135	48	37	14	47	174
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	38	751	15	77	645	60	147	52	40	15	51	189
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	38	751	15	77	645	60	147	52	40	15	51	189
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	38	751	15	77	645	60	147	52	40	15	51	189
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.24	0.99	0.99	0.20	0.98	0.97	0.55	0.55	0.55	0.88	0.88	0.86
Lanes:	1.00	0.98	0.02	1.00	0.91	0.09	0.61	0.22	0.17	0.06	0.20	0.74
Final Sat.:	453	1838	37	388	1698	157	643	229	176	98	329	1219
Capacity Analysis Module:												
Vol/Sat:	0.08	0.41	0.41	0.20	0.38	0.38	0.23	0.23	0.23	0.16	0.16	0.16
Crit Moves:		****						****				
Green/Cycle:	0.61	0.61	0.61	0.61	0.61	0.61	0.34	0.34	0.34	0.34	0.34	0.34
Volume/Cap:	0.14	0.68	0.68	0.33	0.63	0.63	0.68	0.68	0.68	0.46	0.46	0.46
Delay/Veh:	9.2	15.6	15.6	11.1	14.4	14.4	35.2	35.2	35.2	28.1	28.1	28.1
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.2	15.6	15.6	11.1	14.4	14.4	35.2	35.2	35.2	28.1	28.1	28.1
LOS by Move:	A	B	B	B	B	B	D	D	D	C	C	C
HCM2kAvgQ:	16	426	426	40	371	369	197	198	198	170	170	167

Note: Queue reported is the distance per lane in feet.

Year 2020 Volumes
Saturday with Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.685
Loss Time (sec):	6	Average Delay (sec/veh):	16.1
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	20	780	13	96	682	78	126	32	19	3	24	146
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	20	780	13	96	682	78	126	32	19	3	24	146
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	22	848	14	104	741	85	137	35	21	3	26	159
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	22	848	14	104	741	85	137	35	21	3	26	159
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	22	848	14	104	741	85	137	35	21	3	26	159
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.22	0.99	0.99	0.20	0.98	0.97	0.54	0.54	0.54	0.88	0.88	0.87
Lanes:	1.00	0.98	0.02	1.00	0.90	0.10	0.71	0.18	0.11	0.02	0.14	0.84
Final Sat.:	409	1846	31	376	1662	190	732	186	110	29	230	1400
Capacity Analysis Module:												
Vol/Sat:	0.05	0.46	0.46	0.28	0.45	0.45	0.19	0.19	0.19	0.11	0.11	0.11
Crit Moves:		****						****				
Green/Cycle:	0.67	0.67	0.67	0.67	0.67	0.67	0.27	0.27	0.27	0.27	0.27	0.27
Volume/Cap:	0.08	0.68	0.68	0.41	0.67	0.67	0.68	0.68	0.68	0.42	0.42	0.42
Delay/Veh:	6.2	12.2	12.2	9.1	11.8	11.8	41.3	41.3	41.3	32.2	32.2	32.2
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	6.2	12.2	12.2	9.1	11.8	11.8	41.3	41.3	41.3	32.2	32.2	32.2
LOS by Move:	A	B	B	A	B	B	D	D	D	C	C	C
HCM2k95thQ:	16	758	757	106	714	712	330	332	331	257	257	255

Note: Queue reported is the distance per lane in feet.

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Weekday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2020 w-o Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	35			74	7
Peak-Hour Factor, PHF	0.87	0.87			0.87	0.87
Hourly Flow Rate, HFR	0	40			85	8
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				16	0	1
Peak Hour Factor, PHF				0.87	1.00	0.87
Hourly Flow Rate, HFR				18	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	0						19	
C(m) (vph)	1514						875	
v/c	0.00						0.02	
95% queue length	0.00						0.07	
Control Delay	7.4						9.2	
LOS	A						A	
Approach Delay							9.2	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2020 w-o Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	36			26	11
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	3	43			31	13
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				14	0	2
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				16	0	2
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	3						18	
C(m) (vph)	1577						929	
v/c	0.00						0.02	
95% queue length	0.01						0.06	
Control Delay	7.3						9.0	
LOS	A						A	
Approach Delay							9.0	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2020 with Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	36			26	13
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	3	43			31	15
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				16	0	2
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				19	0	2
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	3						21	
C(m) (vph)	1575						927	
v/c	0.00						0.02	
95% queue length	0.01						0.07	
Control Delay	7.3						9.0	
LOS	A						A	
Approach Delay							9.0	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2020 with Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	36			26	13
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	3	43			31	15
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				16	0	2
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				19	0	2
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	3						21	
C(m) (vph)	1575						927	
v/c	0.00						0.02	
95% queue length	0.01						0.07	
Control Delay	7.3						9.0	
LOS	A						A	
Approach Delay							9.0	
Approach LOS							A	

Weekday PM Peak Hour
2030 w-o Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.790
Loss Time (sec):	6	Average Delay (sec/veh):	22.1
Optimal Cycle:	56	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	42	812	22	89	698	56	139	53	41	15	56	194
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	42	812	22	89	698	56	139	53	41	15	56	194
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	46	883	24	97	759	61	151	58	45	16	61	211
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	46	883	24	97	759	61	151	58	45	16	61	211
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	46	883	24	97	759	61	151	58	45	16	61	211
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.18	0.99	0.99	0.13	0.98	0.97	0.51	0.51	0.51	0.88	0.88	0.86
Lanes:	1.00	0.97	0.03	1.00	0.93	0.07	0.60	0.23	0.17	0.05	0.21	0.74
Final Sat.:	336	1824	49	248	1721	138	579	221	171	93	348	1206
Capacity Analysis Module:												
Vol/Sat:	0.14	0.48	0.48	0.39	0.44	0.44	0.26	0.26	0.26	0.17	0.17	0.17
Crit Moves:		****						****				
Green/Cycle:	0.61	0.61	0.61	0.61	0.61	0.61	0.33	0.33	0.33	0.33	0.33	0.33
Volume/Cap:	0.22	0.79	0.79	0.64	0.72	0.72	0.79	0.79	0.79	0.53	0.53	0.53
Delay/Veh:	9.7	19.2	19.2	21.7	16.5	16.5	44.5	44.5	44.5	29.8	29.8	29.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.7	19.2	19.2	21.7	16.5	16.5	44.5	44.5	44.5	29.8	29.8	29.8
LOS by Move:	A	B	B	C	B	B	D	D	D	C	C	C
HCM2kAvgQ:	22	585	585	82	478	476	239	240	240	202	202	198

Note: Queue reported is the distance per lane in feet.

2030 Saturday PM
without Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.983
Loss Time (sec):	6	Average Delay (sec/veh):	22.6
Optimal Cycle:	180	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	22	892	14	112	793	81	130	35	21	4	29	161
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	22	892	14	112	793	81	130	35	21	4	29	161
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	24	970	15	122	862	88	141	38	23	4	32	175
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	24	970	15	122	862	88	141	38	23	4	32	175
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	24	970	15	122	862	88	141	38	23	4	32	175
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.11	0.99	0.99	0.09	0.98	0.97	0.57	0.57	0.57	0.88	0.88	0.87
Lanes:	1.00	0.98	0.02	1.00	0.91	0.09	0.70	0.19	0.11	0.02	0.15	0.83
Final Sat.:	203	1848	29	164	1682	172	760	205	123	34	249	1382
Capacity Analysis Module:												
Vol/Sat:	0.12	0.52	0.52	0.74	0.51	0.51	0.19	0.19	0.19	0.13	0.13	0.13
Crit Moves:				****				****				
Green/Cycle:	0.75	0.75	0.75	0.75	0.75	0.75	0.19	0.19	0.19	0.19	0.19	0.19
Volume/Cap:	0.16	0.70	0.70	0.98	0.68	0.68	0.98	0.98	0.98	0.67	0.67	0.67
Delay/Veh:	4.1	8.3	8.3	87.6	7.9	7.9	100.4	100	100.4	45.4	45.4	45.4
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	4.1	8.3	8.3	87.6	7.9	7.9	100.4	100	100.4	45.4	45.4	45.4
LOS by Move:	A	A	A	F	A	A	F	F	F	D	D	D
HCM2k95thQ:	20	744	743	341	704	703	491	493	491	360	360	357

Note: Queue reported is the distance per lane in feet.

Weekday PM Peak Hour
2030 with Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	0.792
Loss Time (sec):	6	Average Delay (sec/veh):	22.3
Optimal Cycle:	57	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	43	812	22	89	698	57	140	53	42	15	56	194
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	43	812	22	89	698	57	140	53	42	15	56	194
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	47	883	24	97	759	62	152	58	46	16	61	211
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	47	883	24	97	759	62	152	58	46	16	61	211
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	47	883	24	97	759	62	152	58	46	16	61	211
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.18	0.99	0.99	0.13	0.98	0.97	0.51	0.51	0.51	0.88	0.88	0.86
Lanes:	1.00	0.97	0.03	1.00	0.92	0.08	0.60	0.22	0.18	0.05	0.21	0.74
Final Sat.:	334	1824	49	244	1719	140	579	219	174	93	348	1207
Capacity Analysis Module:												
Vol/Sat:	0.14	0.48	0.48	0.40	0.44	0.44	0.26	0.26	0.26	0.17	0.17	0.17
Crit Moves:		****						****				
Green/Cycle:	0.61	0.61	0.61	0.61	0.61	0.61	0.33	0.33	0.33	0.33	0.33	0.33
Volume/Cap:	0.23	0.79	0.79	0.65	0.72	0.72	0.79	0.79	0.79	0.53	0.53	0.53
Delay/Veh:	9.9	19.3	19.3	22.9	16.6	16.6	44.6	44.6	44.6	29.6	29.6	29.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.9	19.3	19.3	22.9	16.6	16.6	44.6	44.6	44.6	29.6	29.6	29.6
LOS by Move:	A	B	B	C	B	B	D	D	D	C	C	C
HCM2kAvgQ:	23	588	588	83	482	479	241	242	242	201	201	198

Note: Queue reported is the distance per lane in feet.

2030 Saturday PM
with Project

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 Fulton/Madrona/SR29

Cycle (sec):	106	Critical Vol./Cap.(X):	1.004
Loss Time (sec):	6	Average Delay (sec/veh):	23.5
Optimal Cycle:	180	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	18	18	18	18	18	18	18	18	18	18	18	18
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0	1 0	1 0	0	1 0	0 0	1!	0 0	0 0	1!	0 0
Volume Module:												
Base Vol:	23	892	14	112	793	82	131	35	22	4	29	161
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	23	892	14	112	793	82	131	35	22	4	29	161
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	25	970	15	122	862	89	142	38	24	4	32	175
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	25	970	15	122	862	89	142	38	24	4	32	175
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	25	970	15	122	862	89	142	38	24	4	32	175
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.10	0.99	0.99	0.08	0.98	0.97	0.57	0.58	0.57	0.88	0.88	0.88
Lanes:	1.00	0.98	0.02	1.00	0.91	0.09	0.70	0.18	0.12	0.02	0.15	0.83
Final Sat.:	198	1848	29	160	1680	174	759	203	127	34	249	1382
Capacity Analysis Module:												
Vol/Sat:	0.13	0.52	0.52	0.76	0.51	0.51	0.19	0.19	0.19	0.13	0.13	0.13
Crit Moves:				****				****				
Green/Cycle:	0.76	0.76	0.76	0.76	0.76	0.76	0.19	0.19	0.19	0.19	0.19	0.19
Volume/Cap:	0.17	0.69	0.69	1.00	0.68	0.68	1.00	1.00	1.00	0.68	0.68	0.68
Delay/Veh:	4.1	8.1	8.1	95.8	7.8	7.8	107.3	107	107.3	46.0	46.0	46.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	4.1	8.1	8.1	95.8	7.8	7.8	107.3	107	107.3	46.0	46.0	46.0
LOS by Move:	A	A	A	F	A	A	F	F	F	D	D	D
HCM2k95thQ:	21	737	737	356	700	698	507	509	507	363	363	360

Note: Queue reported is the distance per lane in feet.

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Weekday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2030 w-o Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	53			110	7
Peak-Hour Factor, PHF	0.87	0.87			0.87	0.87
Hourly Flow Rate, HFR	0	60			126	8
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				18	0	1
Peak Hour Factor, PHF				0.87	1.00	0.87
Hourly Flow Rate, HFR				20	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	0						21	
C(m) (vph)	1463						809	
v/c	0.00						0.03	
95% queue length	0.00						0.08	
Control Delay	7.5						9.6	
LOS	A						A	
Approach Delay							9.6	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2030 w-o Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	53			38	12
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	4	63			45	14
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				15	0	3
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				18	0	3
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	4						21	
C(m) (vph)	1558						893	
v/c	0.00						0.02	
95% queue length	0.01						0.07	
Control Delay	7.3						9.1	
LOS	A						A	
Approach Delay							9.1	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Weekday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2030 with Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	53			110	9
Peak-Hour Factor, PHF	0.87	0.87			0.87	0.87
Hourly Flow Rate, HFR	0	60			126	10
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				20	0	1
Peak Hour Factor, PHF				0.87	1.00	0.87
Hourly Flow Rate, HFR				22	0	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	0						23	
C(m) (vph)	1461						808	
v/c	0.00						0.03	
95% queue length	0.00						0.09	
Control Delay	7.5						9.6	
LOS	A						A	
Approach Delay							9.6	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRR
Agency/Co.: CTG
Date Performed: 26/08/2015
Analysis Time Period: Saturday PM
Intersection: Spring Mtn/St Helena Rd
Jurisdiction: Napa Co
Units: U. S. Customary
Analysis Year: 2030 with Project
Project ID: Behrens Vineyards
East/West Street: Spring Mountain
North/South Street: St Helena
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	53			38	14
Peak-Hour Factor, PHF	0.83	0.83			0.83	0.83
Hourly Flow Rate, HFR	4	63			45	16
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				17	0	3
Peak Hour Factor, PHF				0.83	1.00	0.83
Hourly Flow Rate, HFR				20	0	3
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LTR	
v (vph)	4						23	
C(m) (vph)	1555						891	
v/c	0.00						0.03	
95% queue length	0.01						0.08	
Control Delay	7.3						9.1	
LOS	A						A	
Approach Delay							9.1	
Approach LOS							A	

RESPONSE TO CITY OF ST HELENA
PUBLIC WORKS DIRECTOR

CRANE TRANSPORTATION GROUP

Responses to Comments by Steven Palmer, P.E., Director of Public Works & City Engineer, City of St. Helena

Comment 1: Table 6 trip distribution for visitors doesn't appear reasonable, with them spread evenly throughout visiting hours. Please revise and/or provide an explanation for how this was derived and list any references.

Response 1: Visitors to the Behrens Winery will be by appointment only. Visitor vehicles are projected to be 13 on weekdays and 12 on weekend days, based upon winery visitor vehicle occupancy data by the County. While the average visitor vehicles per hour over the 8 visitation hours would be less than 2, the analysis has utilized 2 per hour through the afternoon, with up to 3 per hour late on a Friday afternoon. Therefore, a higher than average project visitation has been utilized for analysis purposes during the peak traffic hours on the St. Helena circulation system.

Comment 2: Experience tells me that some trips will utilize Elmhurst instead of Madrona. The study needs to distribute some trips to Elmhurst and include an analysis of the Elmhurst at SR 29 intersection.

Response 2: Possibly some of the 7 project employees may use Elmhurst Avenue to access SR 29 as they become familiar with the local circulation system. However, it is doubtful if any significant number of visitors will use Elmhurst, as their instructions will be to use Madrona Avenue to/from Spring Mountain Road.

Turn movement counts were conducted at the SR 29/Elmhurst intersection on Friday, December 11, 2015 from 7:00-9:00 AM and from 2:00-6:00 PM. Local schools were in session during the counts. The December peak traffic hours were 7:45-8:45 AM and 3:30-4:30 PM. Peak hour count results are presented in the attached **Figure 1** along with pedestrian crossings and a projection of the increased PM peak hour volumes that would be expected at the intersection for harvest (September) 2015 conditions, based upon consistency of volumes along SR 29 between Elmhurst and Madrona-Fulton, which was evaluated in the Winery traffic study.

Level of service analysis was conducted at the SR 29/Elmhurst intersection for the December 2015 peak hours and the harvest 2015 PM peak hour. Results presented in **Table 1** show that with December 2015 volumes, the stop sign controlled delay for turns from the Elmhurst approach to SR 29 are LOS C during the AM peak hour and LOS E during the PM peak hour. During September 2015 PM peak conditions, the approach is operating at LOS F with an average delay for turns of about 70 seconds.

No winery-related traffic would be expected to use Elmhurst during the PM peak traffic hours, as employee shift hours would not put traffic onto the St. Helena circulation system until after 5:00 PM and little or no visitor traffic would be expected to travel on Elmhurst Avenue. If 2 to 3

employees would turn from SR 29 to Elmhurst during the AM peak hour, volumes on Elmhurst would be increased by 1 to 2 percent. These turn movements to Elmhurst would not produce any measurable change in delay for turns from the stop sign controlled Elmhurst Avenue approach to SR 29.

Table 1
INTERSECTION LEVEL OF SERVICE
SR 29/ELMHURST

AM PEAK HOUR		PM PEAK HOUR			
DEC. 2015		DEC. 2015		SEPT. 2015	
LOS*	DELAY (SECS)	LOS	DELAY (SECS)	LOS	DELAY (SECS)
C	23.0	E	43.7	F	69.7

* LOS = level of service
Compiled by: Crane Transportation Group

Comment 3: The City has concerns about the potential for cut through traffic onto Elmhurst and Hillview/Oak, and the safety of children walking to and from RLS Middle School. The project should be required to evaluate methods to encourage vehicles to use Madrona instead of Elmhurst and Hillview.

Response 3: Project visitors will be provided directions to the Winery instructing use of SR 29, Madrona Avenue and Spring Mountain Road as the in and outbound access route through St. Helena. It is recommended that the project applicant instruct all employees to use the same access, to the extent reasonable.

Comment 4: The project should evaluate the need for a 3-way stop sign at Spring Mountain Road and Madrona.

Response 4: Vehicle and pedestrian turn movement counts were conducted at the Madrona Avenue/Spring Mountain Road intersection from 7:00-9:00 AM and 2:00-6:00 PM on Friday, December 11, 2015. Hourly vehicle counts are presented in **Figure 2**, while hourly pedestrian counts are presented in **Figure 3**.

Multi-way stop warrant criteria were obtained from the California MUTCD[1] 2014 edition and are presented in **Appendix 1**. Based upon minimum volumes, December traffic does not come close to meeting multi-way stop warrant criteria. In order to meet volume criteria, the major street (Madrona Avenue) approaches would need a combined 300 vehicles per hour for 8 hours. The maximum combined volume during the highest of the 6 surveyed hours was only 263 vehicles. Also, the minor street (Spring Mountain Road) approach would need at least 200 vehicles + pedestrians + bicycles for the same 8 hours. The maximum approach volume on

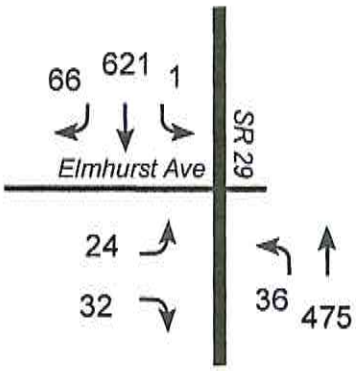
[1] Manual of Uniform Traffic Control Devices.

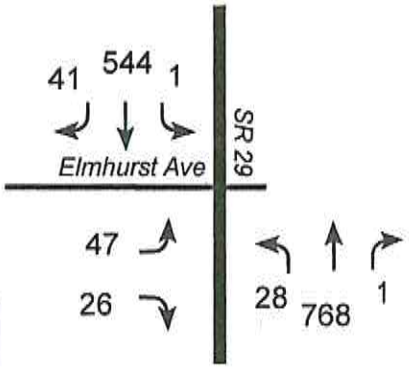
Spring Mountain Road during any of the 6 survey hours was 113 total units (vehicles + pedestrians).

Therefore, even with the addition of 4 or so project vehicles to the intersection approaches, volumes would still be well under warrant criteria for provision of a multi-way stop. From a level of service standpoint, the Spring Mountain Road stop sign controlled approach to Madrona Avenue is operating at an acceptable LOS B during both the December AM and PM peak hours.

Not To Scale

NORTH

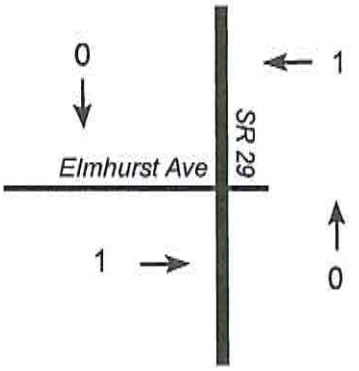


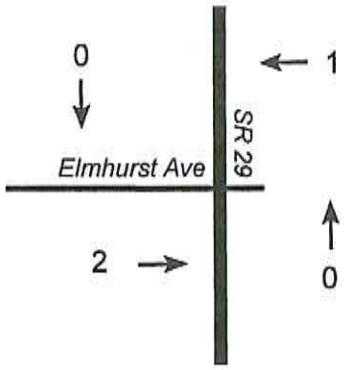


Dec 11, 2015
VEHICLES

Friday AM Peak Hour (7:45-8:45)

Friday PM Peak Hour (3:30-4:30)



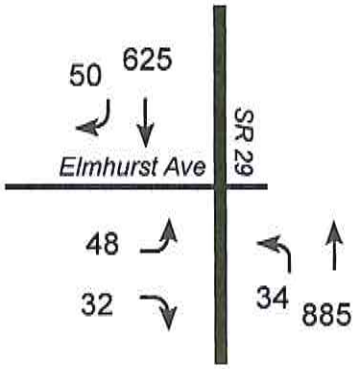


Dec 11, 2015
PEDESTRIANS
(No Bicycles observed)

Friday AM Peak Hour (7:45-8:45)

Friday PM Peak Hour (3:30-4:30)

Harvest 2015
Vehicles



Friday PM Peak Hour (3:30-4:30)

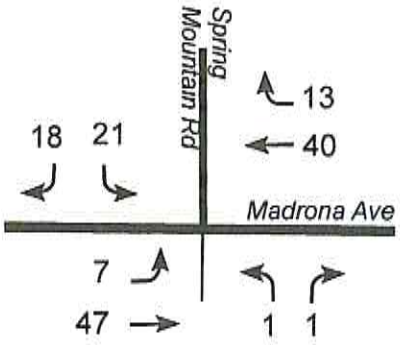
Figure 1
SR29/Elmhurst Ave December & Harvest 2015
Peak Hour Volumes and December Pedestrians

CRANE TRANSPORTATION GROUP

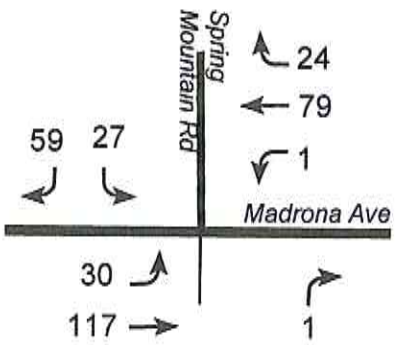
Not To Scale

NORTH

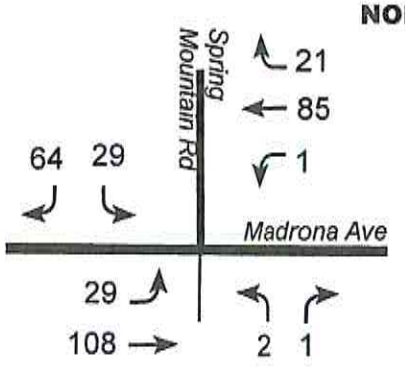
FRIDAY MORNING



7:00-8:00 AM

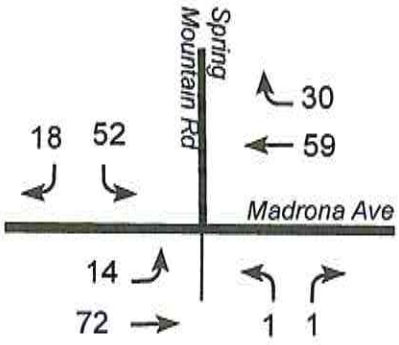


8:00-9:00 AM

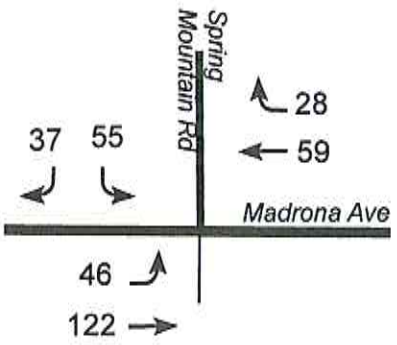


AM Peak Hour (7:45-8:45)

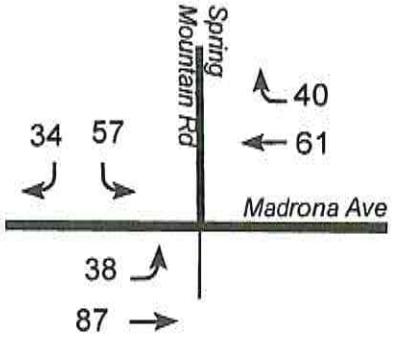
FRIDAY AFTERNOON



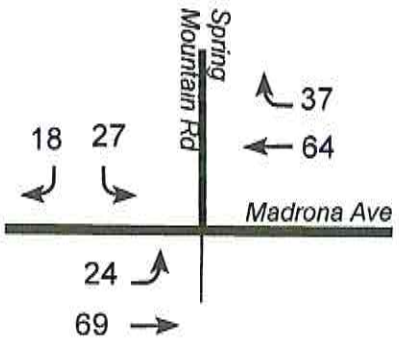
2:00-3:00 PM



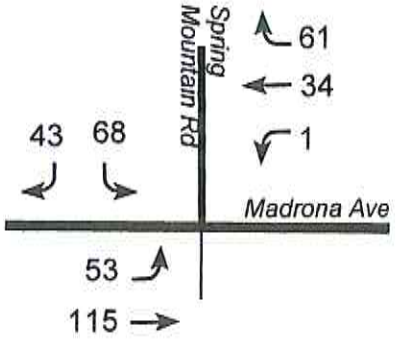
3:00-4:00 PM



4:00-5:00 PM



5:00-6:00 PM



PM Peak Hour (3:30-4:30)

Figure 2

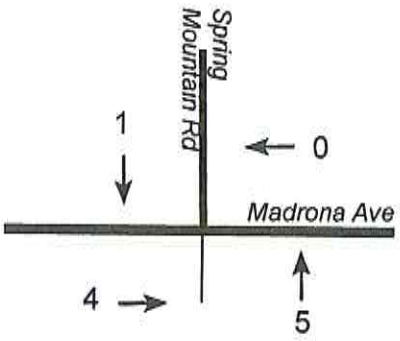
Madrona Ave/Spring Mountain Rd
Vehicle Count Summary
Fridav Dec 11. 2015

CRANE TRANSPORTATION GROUP

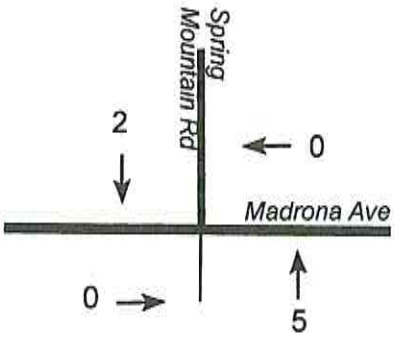
FRIDAY MORNING

Not To Scale

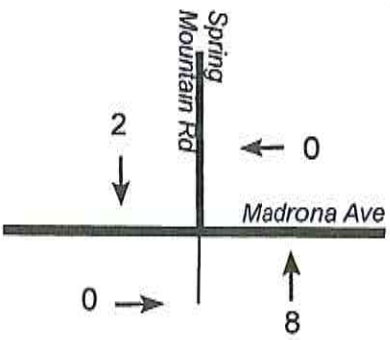
NORTH



7:00-8:00 AM

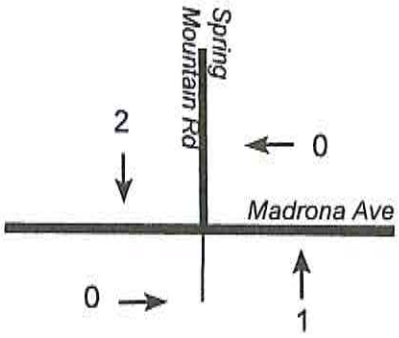


8:00-9:00 AM

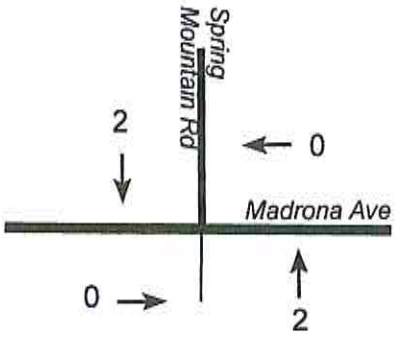


AM Peak Hour (7:45-8:45)

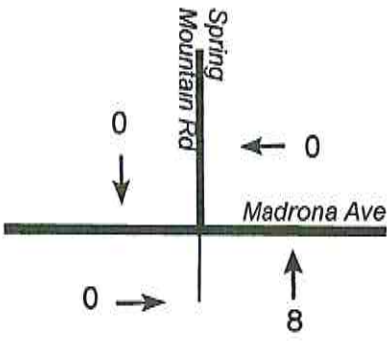
FRIDAY AFTERNOON



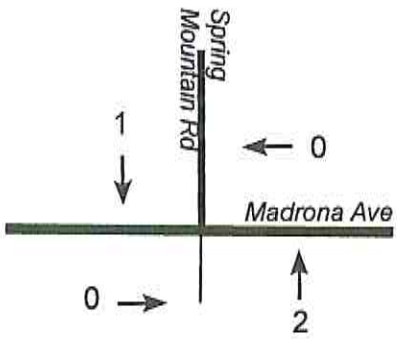
2:00-3:00 PM



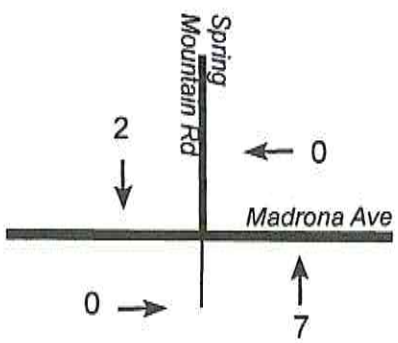
3:00-4:00 PM



4:00-5:00 PM



5:00-6:00 PM



PM Peak Hour (3:30-4:30)

Figure 3

Madrona Ave/Spring Mountain Rd
Pedestrian Count Summary
Friday Dec 11, 2015

CRANE TRANSPORTATION GROUP

Appendix 1

Section 2B.07 California MUTCD 2014 Multi-Way Stop Applications

Support:

01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-say stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to mufti-way stop applications.

Guidance:

03 The decision to install multi-way stop control should be based on an engineering study.

04 The following criteria should be considered in the engineering study for a multi-way STOP sign installation:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.

C. Minimum volumes:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and

2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but

3. If the 85th percentile approach speed of the major street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Option:

05 Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;

B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;

C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop.