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Revised Traffic Study

Benjamin Ranch Winery, Use Permit Application No. P13-00371-UP
Planning Commission Hearing, May 19, 2021

Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Prepared for the County of Napa
County of Napa File Number P13-00371

Submitted by
W-Trans

March 30, 2021

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Executive Summary

The proposed Frank Family Benjamin Ranch Winery would produce up to 475,000 gallons of wine annually, with a tasting room open to the public seven days a week. The proposal includes an allowance of up to 150 visitors daily Monday through Wednesday and 300 daily guests Thursday through Sunday. The project is proposing eight large agriculture promotional events annually with up to 150 attendees along with participation in the Napa Valley Auction; event attendees are included in the daily maximum visitation figures. Events would be scheduled to avoid generating trips during the evening peak period between 4:00 and 6:00 p.m. The winery is expected to have 46 full-time and 15 part-time employees on a typical daily basis. Access to the site would occur via a new driveway on Conn Creek Road.

Based on application of the metrics applied in the County's Winery Trip Generation Form, the project is expected to generate a 408 new trips per day on Fridays, including 69 trips during the p.m. peak hour and 340 trips on Saturdays, with 65 trips during the weekend peak hour.

The study area included the three intersections of Silverado Trail/Conn Creek Road, Rutherford Road/ Conn Creek Road, and SR 29/Rutherford Road. The intersection of Rutherford Road/Conn Creek Road currently operates acceptably at LOS A overall and on the minor street approach during both peak hours.

The study intersection of Silverado Trail/Conn Creek Road operates at an unacceptable LOS F on the minor street approach during both peak hours and would be expected to continue operating unacceptably with the addition of project traffic. Under anticipated future volumes, the intersection would operate unacceptably at LOS F overall and on the Conn Creek Road approach during both peak periods and continue doing so with the project. Because the project adds more than five seconds of delay to the Conn Creek Road approach under existing and future conditions during one or both peaks, the project would have an adverse impact on the intersection's operation. It is noted that County policy eliminates the potential for that signalizing intersection, though this would achieve acceptable operation. Therefore, to mitigate the project's impact at the intersection, the project should include paving the existing gravel shoulder along southbound Silverado Trail to create a separate deceleration lane for traffic turning right onto Conn Creek Road while maintaining the existing bicycle lane. This measure would achieve an acceptable effect on operation except under Future volumes during the weekday p.m. peak hour. As there are no additional feasible measures for increasing capacity, the project would therefore have an adverse effect under these projected future conditions. Implementation of a Transportation Demand Management (TDM) Plan to reduce peak hour trips is recommended to reduce the project's effect on areawide circulation.

Rutherford Road/SR 29 currently operates unacceptably at LOS E or F overall and at LOS F on the Rutherford Road approach during both peak hours under all scenarios evaluated. The project-related increase in overall delay at the intersection and on the minor road approach during the weekday and weekend peak periods exceed the County's level of significance for future conditions. Again, signalization would achieve acceptable operation; however, under County policy this option is not recommended. Because there are no feasible measures accepted by the County to increase capacity at SR 29/Rutherford Road, a TDM Plan should be implemented to reduce the project's impacts.

It is recommended that the applicant establish a TDM plan to reduce trips during peak periods and overall, on a daily basis. Measures should be established that reduce the numbers of daily trips by employees and

visitors by 15 percent. A monitoring program should be established to ensure that the TDM Plan achieves the 15-percent reduction.

While the study area lacks pedestrian facilities and transit service, there is not expected to be a demand for these facilities, and therefore, the lack of them is considered acceptable. Existing bicycle facilities on Silverado Trail, in addition to planned future facilities on Conn Creek Road and SR 29, would provide adequate bicycle access. To accommodate cyclists, the project should provide ten bicycle parking spaces on-site.

On-site circulation is expected to operate acceptably. Sight lines along Conn Creek Road from the proposed project driveway are adequate. A left-turn pocket is not warranted on Conn Creek Road at the project driveway and therefore not recommended.

The proposed 94-space parking supply is adequate for the anticipated demand during typical harvest operation but inadequate for the anticipated demand during events. The supply would be adequate on days when there is a 24-person event if visitation to the tasting room is limited to 75 guests per hour. The applicant should provide a shuttle service and arrange for guests to park off-site during events with 150 guests, as proposed.

In consideration of the potential need to evacuate the site due to wildfires, it is recommended that visitation be cancelled on “red flag” days when the danger of such events it at its highest.

Introduction

This report presents an analysis of the potential traffic impacts that would be associated with development of a proposed winery to be located at 8895 Conn Creek Road in the County of Napa. The traffic study was completed in accordance with the criteria established by the County of Napa and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide County staff and policy makers with data they can use to make an informed decision regarding the potential traffic impacts of and effects on traffic operation due to a proposed project, and any associated improvements that would be required to mitigate these impacts to a level of insignificance or reduce effects to an acceptable level as defined by the County's General Plan or other policies. Effects on vehicular traffic operation are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the effect the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

Project Profile

The proposed Frank Family Vineyards – Benjamin Ranch Winery project (P13-00371) is a new winery that could produce up to 475,000 gallons of wine annually. The winery would have three tasting rooms, a commercial kitchen, and a lounge as well as administrative space located in the proposed 3,140 square-foot visitor center. The tasting rooms would be allowed to serve up to 150 visitors Monday through Wednesday and 300 daily guests Thursday through Sunday. Additionally, eight events having up to 150 people along with participation in the Napa Valley Auction are included in the project proposal; guests of such events would be included in the total daily visitation numbers. Typical winery visitation would occur during scheduled events; however, the winery would limit the daily visitation to the maximum levels of guests even on event days. The winery would operate seven days a week from 8:00 a.m. to 6:00 p.m. A new paved driveway on Conn Creek Road would provide employee and visitor access to the site. The project site is located at 8895 Conn Creek Road, as shown in Figure 1.

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Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Figure 1 – Study Area and Existing Lane Configurations

W-Trans

Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the following intersections. It is noted that the study area replicated that of a study prepared for the same project by another consultant; staff comments on that prior study did not indicate any need for a change or expansion to the study area and no such comments were obtained from staff on the draft version of this report. It was therefore concluded that the study area is acceptable to staff.

1. Silverado Trail/Conn Creek Road (SR 128)
2. Rutherford Road (SR 128)/Conn Creek Road (SR 128)
3. SR 29/Rutherford Road (SR 128)

Operating conditions during the Friday p.m. and Saturday p.m. peak periods were evaluated as these time periods reflect the highest traffic volumes areawide and for the proposed project. The evening peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion of the day during the homeward bound commute, while the weekend midday peak occurs between 12:00 and 5:00 p.m.

Study Intersections

Silverado Trail/Conn Creek Road (SR 128) is a four-legged intersection stop-controlled at the northbound Conn Creek Road (SR 128) approach. The northbound approach includes a flared right-turn lane and the southbound approach is a private driveway to the Rutherford Ranch Winery.

Rutherford Road (SR 128)/Conn Creek Road (SR 128) is a tee-intersection where the northbound Conn Creek Road approach is stop-controlled. The eastbound Rutherford Road approach includes a channelized right turn allowing free right-turn movements. The northbound left-turn and southbound through movements are channelized and stop-controlled.

SR 29/Rutherford Road (SR 128) is a four-legged intersection with stop controls at the westbound and eastbound approaches. The westbound Rutherford Road (SR 128) approach has a flared right-turn lane. The eastbound approach is a private road serving the Rutherford Fire Department and the Inglenook Winery and Bistro.

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

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The

most current five-year period available at the time of the analysis was April 1, 2014 through March 31, 2019.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2014 Collision Data on California State Highways*, California Department of Transportation (Caltrans). The three study intersections had higher collision rates than the Statewide average for similar facilities. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2014-2019)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. Silverado Trail/Conn Creek Rd (SR 128)	9	**0.27**	0.23
2. Rutherford Rd (SR 128)/Conn Creek Rd (SR 128)	2	**0.34**	0.16
3. SR 29/Rutherford Rd (SR 128)	15	**0.36**	0.23

Note: c/mve = collisions per million vehicles entering; **Bold** text indicates an above-average collision rate

Because the collision rates for the three study intersections were higher than the statewide averages, the crashes at these locations were reviewed in greater detail.

Of the nine collisions that occurred at the intersection of Silverado Trail/Conn Creek Road (SR 128), four were broadside collisions, which were attributed to either improper turning or right-of-way violations. The congestion that occurs during peak periods likely contributes to many of these crashes, and the high approach speed may contribute to crashes off-peak. Further, it is noted that none of the collisions at the intersection resulted in injuries; therefore, the incidence of injuries indicates that this intersection does not have a specific safety problem despite the above-average collision rate.

Rutherford Road/Conn Creek Road experienced two collisions over the five-year study period, which translates to a collision rate of 0.34 collisions per million vehicles entering (c/mve) the intersection. While this is higher than the statewide average of 0.16 c/mve for similar facilities, given the very low volumes it takes only two collision to exceed the statewide average rate. The limited number of collisions that have occurred in five years at the study intersection does not appear to indicate a safety concern; therefore, the above-average collision rate is not considered a safety concern.

A review of the records for SR 29/Rutherford Road (SR 128) indicates that nine of the 15 collisions were broadside crashes where eight were attributed to right-of-way violations and one case where the driver was under the influence. The remaining collisions included hit-object, head-on, rear-end, and sideswipe crashes, though there were not enough of any of these types of crashes to indicate a trend. It is noted that the injury rate of 46.7 percent also exceeds the Statewide average of 40.4 percent. While a traffic signal would be expected to address the type of crashes occurring at this location, it is understood that the County of Napa has adopted a policy not to install signals along SR 29.

Alternative Modes

Pedestrian Facilities

As might be expected given the rural location of the project site, there are no pedestrian facilities in the project vicinity.

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2018, classifies bikeways into four categories:

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

There are existing Class II bike lanes on Silverado Trail and Conn Creek Road near the project site and future facilities are planned along several streets in the project vicinity. There are plans to construct Class II bike lanes along SR 29 and the planned extension of the Vine Trail would parallel SR 29. Bicyclists currently ride in the roadway shoulder along SR 29 and share the travel lane with vehicles on other roads within the project study area. Table 2 summarizes the planned bicycle facilities in the project vicinity, as contained in the *Napa County Bicycle Plan*.

Table 2 – Planned Bicycle Facilities in the Project Vicinity

Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Conn Creek Rd	II	0.94	Skellenger Ln	SR 128
Silverado Trail	II	25.9	SE Calistoga City Limit	Trancas St
Skellenger Ln	III	0.91	Conn Creek Rd	Silverado Trail
Planned				
Conn Creek Path	I	0.92	Oakville Cross Rd	Skellenger Ln
Vine Trail	I	7.67	Madison St	Chaix Ln
SR 128 (Conn Creek Rd)	II	1.32	Conn Creek	Silverado Trail
SR 128 (Rutherford Rd)	II	1.52	SR 29 (St. Helena Hwy)	Conn Creek Rd
SR 128 (Sage Canyon Rd)	II	3.80	Silverado Trail	Chiles Pope Valley Rd
SR 29	II	7.63	Madison St	Chaix Ln

Source: *Napa County Bicycle Plan,* W-Trans, 2012

Transit Facilities

There are no existing bus stops within an acceptable walking distance (one-half mile) of the project site.

Capacity Analysis

Intersection Level of Service Methodologies

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

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2016. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The Levels of Service for the study intersections, which have side-street stop controls, or are unsignalized and have one or two approaches stop controlled, were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

The ranges of delay associated with the various levels of service are indicated in Table 3.

Table 3 – Two-Way Stop-Controlled Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.
LOS B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.
LOS C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.
LOS D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.
LOS E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.
LOS F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2010

Traffic Operation Standards

In the Circulation Element of the *Napa County General Plan*, the following policies have been adopted:

- **Policy CIR-31** – *The County seeks to provide a roadway system that maintains current roadway capacities in most locations and is efficient in providing local access.*

- **Policy CIR-38** – *The County seeks to maintain operations of roads and intersections in the unincorporated County area that minimize travel delays and promote safe access for all users. Operational analysis shall be conducted according to the latest version of the Highway Capacity Manual and as described in the current version of the County's Transportation Impact Study Guidelines. In general, the County seeks to maintain Level of Service (LOS) D on arterial roadways and at signalized intersections, as the service level that best aligns with the County's desire to balance its rural character with the needs of supporting economic vitality and growth.*

  In situations where the County determines that achieving LOS D would cause an unacceptable conflict with other goals and objectives, minimizing collisions and the adequacy of local access will be the County's priorities. Mitigating operational impacts should first focus on reducing the project's vehicular trips through modifying the project definition, applying TDM strategies, and/or applying new technologies that could reduce vehicular travel and associated delays; then secondarily should consider physical infrastructure changes. Proposed mitigations will be evaluated for their effect on collisions and local access, and for their effectiveness in achieving the maximum potential reduction in the project's operational impacts (see the County's Transportation Impact Study Guidelines for a list of potential mitigation measures).

  The following roadway segments are exceptions to the LOS D standard described above:
  - *State Route 29 in the unincorporated areas between Yountville and Calistoga: LOS F is acceptable.*
  - *Silverado Trail between State Route 128 and Yountville Cross Road: LOS E is acceptable.*
  - *State Route 12/121 between the Napa/Sonoma county line and Carneros Junction: LOS F is acceptable.*
  - *American Canyon Road from I-80 to American Canyon City Limit: LOS E is acceptable.*

To provide a more quantitative method of adhering to the above standards, the County has recently updated the significance thresholds for intersections as summarized below:

- If an unsignalized intersection is operating acceptably (LOS A though LOS D), and the project would cause the intersection to fall to LOS E or LOS F, the applicant must mitigate the effect to restore to LOS D at a minimum, or the project is considered to adversely affect the intersection.

- If an intersection is already operating at LOS E or F, and the project would increase delay at the intersection by five or more seconds, the applicant must mitigate the effect to lower the increase in delay, or else the project would be considered to adversely affect the intersection. The same standards apply to the analysis of minor approaches to unsignalized intersections.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the p.m. peak period. This condition does not include project-generated traffic volumes. Volume data was collected in October 2017 while local schools were in session. Turning movements counts were conducted by All Traffic Data, as directed by Crane Transportation Group (CTG). These count

days occurred just before the Napa County fires and are therefore representative of typical harvest season peak activity in the region.

Intersection Levels of Service

Under existing conditions, Silverado Trail/Conn Creek Road and Rutherford Road/Conn Creek Road operate acceptably at LOS C or better overall during the weekday and weekend p.m. peak hours; however, Silverado Trail/Conn Creek Road operates unacceptably at LOS F on the stop-controlled approach during both peaks. The intersection of Rutherford Road/SR 29 is operating unacceptably at LOS E or F overall and on the minor street approach during both peak periods. The existing traffic volumes are shown in Figure 2. A summary of the intersection level of service calculations is contained in Table 4, and copies of the Level of Service calculations are provided in Appendix B.

Table 4 – Existing Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	Weekday PM Peak		Weekend PM Peak	
	Delay	**LOS**	**Delay**	**LOS**
1. Silverado Trail/Conn Creek Rd (SR 128)	16.1	C	22.8	C
Northbound (Conn Creek Rd) Approach	***242.1***	***F***	***229.3***	***F***
2. Rutherford Rd (SR 128)/Conn Creek Rd (SR 128)	3.3	A	1.6	A
Northbound (Conn Creek Rd) Approach	*9.7*	*A*	*9.7*	*A*
3. SR 29/Rutherford Rd (SR 128)	**73.6**	**F**	**44.5**	**E**
Westbound (Rutherford Rd) Approach	***1,000***	***F***	***691.5***	***F***

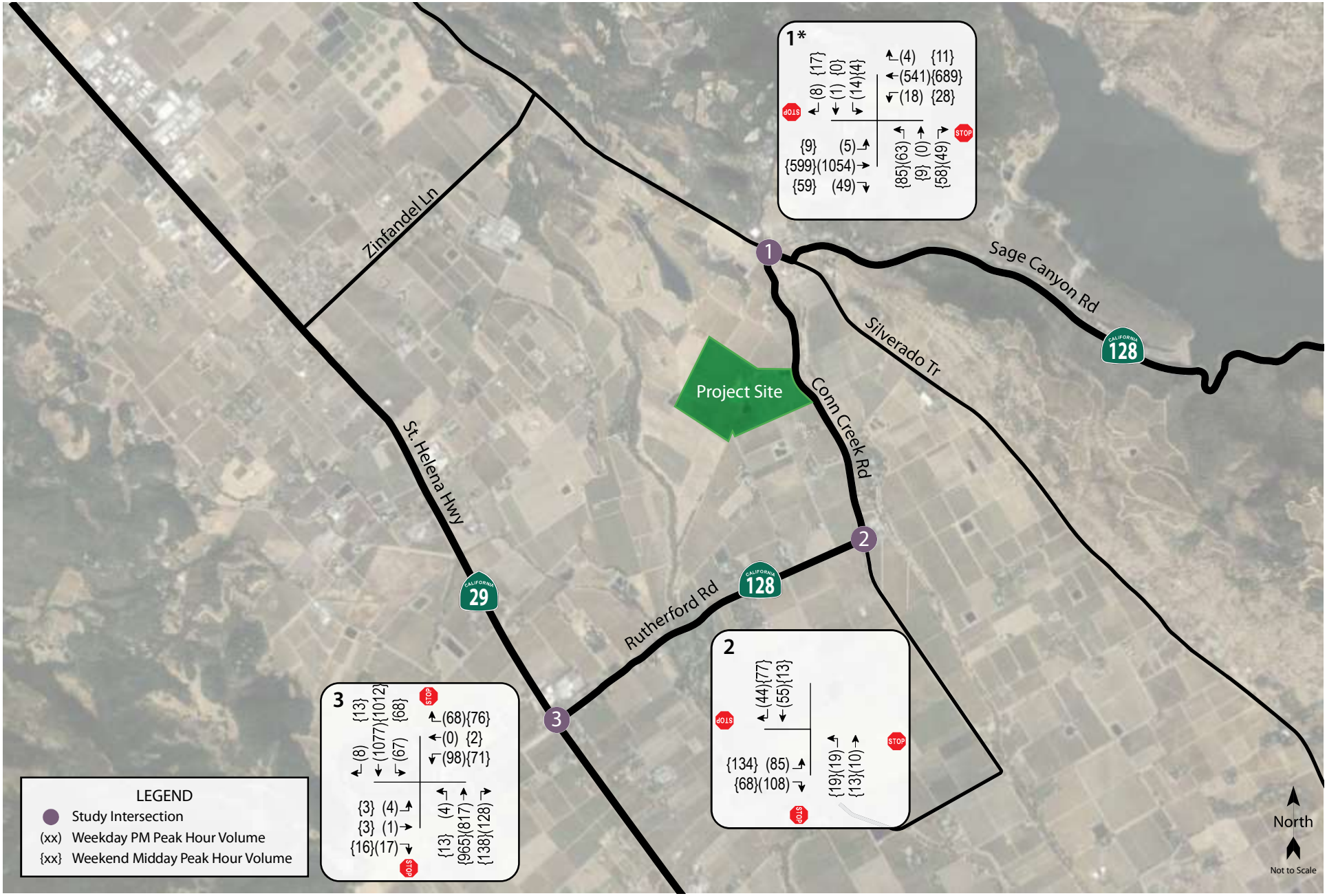
Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation

Although installation of traffic signals would be expected to address the deficient operation at both Silverado Trail/Conn Creek Road and SR 29/Rutherford Road, the County has taken the position that no new traffic signals are to be installed along these two-lane highways. Because this potential capacity improvement is not an option, other potential improvements, such as turn lanes and/or acceleration/ deceleration lanes, were considered. Following is a discussion of the potential improvement options at both study intersections that are operating unacceptably.

Silverado Trail/Conn Creek Road (SR 128)

- Turn Lanes: there are currently left-turn lanes in both directions on Silverado Trail. There is not currently a separate left-turn lane on the northbound Conn Creek Road approach, though the lane is wide enough that there are two stop legends, indicating that drivers are expected to queue up side-by-side. Given the proximity to a creek, additional widening appears infeasible within the existing right-of-way.

- Acceleration/Deceleration Lanes: the existing gravel shoulder along the southbound lane on Silverado Trail provides some space for vehicles to decelerate prior to turning right onto Conn Creek Road and some space for vehicles to accelerate onto Silverado Trail southbound. However, the existing bridge structure limits the potential for providing additional acceleration space. As there are left-turn lanes in both directions, there is no space for acceleration when turning left onto Silverado Trail.



* Silverado Trail is considered to run East-West at this intersection.

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Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Figure 2 – Existing Traffic Volumes

W-Trans

SR 29/Rutherford Road

- Turn Lanes: there are currently left-turn lanes in both directions on SR 29 and there is a flared right-turn lane on Rutherford Road along with 75 feet of red curb on the approach; this reduces delays for right-turning vehicles by allowing them to queue up side-by-side with vehicles that are queued waiting to turn left onto SR 29. Because the existing geometrics function as if there were a separate right-turn lane, no operational benefit would be derived from marking separate turn lanes.

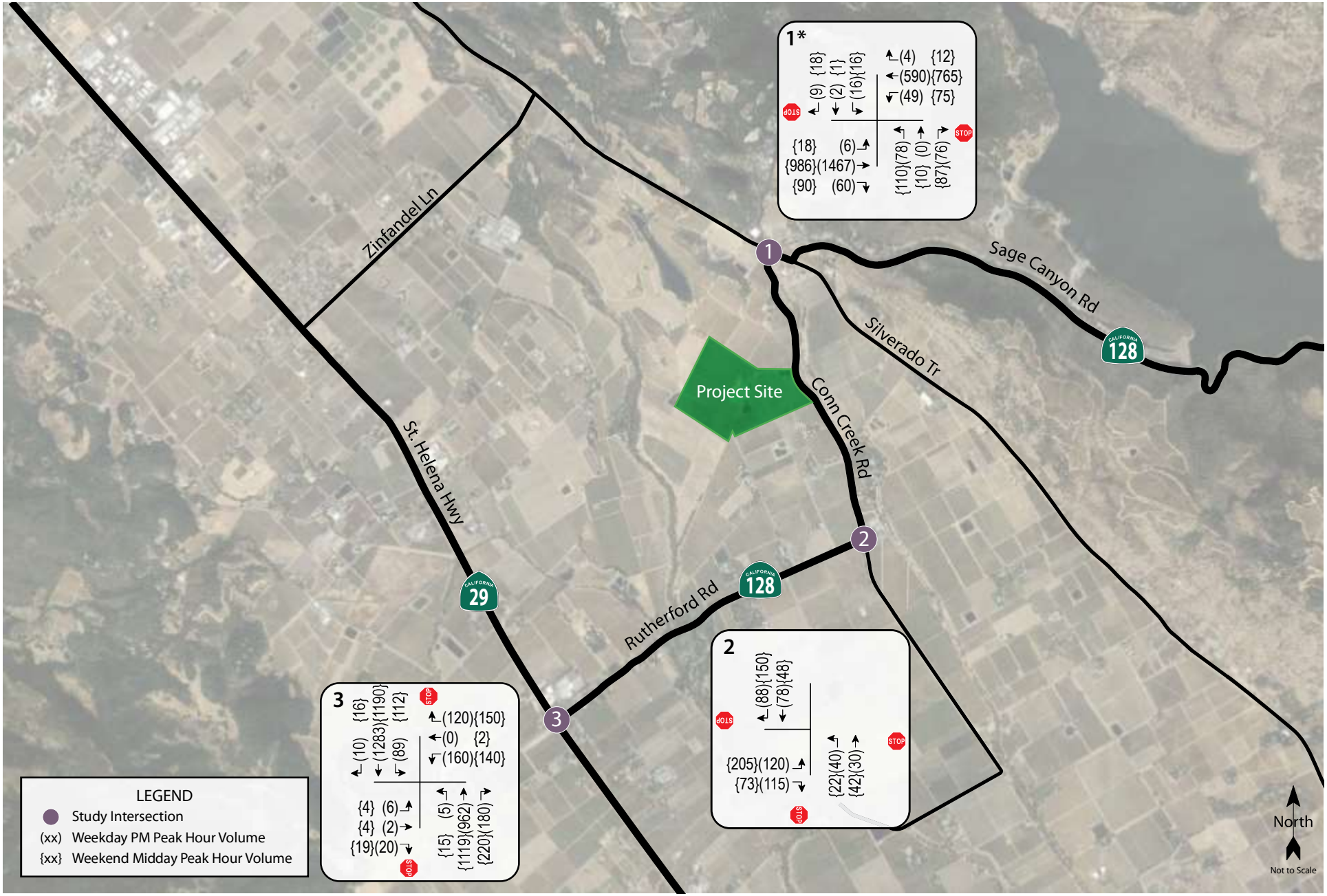
- Acceleration/Deceleration Lanes: bike lanes on the east side of the highway are approximately ten feet wide, providing sufficient space for acceleration/deceleration. Drivers turning left onto SR 29 do not have an acceleration lane due to the presence of left-turn lanes in both directions.

Future Conditions

Future volumes as developed by CTG for the 2030 horizon year were used to evaluate future operating conditions. Traffic projections were developed by CTG for a list of new or expanding winery projects that have been approved, but not built, in the vicinity of the project site and compared to projections from the County model. Traffic projections for specific winery projects from the following traffic studies were considered:

- **Caymus Winery** – Amended Caymus Winery Traffic Impact Study by W-Trans, April 2015
- **Opus One Winery** – Focused Traffic Analysis for the Proposed Opus One Use Modification Project by Omni Means, February 2016
- **Frogs Leap Winery** – Focused Traffic Analysis for the Proposed Frogs Leap Winery Modifications Project by Omni Means, July 2016
- **Scarlett Winery** – No Traffic Study Available
- **Swanson Winery** – Traffic Impact Study by George Nicholson, May 2008
- **LMR Rutherford Estate Winery** – Traffic Impact Study by Crane Transportation Group, January 2014
- **BV Winery** – Frank Family Vineyards Traffic Impact Study by Crane Transportation Group, 2018
- **Matthew Bruno Wines Tasting Room** – No Traffic Study Available

Where appropriate, the projected future volumes derived from the model were increased to ensure that volumes associated with the approved projects were included. Under the anticipated Future volumes, the study intersections of Silverado Trail/Conn Creek Road and Rutherford Road/SR 29 are expected to operate unacceptably at LOS F overall and LOS F on the stop-controlled approaches during both peak periods. Future volumes are shown in Figure 3 and operating conditions are summarized in Table 5.



* Silverado Trail is considered to run East-West at this intersection.

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Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Figure 3 – Future Traffic Volumes

Table 5 – Future Peak Hour Intersection Levels of Service				
Study Intersection ***Approach***	**Weekday PM Peak**		**Weekend PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Silverado Trail/Conn Creek Rd (SR 128)	**85.1**	**F**	**119.1**	**F**
Northbound (Conn Creek Rd) Approach	***1,207***	***F***	***1,219***	***F***
2. Rutherford Rd (SR 128)/Conn Creek Rd (SR 128)	3.7	A	2.2	A
Northbound (Conn Creek Rd) Approach	*10.4*	*B*	*10.3*	*B*
3. Rutherford Rd (SR 128)/SR 29	***259.0***	***F***	***324.6***	***F***
Westbound (Rutherford Rd) Approach	***2,591***	***F***	***3,263***	***F***

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation

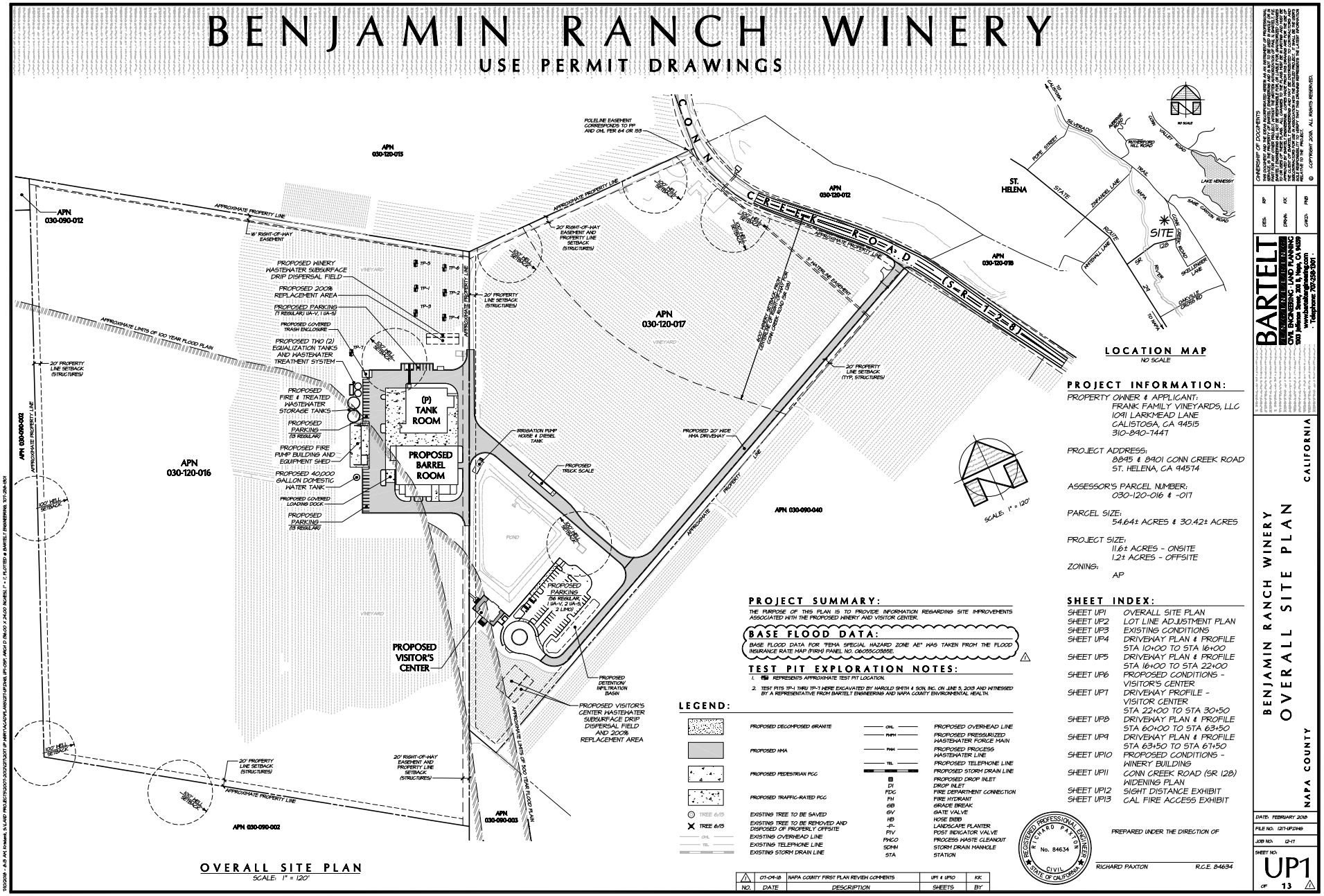
As might be expected with no changes to the intersections' geometries or controls, the operation of Silverado Trail/Conn Creek Road and Rutherford Road/SR 29 is anticipated to deteriorate substantially with the increase in traffic projected over the next nine years. As previously noted, the County has indicated that signalization is not an option for achieving better operation, but it is noted that, if signalized, both intersections would be expected to operate at LOS D or better.

Project Description

The Frank Family Benjamin Ranch Winery would produce up to 475,000 gallons of wine annually. The winery would have a tasting room open to the public seven days a week and is proposing an annual event allowance that would include eight large events with up to 150 attendees along with participation in the Napa Valley Auction. The daily combined tours and tastings and event visitation would not exceed 300 persons per day on Thursday through Sunday and 150 visitors on Monday through Wednesday. Events would be scheduled to avoid generating trips between the 4:00 to 6:00 p.m. weekday peak hours. Staffing levels would include 46 full-time and 15 part-time employees on a typical daily basis and the winery production facility would operate seven days a week from 8:00 a.m. to 6:00 p.m. The tasting room visitation hours would begin at 10:00 a.m. and end at 6:00 p.m. The proposed project site plan is shown in Figure 4.

Trip Generation

The County of Napa's Winery Traffic Information/Trip Generation Sheet was used to determine the anticipated trip generation for the proposed project. The form estimates the number of daily and peak hour trips for Fridays and Saturdays based on the number of full- and part-time employees, average daily visitors, and production. Data collected at numerous wineries in Napa County was used to develop a ratio of peak hour trips for visitors versus as a portion of daily trips. It is noted that the form does not include guidance on inbound versus outbound trips, so it was assumed that two-thirds of trips at the winery would be outbound during the Friday p.m. peak hour as employees and customers leave at closure of the winery. For the Saturday p.m. peak hour, it was assumed that inbound and outbound trips would be evenly split. Copies of the Napa County Winery Traffic Information/Trip Generation Sheet and the peak-hour ratio derivation are provided in Appendix C.



Source: Bartelt Engineering 2/18

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Figure 4 – Site Plan

As shown in Table 6, based on application of the County's standard assumptions the proposed project would be expected to generate 408 daily trips on a Friday and 334 on a Saturday, including 69 peak hour trips on Friday and 65 on Saturday.

Table 6 – Trip Generation Summary

Trip Generator	Friday (Weekdays)					Saturday (Weekends)				
	Units	Daily		Peak Hour		Units	Daily		Peak Hour	
		Rate	Trips	Rate	Trips		Rate	Trips	Rate	Trips
Full-time employees	46 emp	3.05	140	1.00	46	32 emp	3.05	98	1.00	32
Part-time employees	15 emp	1.90	28	0.50	7	10 emp	1.90	19	0.50	5
Visitors	300 gu	0.77	231	0.05	15	300 gu	0.71	214	0.09	27
Production	n/a	n/a	9	n/a	1	n/a	n/a	9	n/a	1
Total			**408**		**69**			**340**		**65**

Note: emp = employees; gu = guests

It is noted that the project would allow wine production using locally-sourced fruit, including grapes grown on the property for this winery, adjacent and nearby vineyards, as well as on other properties under the same ownership, in lieu of trucking the fruit to other sites. While this type of efficiency would likely result in fewer or shorter truck trips on the local network, no deductions were taken for this operation.

Trip Distribution

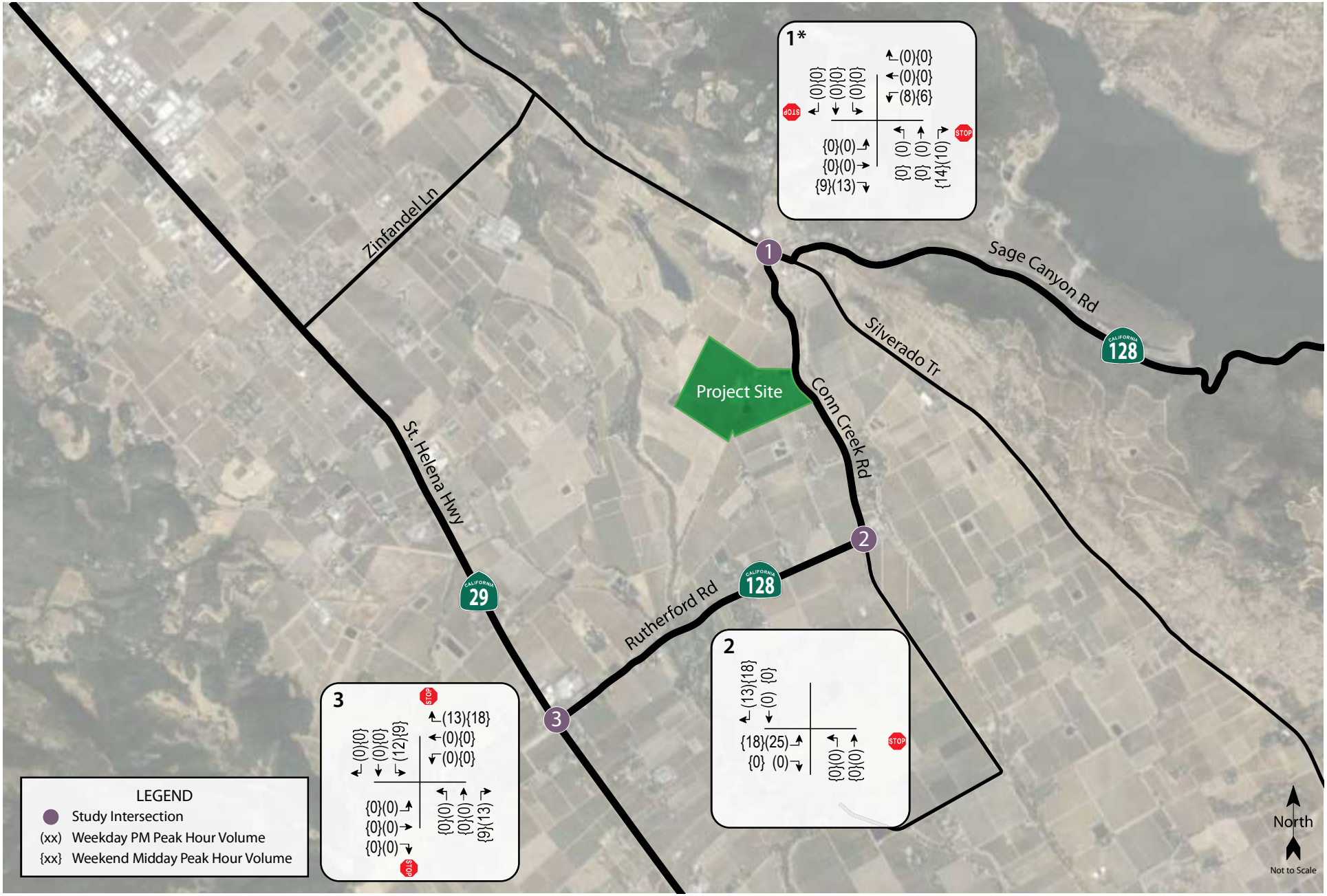
The pattern used to allocate new project trips to the street network was based on the site's location and proximity to adjacent wineries communities. Per traffic data obtained by CTG, trips on the Conn Creek Road and Rutherford Road corridor traveling to and from SR 29 and Silverado Trail exhibit a roughly even split (i.e. 55 percent westbound toward SR 29 and 45 percent eastbound toward Silverado Trail). The applied distribution assumptions and resulting trips are shown in Table 7.

Table 7 – Trip Distribution Assumptions			
Route	**Percent**	**Weekday PM Trips**	**Weekend PM Trips**
Inbound			
From the north via SR 29	27%	12	9
From the north via Silverado Trail	28%	13	9
From the south via SR 29	28%	13	9
From the south via Silverado Trail	17%	8	6
Subtotal	*100%*	*46*	*33*
Outbound			
To the north via SR 29	55%	13	18
To the south via Silverado Trail	45%	10	14
Subtotal	*100%*	*23*	*32*
TOTAL		**69**	**65**

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, Silverado Trail/Conn Creek Road and Rutherford Road/SR 29 are expected to continue operating unacceptably overall and on the minor street approaches during both peak hours. Project traffic volumes are shown in Figure 5 and Existing plus Project volumes in Figure 6. These results are summarized in Table 8.



* Silverado Trail is considered to run East-West at this intersection.

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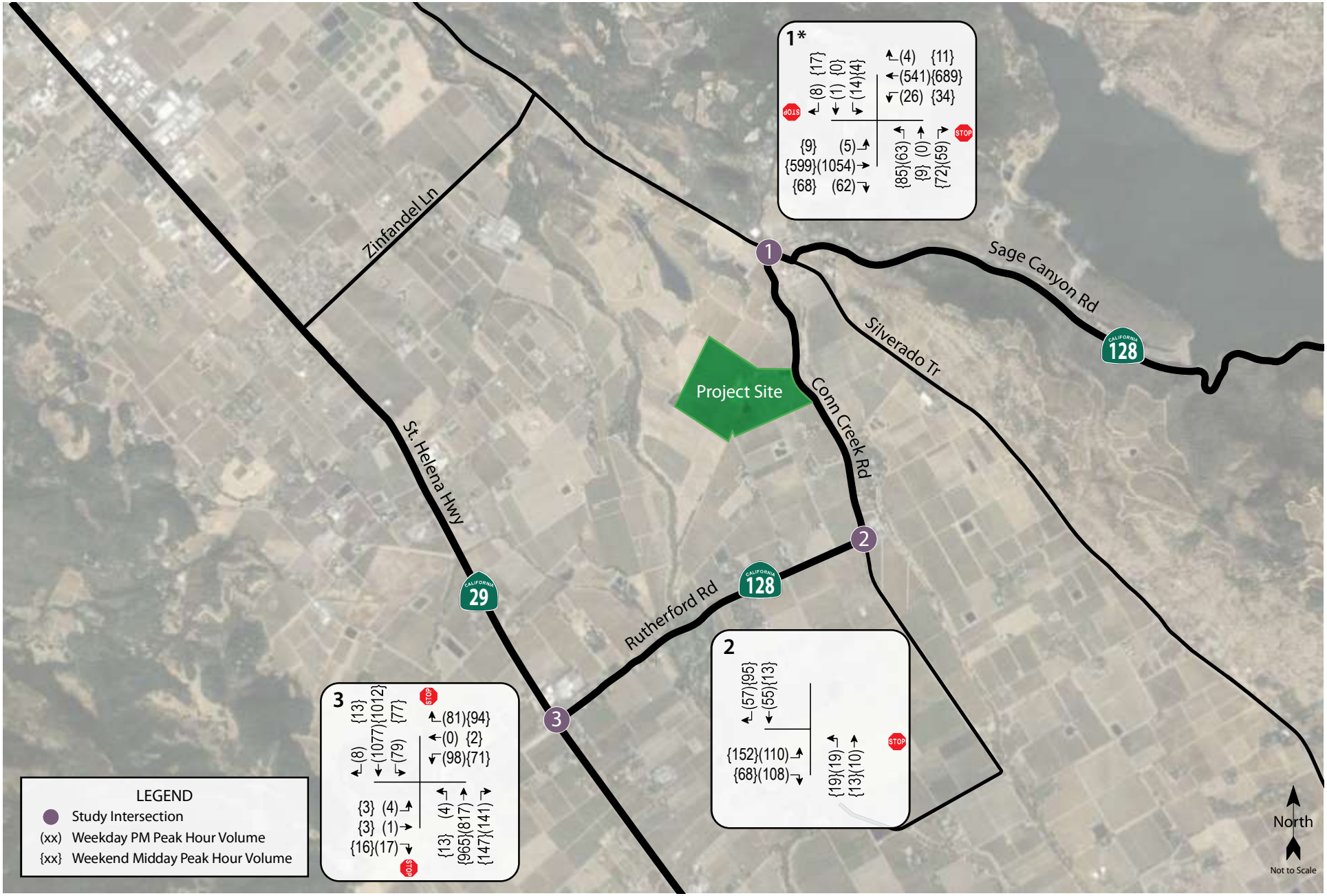
Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Figure 5 – Project Traffic Volumes

W-Trans



* Silverado Trail is considered to run East-West at this intersection.

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Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Figure 6 – Existing plus Project Traffic Volumes

Table 8 – Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Existing Conditions				Existing plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Silverado Tr/Conn Creek Rd (SR 128)	16.1	C	22.8	C	19.5	C	19.2	C
NB (Conn Creek Rd) Approach	***242.1***	***F***	***229.3***	***F***	***275.4***	***F***	***180.1***	***F***
With SB Deceleration Lane	-	-	-	-	12.5	B	12.3	B
NB (Conn Creek Rd) Approach	-	-	-	-	***173.0***	***F***	***113.7***	***F***
2. Rutherford Rd (SR 128)/Conn Creek Rd (SR 128)	3.3	A	1.6	A	2.8	A	1.4	A
NB (Conn Creek Rd) Approach	*9.7*	*A*	*9.7*	*A*	*10.0*	*A*	*9.9*	*A*
3. SR 29/Rutherford Rd (SR 128)	**73.6**	**F**	**44.5**	**E**	**76.1**	**F**	**57.6**	**E**
WB (Rutherford Rd) Approach	***1,000***	***F***	***691.5***	***F***	***974.7***	***F***	***809.5***	***F***

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation; Shaded cells = conditions with recommended improvements

It should be noted that with the addition of project-related traffic volumes, average delay at the intersections of Rutherford Road/Conn Creek Road and Rutherford Road/SR 29 decreases during one or both peak hours. While this is counter-intuitive, this condition occurs when a project adds trips to movements that are currently underutilized or have delays that are below the intersection average, resulting in a better balance between approaches and lower overall average delay. The project adds traffic predominantly to the through movement at Rutherford Road/Conn Creek Road and to the right-turn movements at Rutherford Road/SR 29, both of which have average delays that are lower than the averages for the intersections as a whole, resulting in a slight reduction in the overall average delays. The conclusion could incorrectly be drawn that the project actually improves operation based on this data alone; however, it is more appropriate to conclude that the project trips are expected to make use of excess capacity, so drivers will experience little, if any, change in conditions as a result of the project.

Findings – Rutherford Road/Conn Creek Road currently operates at an acceptable service level during both peaks and would continue doing so upon adding project-generated traffic. The remaining two study intersections would continue to operate unacceptably.

- Traffic delays on the stop-controlled northbound Conn Creek Road approach to Silverado Trail would be expected to increase with the addition of project-related traffic by 33.3 seconds during the weekday peak hour. This exceeds the County's five-second threshold, which is considered an adverse impact under the County standards. However, it is noted that the County has established LOS E operation on Silverado Trail as being acceptable and has indicated that signalization is not an option, though this would achieve acceptable operation. Given that signalization was not an option, the addition of a deceleration lane was considered as a project mitigation measure. It is noted that with the addition of a deceleration lane on Silverado Trail at Conn Creek Road, the intersection would

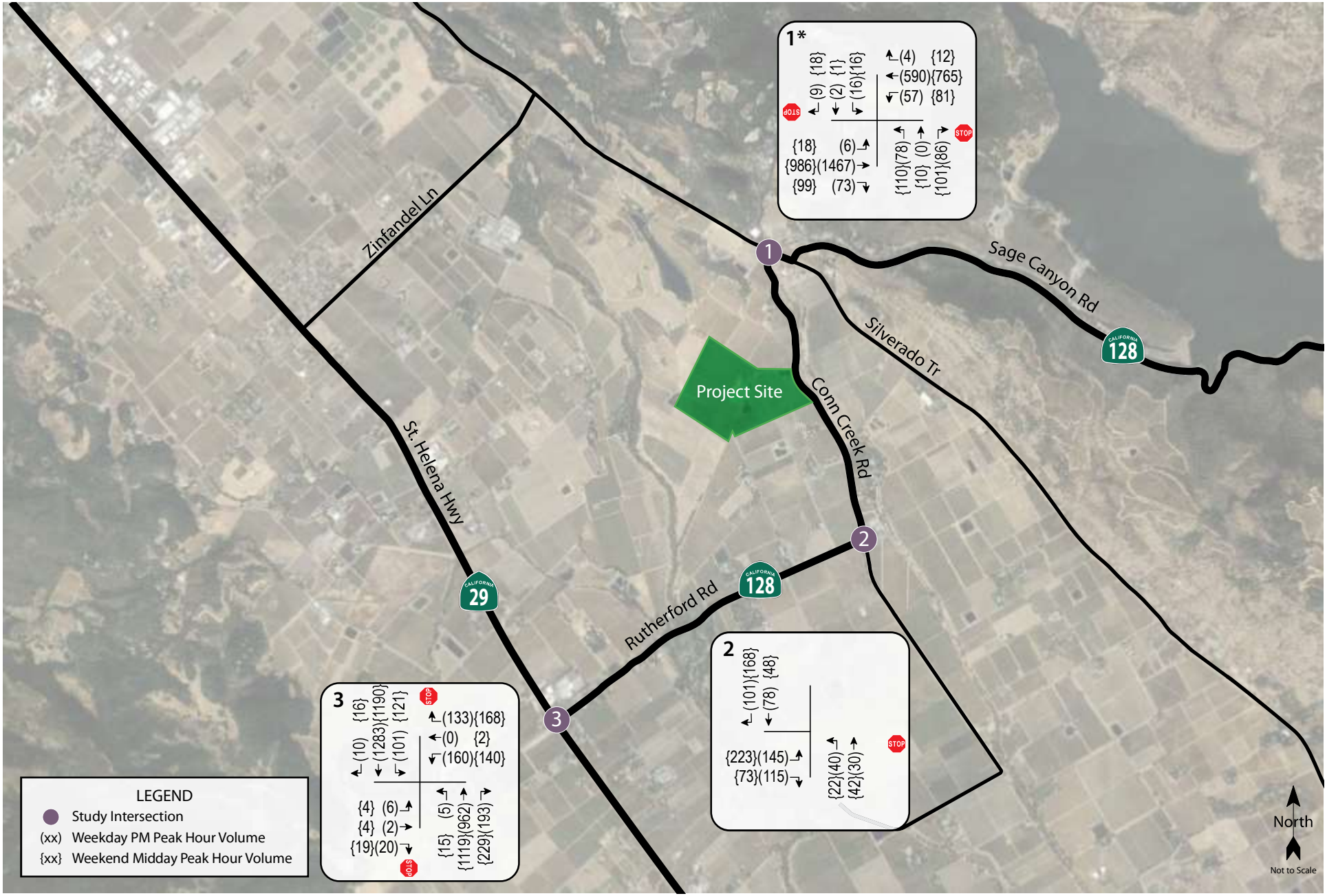
continue to operate at the same levels of service; however, the delay on the minor road approach would decrease by 69.1 seconds during the weekday peak periods. Because the addition of a deceleration lane would decrease the delay compared to conditions without the project, this improvement would adequately address the adverse effect per the County's standard. The Silverado Trail approaches would continue to operate acceptably above the County's LOS E standard.

- Similarly, average delay on the Rutherford Road approach to SR 29 is anticipated to increase during the weekend peak period upon adding project-generated traffic, with LOS F operation without or with the project. The increase in delay would exceed the County's five-second threshold; however, there are no feasible improvements that can be made to this intersection. It is noted that per the County's standards, LOS F operation is considered acceptable for SR 29.

Recommendation – The project applicant should pave the existing gravel shoulder to provide a deceleration lane on Silverado Trail at Conn Creek Road. Additionally, the applicant should implement a Transportation Demand Management (TDM) Plan to reduce trips generated by employees and visitors to the maximum extent possible to reduce the effect on operation at SR 29/Rutherford Road.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, and with the recommended improvements, Silverado Trail/Conn Creek Road and Rutherford Road/SR 29 are expected to continue operating unacceptably at LOS F overall and on the stop-controlled approaches during both peak periods. The Future plus Project operating conditions are summarized in Table 9 and the volumes for this scenario are presented in Figure 7.



* Silverado Trail is considered to run East-West at this intersection.

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Traffic Impact Study for the Frank Family Benjamin Ranch Winery Project

Figure 7 – Future plus Project Traffic Volumes

W-Trans

Table 9 – Future and Future plus Project Peak Hour Intersection Levels of Service								
Study Intersection ***Approach***	**Future Conditions**				**Future plus Project**			
	Weekday PM Peak		**Weekend PM Peak**		**Weekday PM Peak**		**Weekend PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Silverado Tr/Conn Creek Rd (SR 128)	**85.1**	**F**	**119.1**	**F**	**131.9**	**F**	**172.0**	**F**
NB (Conn Creek Rd) Approach	***1,207***	***F***	***1,219***	***F***	***1,730***	***F***	***1,661***	***F***
With SB Deceleration Lane	-	-	-	-	**92.2**	**F**	**118.1**	**F**
NB (Conn Creek Rd) Approach	-	-	-	-	***1,231***	***F***	***1,142***	***F***
2. Rutherford Rd (SR 128)/Conn Creek Rd (SR 128)	3.7	A	2.2	A	3.4	A	2.1	A
NB (Conn Creek Rd) Approach	*10.4*	*B*	*10.3*	*B*	*10.9*	*B*	*10.8*	*B*
3. Rutherford Rd (SR 128)/SR 29	***259.0***	***F***	***324.6***	***F***	***455.2***	***F***	***720.8***	***F***
WB (Rutherford Rd) Approach	***2,591***	***F***	***3,263***	***F***	***4394***	***F***	***6,779***	***F***

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation; Shaded cells = conditions with recommended improvements

Findings – Silverado Trail/Conn Creek Road and Rutherford Road/SR 29 will continue operating unacceptably with project traffic added, at the same Levels of Service as without it.

- The study intersection of Silverado Trail/Conn Creek Road would continue to experience unacceptable operation of LOS F overall and on the minor street approach during both peak hours without and with project-related traffic. The project's impact would be considered adverse under the County's standards because it adds more than five seconds to the overall delay and to the delay at the minor road approach. It is noted that signalization would achieve acceptable operation; however, given that this is not an option, alternative feasible mitigation measures were evaluated. With the addition of a deceleration lane on Silverado Trail, delay during the weekday p.m. peak hour would still increase by more than five seconds, indicating an adverse effect. On weekends the addition of the deceleration lane would improve operation to levels better than conditions without the project.

- Similarly, the intersection of Rutherford Road/SR 29 would operate unacceptably at LOS F during both peak hours, without and with project-generated trips added. The project would add more than five seconds to the overall delay during the weekday and weekend peak hours, exceeding the County's threshold. This is considered an adverse impact under the County's standards.

Recommendation – To mitigate the project's adverse effects, the project should pave the existing gravel shoulder to provide a deceleration lane on southbound Silverado Trail at Conn Creek Road. Because there are no feasible improvements to increase capacity at SR 29/ Rutherford Road besides signalization or additional measures feasible for Silverado Trail/Conn Creek Road, the applicant should implement a Transportation Demand Management Plan to reduce the project's effect on operation.

Queuing

Unsignalized Intersection

Under each scenario, the projected maximum queues in dedicated turn pockets at the study intersections were determined using a methodology contained in "Estimating Maximum Queue Length at Unsignalized Intersections," John T. Gard, *ITE Journal*, November 2001. Summarized in Table 10 are the predicted queue lengths in vehicles. A copy of the maximum queue length spreadsheet is provided in Appendix D.

Table 10 – Maximum Queues Exceeding Available Storage

Study Intersection Approach	Available Storage (vehs)	Maximum Queues							
		Weekday PM Peak				Weekend PM Peak			
		E	E+P	F	F+P	E	E+P	F	F+P
Silverado Trail/Conn Creek Rd (SR 128)									
Westbound (Silverado Tr) Left-Turn	7	1	2	2	3	2	2	3	3
Eastbound (Silverado Tr) Left-Turn	3	0	0	0	0	1	1	1	1
Rutherford Rd (SR 128)/SR 29									
Northbound (SR 29) Left-Turn	6	0	0	0	0	1	1	1	1
Southbound (SR 29) Left-Turn	6	3	3	3	5	3	3	3	6

Notes: All distances are measured in feet; E = existing conditions; E+P = existing plus project conditions; F = future conditions; F+P = future plus project conditions

Finding – Existing stacking space for all turn lanes at the study intersections is sufficient to accommodate queues with project traffic added. The project does not cause any queues to exceed available storage.

Vehicle Miles Traveled

Senate Bill (SB) 743 established a change in the metric to be applied for determining transportation impacts associated with development projects. Rather than the delay-based criteria associated with a Level of Service analysis, the increase in Vehicle Miles Traveled (VMT) as a result of a project is now the basis for determining California Environmental Quality Act (CEQA) impacts with respect to transportation and traffic. Guidance to assess project related VMT impacts has been provided by the California Governor's Office of Planning and Research (OPR) in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018. For most land uses, the OPR guidance recommends a significance threshold of 15 percent below a baseline level of weekday VMT, which represents travel patterns associated with existing development.

At the time of this analysis, the County of Napa had not established VMT thresholds of significance and was in the process of developing a countywide travel demand model which would provide the basis to quantify project VMT. In the absence of model data, County staff provided guidance to evaluate the VMT impact based on the number of weekday trips generated by the project; the threshold applied to the project was therefore a 15-percent reduction in the number of project-related trips that would be expected based on the County's trip generation spreadsheet.

Finding – The project would need to reduce the number of trips generated by employees and guests by 15 percent to have a VMT impact that is less than significant.

Transportation Demand Management Plan

To address the project's anticipated potential impact on VMT and adverse effects on traffic operation, implementation of a Transportation Demand Management (TDM) Plan is recommended. TDM measures aim to reduce single-occupancy vehicle trips during peak hours, parking demand, and total vehicle miles traveled (VMT) through use of alternative modes of transportation and more efficiently planned trips. Due to the project's rural location, the site does not have as many options to reduce VMT as one located in an urban environment, but the winery would have up to 46 full-time and 15 part-time employees, as well as up to 300 daily visitors so there is potential to reduce vehicular trips and parking demand with implementation of a TDM program.

The County has established metrics for estimating the trip generation of wineries. This adopted standard includes 3.05 trips per day for full-time employees and 1.90 trips per day for part-time employees. Visitors to the tasting room are assumed to arrive with an average of 2.6 persons per vehicle based on past data collected by the County. To achieve a 15-percent reduction in vehicle miles traveled, a 15-percent reduction in trips is suggested. To would translate to full-time employees making an average of 2.59 trips per day, part-time employees generating 1.62 trips per day and guests arriving at an average occupancy of 3.06 persons per vehicle.

The focus of the project's TDM Program would be to provide information, encouragement, and access to travel options to reduce the number of vehicle trips during peak hours and overall, thus reducing VMT. The following measures are suggested and are consistent with the goals of Caltrans' *Smart Mobility 2010: A Call to Action for the New Decade*. It is recommended that the incentives offered as part of the program be available for the first two years of operation, after which the effectiveness of the program should be reevaluated and modified, if needed.

Ridesharing Program

Carpooling is one of the most common and cost-effective alternative modes of transportation and one that commuters can adopt part-time. There are numerous benefits to ridesharing. Carpooling can reduce peak-period vehicle trips and increase commuters' travel choices. Further, it reduces congestion, road and parking facility costs and pollution emissions. Carpooling tends to have the lowest cost per passenger-mile of any motorized mode of transportation, since it makes use of a vehicle seat that would otherwise be empty. Carpooling also provides consumer financial savings by decreasing fuel and parking costs.

Ridematching

The greatest barrier to workplace carpooling is often simply being able to identify and travel with other nearby employees. Fortunately, there are many services that can assist in pairing employees within the same organization or across organizations. The most basic publicly available service is 511.org's free ridematching service. There are also various private ridematching providers (e.g. Zimride, RideAmigos, Via, Scoop) that can effectively create carpool networks while making them safe and convenient for their users. The Napa Valley Transportation Authority (NVTA) uses RideAmigos as a resource for local employers as part of its V-Commute program.

Tele-Work/Compressed/Flex Schedules

Telework (i.e. working from home) and compressed schedules (i.e. working more than eight hours each day and shortening the work week) are among the most commonly employed scheduling means to reduce vehicle trips. While many winery employees are required to be on-site to perform their jobs, some staff may be able to take advantage of these options.

Guaranteed Ride Home Program

One of the reasons that many employees do not carpool to work is the fear of being stranded should they need to leave in an emergency. Employees who carpool to work should be guaranteed a ride home in the case of an emergency or unique situation. The Napa Valley Transportation Authority (NVTA) offers a Guaranteed Ride Home (GRH) program, which is available to employees who carpool or commute via alternative modes. Participants are be able to use a taxi, rental car, Lyft, Uber, or other means to get home in an emergency – such as taking care of a sick child or other unexpected need – and are reimbursed for the full cost of the service. The program is available to all who work or attend college in Napa County and is free to join, but registration is required. As part of the project's TDM program, employees would be provided information about V-Commute and would be encouraged to register for the service.

On-Site Amenities

Although it is not a transportation program in itself, on-site employee and visitor amenities serve to reduce vehicle trips. This can take many forms depending on the need. For example, providing lunch or food options on-site allows workers and visitors to forgo midday trips to purchase lunch.

Cash-Out

A cash-out program operates when employers pay their employees a cash incentive for the days they use an alternative mode of transportation (transit, bike, walk, or carpool to work) to help reduce vehicle commute trips and emissions. The cash value of the subsidy can be equal to the cost they would otherwise incur for travel and would be offered to both employees who carpool to provide an equitable benefit.

Education, Outreach & Marketing

Transportation Coordinator

The presence of a staff person dedicated part-time to overseeing and managing the TDM program is helpful in ensuring the ongoing success of these programs. This would not be a distinct position, but instead would be a role that is integrated into the on-site manager. The duties for this position could include the following:

- Create and distribute employee transportation information welcome packets
- Maintain and update a bulletin board or other physical source of transportation information
- Distribute Napa Bicycle Coalition maps
- Monitor bicycle facilities
- Administer the cash-out program
- Promote the ride-matching program

Welcome Packet for New Employees

New employees should be provided with a welcome packet containing relevant transportation information. The packet could include information about NVTA's V-Commute program, which offers resources related to non-automobile transportation options, such as bicycle transportation information, ride-matching services, and the guaranteed ride home program. Transit maps for Vine Transit service could also be provided.

Visitor Transportation Information

The site is located north of the City of Napa in an area that contains numerous other wineries and tasting rooms, so the project is likely to attract a substantial amount of linked traffic from guests visiting multiple tasting rooms in the area rather than generating new trips associated with the project itself. As is typical with existing wineries in the area, visitors in large groups often arrange for their own private van or shuttle transportation, resulting in fewer trips to and from the site than might otherwise occur. This is a common means of transportation as most visitors intend to drink wine, which can impair driving abilities.

Providing guests with on-line information regarding transportation options for travel to the winery can help encourage guests to consider non-auto or rideshare options. This information should be emailed or mailed to guests as part of their registration confirmation process to assist in their logistics planning. Guests making appointments for four or more persons should be encouraged to use private vans or a shuttle for their entire group.

Monitor Performance

It is important to continually monitor the performance of a TDM program and adjust measures as necessary to ensure its success. Employers should conduct mode split and VMT surveys before the implementation of a TDM program and each year thereafter to both make adjustments and use as a marketing material. Employee satisfaction surveys are also an effective way of ensuring a quality TDM program.

Bicycle Benefits

Bicycle Parking

The provision of both short-term and long-term bicycle parking is important. Secure long-term parking (e.g. bike lockers) is a critical component in encouraging employees to bike to work as the lack of secure parking is often cited by employees as a deterrent. Short-term parking (e.g. bike racks) can be utilized by employees or visitors and is generally an inexpensive way to accommodate visitors traveling between wineries.

Changing & Shower Facilities

Bicycling to work can be an attractive option for employees, but it is less so if the employee appears sweaty or unkempt after a long ride. By offering a basic shower and changing facility, employers give workers the reassurance that they can bike to work and still appear presentable to visitors.

Shared Bicycles & Maintenance Tools

Many businesses have experience in providing one or more vehicles on-site for employee use during work hours. Today, many employers are offering the same benefit in the form of shared bicycles for employee or guest use. These bicycles are ideal for short trips and are a cost-effective way of providing a new

mobility option to nearby wineries or other destinations during the workday. Bicycles that are shared or used by individuals can be serviced with simple tools such as a pump and tire patches that are kept on-site.

Recommendation – It is recommended that TDM measures be implemented that result in a 15-percent reduction from the metrics typically associated with winery activity. Activity at the winery should be monitored to ensure that, on average, full-time employees generate 2.59 trips per day, part-time employees generate 1.62 trips per day and guests arrive at an occupancy of 3.06 persons per vehicle. It is suggested that the monitoring occur for one week every month, ideally covering the same dates for every month; this data would then be averaged over the course of the year to achieve annualized rates.

Alternative Modes

Pedestrian Facilities

Consistent with expectations for a rural area, there are no existing pedestrian facilities in the project vicinity.

Finding – While there are no pedestrian facilities serving the project site, pedestrian trips to and from the site are not expected, so this condition is acceptable.

Bicycle Facilities

Existing bike lanes on Silverado Trail, together with planned future facilities and the shared use of minor streets, provide adequate access for bicyclists.

Finding – Bicycle facilities serving the project site will be adequate upon completion of planned facilities.

Recommendation – The applicant should dedicate the necessary frontage along the west side of Conn Creek Road to implement planned bicycle facilities for this roadway.

Bicycle Storage

The County does not have specific bicycle parking requirements for wineries; however, the project should provide bicycle parking consistent with the requirements outlined in Chapter 18.110.040 of the Napa County Code of Ordinances which states that ten bicycle parking spaces should be provided for all nonresidential uses where ten or more automobile parking spaces are required. With a proposed supply of 75 permanent vehicle parking spaces, the project would need to provide ten bicycle spaces on-site.

Recommendation – The applicant should ensure that parking for a minimum of ten bicycles is provided on-site, preferably near the tasting room.

Transit

While there are no transit facilities serving the project site, there is also no anticipated need for such service.

Finding – The lack of transit access does not result in an impact given the limited potential for any demand.

Access and Circulation

Site Access

The winery would be accessed via a new paved driveway on Conn Creek Road, which would be stop-controlled on its approach to Conn Creek Road.

Access Analysis

Left-Turn Lane Warrants

Consideration was given to the need for a left-turn lane on Conn Creek Road to serve project traffic. As access would be taken from a State highway, the need for a left-turn lane was evaluated based on criteria used by Caltrans and contained in the *Intersection Channelization Design Guide*, National Cooperative Highway Research Program (NCHRP) Report No. 279, Transportation Research Board, 1985, as well as an update of the methodology developed by the Washington State Department of Transportation and published in the *Method For Prioritizing Intersection Improvements*, January 1997. The NCHRP report references a methodology developed by M. D. Harmelink that includes equations that can be applied to expected or actual traffic volumes in order to determine the need for a left-turn pocket based on safety issues. Additionally, the methodology set forth in the *Guidelines for Reconstruction of Intersections*, August 1985, was referenced.

Based on volumes for both the Existing plus Project and Future plus Project scenarios, a left-turn lane is not warranted at the project driveway using the TRB methodology. Applying the Caltrans guidance and the highest volumes for any of the four scenarios evaluated, which are for the future weekend peak hour, with approximately 250 opposing vehicles left turns would need to comprise 30 percent of an advancing volume of about 250 vehicles, or 75 left turns, to warrant installation of a left-turn lane. As the volumes anticipated during the largest event planned of 30 left turns would comprise about 12 percent of the advancing volume based on the distribution assumptions applied, a left-turn lane is not warranted using this criterion. Even if all 53 inbound trips associated with a 150-person event were assumed to turn left during a single hour, that would comprise about 21 percent of the approaching volume and remain well below the 75 left turns needed to meet the criteria. Copies of the calculations for the TRB methodology indicating the volumes for all scenarios as well as a copy of the Table V-1 from the Caltrans guidelines are provided in Appendix E.

Delay for drivers exiting the site from the driveway was reviewed for the highest volume and therefore "worst-case" future scenarios during the p.m. weekday peak as well as the Saturday peak to determine the potential on-site delay. During the weekday p.m. peak period, the project driveway is anticipated to have an average delay of 9.5 seconds. For the Saturday peak period, the delay leaving the site would average 11.2 seconds. Given the minimal delay expected at the driveway, the driveway is expected to operate acceptably.

Sight Distance

At unsignalized intersections a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Adequate time must be

provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed.

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

Sight lines along Conn Creek Road from the edge of traveled way in both directions from the driveway are clear for more than 500 feet, which exceeds the minimum sight distance required for vehicles traveling at 55 mph. Similarly, drivers on Conn Creek Road will have visibility of a vehicle stopped to turn left into the driveway for more than 500 feet.

Finding – Stopping sight distance at the project driveway is adequate to meet the applied criteria for both entering and exiting movements.

Recommendation – Because landscaping and signs can impede clear sight lines, any new plantings or signs should be designed to ensure that adequate sight lines will be maintained.

Site Circulation

The AutoTURN application of AutoCAD was used to evaluate the adequacy of on-site circulation for fire trucks and commercial trucks. As designed, there would be no anticipated issues with either of these types of vehicles accessing or circulating through the project site. Exhibits showing the expected travel paths are provided in Appendix E.

Finding – On-site circulation is expected to operate acceptably.

Emergency Evacuation

Consideration was given to the project's potential effect on the ability of residents, guests, and employees to evacuate the area in the case of a wildfire. Should such events occur during the nighttime hours, the winery would be closed, so there would be no effect. However, during daytime hours any employees or guests on-site would need to be evacuated in the event of a wildfire. As has been evidenced over the past two fire seasons, response personnel are asking for evacuations well in advance of any potential for a wildfire to reach developed areas, including the valley floor where the winery is located. It is therefore reasonable to anticipate that there would be sufficient notice for any persons at the winery when an evacuation was required would have sufficient time to exit the area, though it is noted that traffic conditions result in substantial delay during an evacuation but the nominal additional vehicles associated with the winery project would not cause any appreciable change in this condition.

Because such evacuations would typically only occur during warm weather when a combination of high winds, low humidity and dry conditions combine to result in higher chances for a large wildfire, it is recommended that the applicant prohibit visitation to the winery during "red flag" days. Such conditions are typically anticipated days in advance, so winery staff would have adequate notice to cancel any planned visitations and post the closure notice on their webpage.

Finding – There is a potential for the site to be impacted by wildfire events.

Recommendation – To minimize the number of persons on-site in the event of an evacuation, visitation (including events) should be cancelled on “red flag” days.

Parking

The project was analyzed to determine whether the proposed parking supply would be sufficient for the anticipated daily demand during harvest conditions as well as during events. The project site, as proposed, would have 89 standard parking spaces and five accessible parking spaces for a total of 94 parking spaces. It is understood that rideshare services such as Uber and Lyft as well as shuttles would be used to transport guests to the site during events.

To accommodate the daily parking demand for the tasting room, there should be at least one space provided for every employee on-site, as well as parking stalls for about 25 percent of the expected daily tasting room visitors. During typical daily operations there would be 46 full-time and 15 part-time employees and a maximum of 300 visitors per day to the tasting room. Assuming the County's standard occupancy rate of 2.8 guests per vehicle, a total of 107 guest vehicles would require parking over the course of the day. Therefore, the proposed project would need at least 88 parking spaces, including 61 for employees and 27 for guests assuming one-quarter of the guests would be there at any one time. The proposed supply of 94 spaces would sufficient to accommodate the approximate day-to-day peak demand of 88 spaces.

The maximum number of parking spaces that would be needed on-site to accommodate employees and visitors during a 150-person marketing event was also estimated using the County's standard vehicle occupancies of one employee or 2.8 visitors per vehicle. It is noted that tastings could be scheduled during events; however, the daily combined tours and tasting and marketing event visitation shall not exceed 300 persons. Based on these operational parameters, during a 150-person event, a total of 135 parking spaces would be needed, including 54 for event guests, 20 for typical winery tasting guests, and 61 for winery employees. Therefore, the total parking supply at the winery is insufficient to meet the anticipated parking demand for the largest event, experiencing a shortfall of 41 spaces.

The second largest event would be a 24-person event. Assuming staffing levels are maintained at the typical daily levels, the parking required for a 24-person event would be 97 spaces, including nine for event guests, 27 for guests visiting the winery tasting room, and 61 for winery employees. Therefore, the proposed supply is deficient by three spaces to meet the anticipated demand for 24-person events. This deficiency could be offset by reducing the number of tasting room appointments during events to no more than 75 persons per hour.

Finding – The proposed permanent parking supply is adequate for the anticipated demand during typical harvest operation but inadequate for the anticipated demand during events.

Recommendation – The applicant should reduce the number of tasting room guests allowed during a 24-person event to 75 in a single hour to achieve an adequate parking supply.

Recommendation – As proposed, the applicant should provide a shuttle service and arrange for guests to park off-site during events with 150 guests.

Conclusions and Recommendations

Conclusions

- The project is expected to generate a 408 new trips per day on Fridays, including 69 trips during the p.m. peak hour and 340 trips on Saturdays, with 65 trips during the weekend peak hour.
- Silverado Trail/Conn Creek Road is currently operating unacceptably at LOS F on the minor street approach during both peak periods. The project adds more than five seconds of delay to the stop-controlled northbound approach for existing and future conditions during the weekday and/or weekend peak hours, which is considered an adverse effect on operation. Provision of a deceleration lane would achieve an acceptable effect for all scenarios except the weekday p.m. peak period under Future volumes. The project would therefore have an adverse effect on operation of this intersection.
- The intersection of Rutherford Road/SR 29 is currently operating at LOS E or F overall and at LOS F on the stop-controlled Rutherford Road approach during the two peak hours evaluated and would be expected to operate with higher delays during both peak hours in the future and with project traffic added. The project adds more than five seconds of delay overall and to the minor approach for future conditions during the weekday and weekend peak periods; therefore, the impact is considered adverse under the County's criteria.
- The project would not cause any turn pocket queues at the study intersections to exceed available storage.
- The lack of pedestrian facilities serving the project site does not result in an impact given the rural location and type of project.
- Similarly, the lack of transit service does not result in an impact due to the lack of demand for such services.
- The parking supply is adequate for the anticipated demand during harvest.
- Fire truck and commercial vehicle access are expected to operate acceptably.
- Sight distances along Conn Creek Road at the location of the proposed project driveway are adequate.
- A left-turn lane is not warranted at the project driveway on Conn Creek Road based on either the TRB or Caltrans methodologies.

Recommendations

- The project should include paving the existing gravel shoulder along southbound Silverado Trail to create a separate deceleration lane at Conn Creek Road while maintaining the existing bicycle lane.
- The applicant should establish a TDM plan to reduce peak hour trips, thereby reducing the effect on traffic operation, and to reduce VMT to a level 15-percent below that typical of Napa County wineries.

A monitoring program should be established to verify that the measures implemented achieve the appropriate reductions in employee and visitor trips.

- The applicant should dedicate right-of-way along the project frontage, if necessary, to accommodate the planned future bicycle facilities on Conn Creek Road.
- Secure parking facilities for at least ten bicycles should be provided on-site.
- Because landscaping and signs can impede clear sight lines, any new plantings or signs should be designed to ensure that adequate sight lines will be maintained.
- As proposed, the applicant should provide a shuttle service and arrange for guests to park off-site during the largest 150-person events. For the proposed 24-person events, the applicant should limit visitation in the tasting room to 75 persons.
- Visitation to the winery should be cancelled on "red flag" days to ensure that a limited number of people would be on-site in the event of an evacuation.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE, PTOE
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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Calculations

TIS for the Frank Family Benjamin Ranch Winery

Intersection # 1: Silverado Trail & Conn Creek Road (SR 128)
Date of Count: Friday, October 6, 2017

Number of Collisions: 9
Number of Injuries: 0
Number of Fatalities: 0
ADT: 18100
Start Date: April 1, 2014
End Date: March 31, 2019
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Stop & Yield Controls
Area: Rural

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{9 \times 1{,}000{,}000}{18{,}100 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.27 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.23 c/mve**	**2.0%**	**40.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 2: Rutherford Road (SR 128) & Conn Creek Road (SR 128)
Date of Count: Friday, October 6, 2017

Number of Collisions: 2
Number of Injuries: 1
Number of Fatalities: 0
ADT: 3200
Start Date: April 1, 2014
End Date: March 31, 2019
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Rural

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{2 \times 1{,}000{,}000}{3{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.34 c/mve**	**0.0%**	**50.0%**
Statewide Average*	**0.16 c/mve**	**1.7%**	**39.2%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

TIS for the Frank Family Benjamin Ranch Winery

Intersection # 3: SR 29 & Rutherford Road (SR 128)
Date of Count: Friday, October 6, 2017

Number of Collisions: 15
Number of Injuries: 7
Number of Fatalities: 0
ADT: 22900
Start Date: April 1, 2014
End Date: March 31, 2019
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Stop & Yield Controls
Area: Rural

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{15 \times 1{,}000{,}000}{22{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.36 c/mve**	**0.0%**	**46.7%**
Statewide Average*	**0.23 c/mve**	**2.0%**	**40.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

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Intersection	
Int Delay, s/veh	16.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1054	49	18	541	4	63	0	49	14	1	8
Future Vol, veh/h	5	1054	49	18	541	4	63	0	49	14	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	5	1098	51	19	564	4	66	0	51	15	1	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	568	0	0	1149	0	0	1743	1740	1124	1763	1763	566
Stage 1	-	-	-	-	-	-	1134	1134	-	604	604	-
Stage 2	-	-	-	-	-	-	609	606	-	1159	1159	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1014	-	-	615	-	-	69	88	252	66	85	528
Stage 1	-	-	-	-	-	-	249	280	-	489	491	-
Stage 2	-	-	-	-	-	-	486	490	-	241	272	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1014	-	-	615	-	-	~ 65	85	252	51	82	528
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 65	85	-	51	82	-
Stage 1	-	-	-	-	-	-	248	279	-	487	476	-
Stage 2	-	-	-	-	-	-	463	475	-	191	271	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	242.1	72.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	96	1014	-	-	615	-	-	76
HCM Lane V/C Ratio	1.215	0.005	-	-	0.03	-	-	0.315
HCM Control Delay (s)	242.1	8.6	-	-	11	-	-	72.8
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	8	0	-	-	0.1	-	-	1.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3.3

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	19	10	85	108	55	44
Future Vol, veh/h	19	10	85	108	55	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	21	11	92	117	60	48

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	260	92	0	-	92	0
Stage 1	92	-	-	-	-	-
Stage 2	168	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	733	971	-	0	1515	-
Stage 1	937	-	-	0	-	-
Stage 2	867	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	703	971	-	-	1515	-
Mov Cap-2 Maneuver	703	-	-	-	-	-
Stage 1	899	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	9.7	0	4.2
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	703	971	1515	-
HCM Lane V/C Ratio	-	0.029	0.011	0.039	-
HCM Control Delay (s)	-	10.3	8.7	7.5	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.1	0	0.1	-

HCM 6th TWSC
3: SR 29 & Driveway/Rutherford Rd 06/10/2019

Intersection	
Int Delay, s/veh	73.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	17	98	0	68	4	817	128	67	1077	8
Future Vol, veh/h	4	1	17	98	0	68	4	817	128	67	1077	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	2	1	0	0	1	2	0	1	0
Mvmt Flow	4	1	18	105	0	73	4	878	138	72	1158	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2299	2331	1163	2202	2197	878	1167	0	0	1016	0	0
Stage 1	1307	1307	-	886	886	-	-	-	-	-	-	-
Stage 2	992	1024	-	1316	1311	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	28	37	239	~ 32	45	350	606	-	-	691	-	-
Stage 1	198	232	-	339	364	-	-	-	-	-	-	-
Stage 2	299	315	-	194	230	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	20	33	239	~ 26	40	350	606	-	-	691	-	-
Mov Cap-2 Maneuver	20	33	-	~ 26	40	-	-	-	-	-	-	-
Stage 1	197	208	-	337	361	-	-	-	-	-	-	-
Stage 2	235	313	-	160	206	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	76.4	$ 1000.1	0	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	606	-	-	73	26	350	691	-	-
HCM Lane V/C Ratio	0.007	-	-	0.324	4.053	0.209	0.104	-	-
HCM Control Delay (s)	11	-	-	76.8	$ 1681.5	18	10.8	-	-
HCM Lane LOS	B	-	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	1.2	13	0.8	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
1: Conn Creek Rd/Driveway & Silverado Trail 10/03/2019

Intersection	
Int Delay, s/veh	22.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	599	59	28	689	11	85	9	58	4	0	17
Future Vol, veh/h	9	599	59	28	689	11	85	9	58	4	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	10	651	64	30	749	12	92	10	63	4	0	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	761	0	0	715	0	0	1527	1524	683	1555	1550	755
Stage 1	-	-	-	-	-	-	703	703	-	815	815	-
Stage 2	-	-	-	-	-	-	824	821	-	740	735	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	860	-	-	895	-	-	97	119	453	93	115	412
Stage 1	-	-	-	-	-	-	431	443	-	374	394	-
Stage 2	-	-	-	-	-	-	370	391	-	412	428	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	860	-	-	895	-	-	~ 89	114	453	72	110	412
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 89	114	-	72	110	-
Stage 1	-	-	-	-	-	-	426	438	-	370	381	-
Stage 2	-	-	-	-	-	-	342	378	-	343	423	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	229.3	23.5
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	131	860	-	-	895	-	-	217
HCM Lane V/C Ratio	1.261	0.011	-	-	0.034	-	-	0.105
HCM Control Delay (s)	229.3	9.2	-	-	9.2	-	-	23.5
HCM Lane LOS	F	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	10.3	0	-	-	0.1	-	-	0.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	1.6

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	19	13	134	68	13	77
Future Vol, veh/h	19	13	134	68	13	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	21	14	146	74	14	84

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	258	146	0	-	146	0
Stage 1	146	-	-	-	-	-
Stage 2	112	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	735	906	-	0	1448	-
Stage 1	886	-	-	0	-	-
Stage 2	918	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	728	906	-	-	1448	-
Mov Cap-2 Maneuver	728	-	-	-	-	-
Stage 1	877	-	-	-	-	-
Stage 2	918	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	9.7	0	1.1
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	728	906	1448	-
HCM Lane V/C Ratio	-	0.028	0.016	0.01	-
HCM Control Delay (s)	-	10.1	9	7.5	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.1	0	0	-

Intersection	
Int Delay, s/veh	44.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	3	16	71	2	76	13	965	138	68	1012	13
Future Vol, veh/h	3	3	16	71	2	76	13	965	138	68	1012	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0	0	1	1	0	1	0
Mvmt Flow	3	3	17	74	2	79	14	1005	144	71	1054	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2349	2380	1061	2246	2243	1005	1068	0	0	1149	0	0
Stage 1	1203	1203	-	1033	1033	-	-	-	-	-	-	-
Stage 2	1146	1177	-	1213	1210	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	25	35	274	~ 30	43	296	660	-	-	615	-	-
Stage 1	227	260	-	283	312	-	-	-	-	-	-	-
Stage 2	245	267	-	224	258	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	16	30	274	~ 23	37	296	660	-	-	615	-	-
Mov Cap-2 Maneuver	16	30	-	~ 23	37	-	-	-	-	-	-	-
Stage 1	222	230	-	277	305	-	-	-	-	-	-	-
Stage 2	174	261	-	184	228	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	89.8	$ 691.5	0.1	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	660	-	-	64	23	296	615	-	-
HCM Lane V/C Ratio	0.021	-	-	0.358	3.306	0.267	0.115	-	-
HCM Control Delay (s)	10.6	-	-	89.8	$ 1389	21.5	11.6	-	-
HCM Lane LOS	B	-	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.3	9.6	1.1	0.4	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	85.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	1467	60	49	590	4	78	0	76	16	2	9
Future Vol, veh/h	6	1467	60	49	590	4	78	0	76	16	2	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	6	1467	60	49	590	4	78	0	76	16	2	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	594	0	0	1527	0	0	2205	2201	1497	2237	2229	592
Stage 1	-	-	-	-	-	-	1509	1509	-	690	690	-
Stage 2	-	-	-	-	-	-	696	692	-	1547	1539	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	992	-	-	442	-	-	~ 32	45	152	31	43	510
Stage 1	-	-	-	-	-	-	152	185	-	439	449	-
Stage 2	-	-	-	-	-	-	435	448	-	145	179	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	442	-	-	~ 28	40	152	~ 14	38	510
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 28	40	-	~ 14	38	-
Stage 1	-	-	-	-	-	-	151	184	-	436	399	-
Stage 2	-	-	-	-	-	-	378	398	-	72	178	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.1	$ 1206.5	$ 524.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	47	992	-	-	442	-	-	22
HCM Lane V/C Ratio	3.277	0.006	-	-	0.111	-	-	1.227
HCM Control Delay (s)	$ 1206.5	8.7	-	-	14.2	-	-	$ 524.7
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	16.8	0	-	-	0.4	-	-	3.5

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3.7

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	40	30	120	115	78	88
Future Vol, veh/h	40	30	120	115	78	88
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	40	30	120	115	78	88

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	364	120	0	-	120	0
Stage 1	120	-	-	-	-	-
Stage 2	244	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	639	937	-	0	1480	-
Stage 1	910	-	-	0	-	-
Stage 2	801	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	604	937	-	-	1480	-
Mov Cap-2 Maneuver	604	-	-	-	-	-
Stage 1	860	-	-	-	-	-
Stage 2	801	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	10.4	0	3.6
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	604	937	1480	-
HCM Lane V/C Ratio	-	0.066	0.032	0.053	-
HCM Control Delay (s)	-	11.4	9	7.6	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.2	0.1	0.2	-

HCM 6th TWSC
3: SR 29 & Driveway/Rutherford Rd 09/23/2019

Intersection	
Int Delay, s/veh	259

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	2	20	160	0	120	5	962	180	89	1283	10
Future Vol, veh/h	6	2	20	160	0	120	5	962	180	89	1283	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	2	1	0	0	1	2	0	1	0
Mvmt Flow	6	2	20	160	0	120	5	962	180	89	1283	10

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2588	2618	1288	2449	2443	962	1293	0	0	1142	0	0
Stage 1	1466	1466	-	972	972	-	-	-	-	-	-	-
Stage 2	1122	1152	-	1477	1471	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	17	25	202	~ 21	32	313	543	-	-	619	-	-
Stage 1	161	194	-	304	332	-	-	-	-	-	-	-
Stage 2	252	275	-	~ 157	192	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	9	21	202	~ 16	27	313	543	-	-	619	-	-
Mov Cap-2 Maneuver	9	21	-	~ 16	27	-	-	-	-	-	-	-
Stage 1	160	166	-	301	329	-	-	-	-	-	-	-
Stage 2	154	273	-	~ 120	164	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	286.9	$ 2590.8	0.1	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	543	-	-	33	16	313	619	-	-
HCM Lane V/C Ratio	0.009	-	-	0.848	10	0.383	0.144	-	-
HCM Control Delay (s)	11.7	-	-	286.9	4516.2	23.5	11.8	-	-
HCM Lane LOS	B	-	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	2.9	20.9	1.7	0.5	-	-

Notes
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 TWSC
1: Conn Creek Rd/Driveway & Silverado Trail 10/03/2019

Intersection	
Int Delay, s/veh	119.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	986	90	75	765	12	110	10	87	16	1	18
Future Vol, veh/h	18	986	90	75	765	12	110	10	87	16	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	18	986	90	75	765	12	110	10	87	16	1	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	777	0	0	1076	0	0	1998	1994	1031	2037	2033	771
Stage 1	-	-	-	-	-	-	1067	1067	-	921	921	-
Stage 2	-	-	-	-	-	-	931	927	-	1116	1112	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	848	-	-	656	-	-	~ 45	61	286	43	58	403
Stage 1	-	-	-	-	-	-	271	301	-	327	352	-
Stage 2	-	-	-	-	-	-	323	350	-	254	287	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	848	-	-	656	-	-	~ 38	53	286	23	50	403
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 38	53	-	23	50	-
Stage 1	-	-	-	-	-	-	265	295	-	320	312	-
Stage 2	-	-	-	-	-	-	272	310	-	167	281	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1	$ 1219.1	201.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	61	848	-	-	656	-	-	46
HCM Lane V/C Ratio	3.393	0.021	-	-	0.114	-	-	0.761
HCM Control Delay (s)	$ 1219.1	9.3	-	-	11.2	-	-	201.8
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	21.8	0.1	-	-	0.4	-	-	3

Notes
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.2

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	22	42	205	73	48	150
Future Vol, veh/h	22	42	205	73	48	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	22	42	205	73	48	150

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	451	205	0	-	205	0
Stage 1	205	-	-	-	-	-
Stage 2	246	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	570	841	-	0	1378	-
Stage 1	834	-	-	0	-	-
Stage 2	800	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	548	841	-	-	1378	-
Mov Cap-2 Maneuver	548	-	-	-	-	-
Stage 1	802	-	-	-	-	-
Stage 2	800	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	10.3	0	1.9
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	548	841	1378	-
HCM Lane V/C Ratio	-	0.04	0.05	0.035	-
HCM Control Delay (s)	-	11.8	9.5	7.7	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.1	0.2	0.1	-

Intersection	
Int Delay, s/veh	324.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	19	140	2	150	15	1119	220	112	1190	16
Future Vol, veh/h	4	4	19	140	2	150	15	1119	220	112	1190	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	1	1	0	1	0
Mvmt Flow	4	4	19	140	2	150	15	1119	220	112	1190	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2757	2791	1198	2583	2579	1119	1206	0	0	1339	0	0
Stage 1	1422	1422	-	1149	1149	-	-	-	-	-	-	-
Stage 2	1335	1369	-	1434	1430	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	13	19	228	~ 17	26	254	586	-	-	521	-	-
Stage 1	171	204	-	244	275	-	-	-	-	-	-	-
Stage 2	191	216	-	168	202	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	4	15	228	~ 10	20	254	586	-	-	521	-	-
Mov Cap-2 Maneuver	4	15	-	~ 10	20	-	-	-	-	-	-	-
Stage 1	167	160	-	238	268	-	-	-	-	-	-	-
Stage 2	76	210	-	~ 118	159	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 603.7	$ 3262.9	0.1	1.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	586	-	-	20	10	254	521	-	-
HCM Lane V/C Ratio	0.026	-	-	1.35	14.2	0.591	0.215	-	-
HCM Control Delay (s)	11.3	-	-	$ 603.7	$ 6669.9	37.7	13.8	-	-
HCM Lane LOS	B	-	-	F	F	E	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.6	19.3	3.4	0.8	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	19.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1054	62	26	541	4	63	0	59	14	1	8
Future Vol, veh/h	5	1054	62	26	541	4	63	0	59	14	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	5	1098	65	27	564	4	66	0	61	15	1	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	568	0	0	1163	0	0	1766	1763	1131	1791	1793	566
Stage 1	-	-	-	-	-	-	1141	1141	-	620	620	-
Stage 2	-	-	-	-	-	-	625	622	-	1171	1173	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1014	-	-	608	-	-	66	85	250	63	82	528
Stage 1	-	-	-	-	-	-	246	278	-	479	483	-
Stage 2	-	-	-	-	-	-	476	482	-	237	268	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1014	-	-	608	-	-	~ 62	81	250	46	78	528
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 62	81	-	46	78	-
Stage 1	-	-	-	-	-	-	245	277	-	477	462	-
Stage 2	-	-	-	-	-	-	447	461	-	178	267	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	275.4	82.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	97	1014	-	-	608	-	-	69
HCM Lane V/C Ratio	1.31	0.005	-	-	0.045	-	-	0.347
HCM Control Delay (s)	275.4	8.6	-	-	11.2	-	-	82.7
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	9	0	-	-	0.1	-	-	1.3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	2.8

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	19	10	110	108	55	57
Future Vol, veh/h	19	10	110	108	55	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	21	11	120	117	60	62

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	302	120	0	-	120	0
Stage 1	120	-	-	-	-	-
Stage 2	182	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	694	937	-	0	1480	-
Stage 1	910	-	-	0	-	-
Stage 2	854	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	665	937	-	-	1480	-
Mov Cap-2 Maneuver	665	-	-	-	-	-
Stage 1	910	-	-	-	-	-
Stage 2	818	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	10	0	3.7
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	665	937	1480	-
HCM Lane V/C Ratio	-	0.031	0.012	0.04	-
HCM Control Delay (s)	-	10.6	8.9	7.5	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.1	0	0.1	-

Intersection	
Int Delay, s/veh	76.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	17	98	0	81	4	817	141	79	1077	8
Future Vol, veh/h	4	1	17	98	0	81	4	817	141	79	1077	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	2	1	0	0	1	2	0	1	0
Mvmt Flow	4	1	18	105	0	87	4	878	152	85	1158	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2339	2371	1163	2228	2223	878	1167	0	0	1030	0	0
Stage 1	1333	1333	-	886	886	-	-	-	-	-	-	-
Stage 2	1006	1038	-	1342	1337	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	26	35	239	~ 31	44	350	606	-	-	682	-	-
Stage 1	192	225	-	339	364	-	-	-	-	-	-	-
Stage 2	293	311	-	188	223	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	18	30	239	~ 25	38	350	606	-	-	682	-	-
Mov Cap-2 Maneuver	18	30	-	~ 25	38	-	-	-	-	-	-	-
Stage 1	191	197	-	337	361	-	-	-	-	-	-	-
Stage 2	219	309	-	151	195	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	85.6	$ 974.7	0	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	606	-	-	67	25	350	682	-	-
HCM Lane V/C Ratio	0.007	-	-	0.353	4.215	0.249	0.125	-	-
HCM Control Delay (s)	11	-	-	85.5	$ 1764.8	18.7	11	-	-
HCM Lane LOS	B	-	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	1.3	13.1	1	0.4	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	12.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1054	62	26	541	4	63	0	59	14	1	8
Future Vol, veh/h	5	1054	62	26	541	4	63	0	59	14	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	100	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	5	1054	62	26	541	4	63	0	59	14	1	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	545	0	0	1116	0	0	1664	1661	1054	1720	1721	543
Stage 1	-	-	-	-	-	-	1064	1064	-	595	595	-
Stage 2	-	-	-	-	-	-	600	597	-	1125	1126	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1034	-	-	633	-	-	78	98	277	71	90	544
Stage 1	-	-	-	-	-	-	272	302	-	494	496	-
Stage 2	-	-	-	-	-	-	491	495	-	251	282	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1034	-	-	633	-	-	74	93	277	54	86	544
Mov Cap-2 Maneuver	-	-	-	-	-	-	74	93	-	54	86	-
Stage 1	-	-	-	-	-	-	271	300	-	492	476	-
Stage 2	-	-	-	-	-	-	463	475	-	197	281	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	173	66.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	115	1034	-	-	633	-	-	81
HCM Lane V/C Ratio	1.061	0.005	-	-	0.041	-	-	0.284
HCM Control Delay (s)	173	8.5	-	-	10.9	-	-	66.2
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	7.2	0	-	-	0.1	-	-	1

Intersection	
Int Delay, s/veh	19.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	599	68	34	689	11	85	9	72	4	0	17
Future Vol, veh/h	9	599	68	34	689	11	85	9	72	4	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	9	624	71	35	718	11	89	9	75	4	0	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	729	0	0	695	0	0	1481	1477	660	1514	1507	724
Stage 1	-	-	-	-	-	-	678	678	-	794	794	-
Stage 2	-	-	-	-	-	-	803	799	-	720	713	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	884	-	-	910	-	-	105	127	467	99	122	429
Stage 1	-	-	-	-	-	-	445	455	-	384	403	-
Stage 2	-	-	-	-	-	-	380	401	-	422	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	884	-	-	910	-	-	97	121	467	75	116	429
Mov Cap-2 Maneuver	-	-	-	-	-	-	97	121	-	75	116	-
Stage 1	-	-	-	-	-	-	441	450	-	380	388	-
Stage 2	-	-	-	-	-	-	350	386	-	343	434	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	180.1	22.6
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	150	884	-	-	910	-	-	226
HCM Lane V/C Ratio	1.153	0.011	-	-	0.039	-	-	0.097
HCM Control Delay (s)	180.1	9.1	-	-	9.1	-	-	22.6
HCM Lane LOS	F	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	9.6	0	-	-	0.1	-	-	0.3

Intersection	
Int Delay, s/veh	1.4

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	19	13	152	68	13	95
Future Vol, veh/h	19	13	152	68	13	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	21	14	165	74	14	103

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	296	165	0	-	165	0
Stage 1	165	-	-	-	-	-
Stage 2	131	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	699	885	-	0	1426	-
Stage 1	869	-	-	0	-	-
Stage 2	900	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	692	885	-	-	1426	-
Mov Cap-2 Maneuver	692	-	-	-	-	-
Stage 1	869	-	-	-	-	-
Stage 2	891	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	9.9	0	0.9
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	692	885	1426	-
HCM Lane V/C Ratio	-	0.03	0.016	0.01	-
HCM Control Delay (s)	-	10.4	9.1	7.5	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.1	0	0	-

Intersection	
Int Delay, s/veh	57.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	3	16	71	2	94	13	965	147	77	1012	13
Future Vol, veh/h	3	3	16	71	2	94	13	965	147	77	1012	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	2	1	0	0	1	2	0	1	0
Mvmt Flow	3	3	17	76	2	101	14	1038	158	83	1088	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2458	2485	1095	2337	2334	1038	1102	0	0	1196	0	0
Stage 1	1261	1261	-	1066	1066	-	-	-	-	-	-	-
Stage 2	1197	1224	-	1271	1268	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	21	30	262	~ 26	37	283	641	-	-	591	-	-
Stage 1	211	244	-	269	300	-	-	-	-	-	-	-
Stage 2	229	254	-	206	241	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	11	25	262	~ 19	31	283	641	-	-	591	-	-
Mov Cap-2 Maneuver	11	25	-	~ 19	31	-	-	-	-	-	-	-
Stage 1	206	210	-	263	293	-	-	-	-	-	-	-
Stage 2	143	248	-	163	207	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	138.1	$ 809.5	0.1	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	641	-	-	48	19	283	591	-	-
HCM Lane V/C Ratio	0.022	-	-	0.493	4.131	0.357	0.14	-	-
HCM Control Delay (s)	10.7	-	-	138.9	$ 1820.2	24.6	12.1	-	-
HCM Lane LOS	B	-	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.8	10.3	1.6	0.5	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	12.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	599	68	34	689	11	85	9	72	4	0	17
Future Vol, veh/h	9	599	68	34	689	11	85	9	72	4	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	100	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	9	599	68	34	689	11	85	9	72	4	0	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	700	0	0	667	0	0	1388	1385	599	1455	1448	695
Stage 1	-	-	-	-	-	-	617	617	-	763	763	-
Stage 2	-	-	-	-	-	-	771	768	-	692	685	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	906	-	-	932	-	-	121	145	505	109	133	446
Stage 1	-	-	-	-	-	-	481	484	-	400	416	-
Stage 2	-	-	-	-	-	-	396	414	-	437	451	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	906	-	-	932	-	-	112	138	505	86	127	446
Mov Cap-2 Maneuver	-	-	-	-	-	-	112	138	-	86	127	-
Stage 1	-	-	-	-	-	-	476	479	-	396	401	-
Stage 2	-	-	-	-	-	-	367	399	-	364	446	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	113.7	20.9
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	172	906	-	-	932	-	-	248
HCM Lane V/C Ratio	0.965	0.01	-	-	0.036	-	-	0.085
HCM Control Delay (s)	113.7	9	-	-	9	-	-	20.9
HCM Lane LOS	F	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	7.5	0	-	-	0.1	-	-	0.3

Intersection	
Int Delay, s/veh	131.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	1467	73	57	590	4	78	0	86	16	2	9
Future Vol, veh/h	6	1467	73	57	590	4	78	0	86	16	2	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	6	1528	76	59	615	4	81	0	90	17	2	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	619	0	0	1604	0	0	2319	2315	1566	2358	2351	617
Stage 1	-	-	-	-	-	-	1578	1578	-	735	735	-
Stage 2	-	-	-	-	-	-	741	737	-	1623	1616	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	971	-	-	413	-	-	~ 27	38	139	25	36	494
Stage 1	-	-	-	-	-	-	139	171	-	414	428	-
Stage 2	-	-	-	-	-	-	411	428	-	131	164	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	971	-	-	413	-	-	~ 22	32	139	~ 8	31	494
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 22	32	-	~ 8	31	-
Stage 1	-	-	-	-	-	-	138	170	-	412	367	-
Stage 2	-	-	-	-	-	-	344	367	-	46	163	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.3	$ 1729.9	$ 1125.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	39	971	-	-	413	-	-	13
HCM Lane V/C Ratio	4.38	0.006	-	-	0.144	-	-	2.163
HCM Control Delay (s)	$ 1729.9	8.7	-	-	15.2	-	-	$ 1125.2
HCM Lane LOS	F	A	-	-	C	-	-	F
HCM 95th %tile Q(veh)	19.7	0	-	-	0.5	-	-	4.3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3.4

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	40	30	145	155	78	101
Future Vol, veh/h	40	30	145	155	78	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	43	33	158	168	85	110

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	438	158	0	-	158	0
Stage 1	158	-	-	-	-	-
Stage 2	280	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	580	893	-	0	1434	-
Stage 1	875	-	-	0	-	-
Stage 2	772	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	543	893	-	-	1434	-
Mov Cap-2 Maneuver	543	-	-	-	-	-
Stage 1	875	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	10.9	0	3.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	543	893	1434	-
HCM Lane V/C Ratio	-	0.08	0.037	0.059	-
HCM Control Delay (s)	-	12.2	9.2	7.7	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.3	0.1	0.2	-

Intersection	
Int Delay, s/veh	455.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↰	↱	↰	↑	↱	↰	↦	
Traffic Vol, veh/h	6	2	20	160	0	133	5	962	193	101	1283	10
Future Vol, veh/h	6	2	20	160	0	133	5	962	193	101	1283	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	2	1	0	0	1	2	0	1	0
Mvmt Flow	6	2	22	172	0	143	5	1034	208	109	1380	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2824	2856	1386	2660	2653	1034	1391	0	0	1242	0	0
Stage 1	1604	1604	-	1044	1044	-	-	-	-	-	-	-
Stage 2	1220	1252	-	1616	1609	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	12	17	177	~ 15	23	285	498	-	-	568	-	-
Stage 1	134	166	-	277	307	-	-	-	-	-	-	-
Stage 2	222	246	-	~ 130	165	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 5	14	177	~ 10	18	285	498	-	-	568	-	-
Mov Cap-2 Maneuver	~ 5	14	-	~ 10	18	-	-	-	-	-	-	-
Stage 1	133	134	-	274	304	-	-	-	-	-	-	-
Stage 2	109	244	-	~ 91	133	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 716.4	$ 4393.5	0.1	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	498	-	-	19	10	285	568	-	-
HCM Lane V/C Ratio	0.011	-	-	1.585	17.204	0.502	0.191	-	-
HCM Control Delay (s)	12.3	-	-	$ 716.4	$ 8021	29.7	12.8	-	-
HCM Lane LOS	B	-	-	F	F	D	B	-	-
HCM 95th %tile Q(veh)	0	-	-	4.1	23.1	2.6	0.7	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	92.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↦			↕			↕	
Traffic Vol, veh/h	6	1467	73	57	590	4	78	0	86	16	2	9
Future Vol, veh/h	6	1467	73	57	590	4	78	0	86	16	2	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	100	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	6	1467	73	57	590	4	78	0	86	16	2	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	594	0	0	1540	0	0	2191	2187	1467	2265	2258	592
Stage 1	-	-	-	-	-	-	1479	1479	-	706	706	-
Stage 2	-	-	-	-	-	-	712	708	-	1559	1552	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	992	-	-	437	-	-	~ 33	46	159	29	42	510
Stage 1	-	-	-	-	-	-	158	191	-	430	442	-
Stage 2	-	-	-	-	-	-	427	441	-	142	176	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	437	-	-	~ 28	40	159	~ 12	36	510
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 28	40	-	~ 12	36	-
Stage 1	-	-	-	-	-	-	157	190	-	427	385	-
Stage 2	-	-	-	-	-	-	363	384	-	65	175	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.3	$ 1230.6	$ 650
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	49	992	-	-	437	-	-	19
HCM Lane V/C Ratio	3.347	0.006	-	-	0.13	-	-	1.421
HCM Control Delay (s)	$ 1230.6	8.7	-	-	14.5	-	-	$ 650
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	17.8	0	-	-	0.4	-	-	3.7

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	172

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	986	99	81	765	12	110	10	101	16	1	18
Future Vol, veh/h	18	986	99	81	765	12	110	10	101	16	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	-	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	19	1027	103	84	797	13	115	10	105	17	1	19

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	810	0	0	1130	0	0	2099	2095	1079	2146	2140	804
Stage 1	-	-	-	-	-	-	1117	1117	-	972	972	-
Stage 2	-	-	-	-	-	-	982	978	-	1174	1168	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	825	-	-	626	-	-	~ 38	53	268	36	50	386
Stage 1	-	-	-	-	-	-	254	285	-	306	333	-
Stage 2	-	-	-	-	-	-	302	331	-	236	270	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	825	-	-	626	-	-	~ 31	45	268	~ 16	42	386
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 31	45	-	~ 16	42	-
Stage 1	-	-	-	-	-	-	248	278	-	299	288	-
Stage 2	-	-	-	-	-	-	248	287	-	135	264	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.1	$ 1661.1	$ 371.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	53	825	-	-	626	-	-	33
HCM Lane V/C Ratio	4.344	0.023	-	-	0.135	-	-	1.105
HCM Control Delay (s)	$ 1661.1	9.5	-	-	11.6	-	-	$ 371.7
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	25.5	0.1	-	-	0.5	-	-	3.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	2.1

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	22	42	223	73	48	168
Future Vol, veh/h	22	42	223	73	48	168
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	24	46	242	79	52	183

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	529	242	0	-	242	0
Stage 1	242	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	514	802	-	0	1336	-
Stage 1	803	-	-	0	-	-
Stage 2	766	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	492	802	-	-	1336	-
Mov Cap-2 Maneuver	492	-	-	-	-	-
Stage 1	803	-	-	-	-	-
Stage 2	733	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	10.8	0	1.7
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	492	802	1336	-
HCM Lane V/C Ratio	-	0.049	0.057	0.039	-
HCM Control Delay (s)	-	12.7	9.8	7.8	0
HCM Lane LOS	-	B	A	A	A
HCM 95th %tile Q(veh)	-	0.2	0.2	0.1	-

HCM 6th TWSC
3: SR 29 & Driveway/Rutherford Rd 03/10/2021

Intersection												
Int Delay, s/veh	720.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	19	140	2	168	15	1119	229	121	1190	16
Future Vol, veh/h	4	4	19	140	2	168	15	1119	229	121	1190	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	75	100	-	130	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	2	1	0	0	1	2	0	1	0
Mvmt Flow	4	4	20	151	2	181	16	1203	246	130	1280	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2999	3030	1289	2796	2792	1203	1297	0	0	1449	0	0
Stage 1	1549	1549	-	1235	1235	-	-	-	-	-	-	-
Stage 2	1450	1481	-	1561	1557	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	9	13	202	~ 12	19	227	541	-	-	474	-	-
Stage 1	144	177	-	216	250	-	-	-	-	-	-	-
Stage 2	164	191	-	~ 140	174	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 1	9	202	~ 5	13	227	541	-	-	474	-	-
Mov Cap-2 Maneuver	~ 1	9	-	~ 5	13	-	-	-	-	-	-	-
Stage 1	140	129	-	210	243	-	-	-	-	-	-	-
Stage 2	32	185	-	~ 88	126	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 2901.3	$ 6778.7	0.1	1.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	541	-	-	6	5	227	474	-	-
HCM Lane V/C Ratio	0.03	-	-	4.839	30.538	0.796	0.274	-	-
HCM Control Delay (s)	11.9	-	-	$ 2905	$ 34723.7	63.2	15.4	-	-
HCM Lane LOS	B	-	-	F	F	F	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-	5	21.2	5.8	1.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
1: Conn Creek Rd/Driveway & Silverado Trail 03/10/2021

Intersection												
Int Delay, s/veh	118.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	986	99	81	765	12	110	10	101	16	1	18
Future Vol, veh/h	18	986	99	81	765	12	110	10	101	16	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	70	-	100	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	18	986	99	81	765	12	110	10	101	16	1	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	777	0	0	1085	0	0	1965	1961	986	2060	2054	771
Stage 1	-	-	-	-	-	-	1022	1022	-	933	933	-
Stage 2	-	-	-	-	-	-	943	939	-	1127	1121	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	848	-	-	651	-	-	~ 48	64	303	41	56	403
Stage 1	-	-	-	-	-	-	287	316	-	322	348	-
Stage 2	-	-	-	-	-	-	318	345	-	251	284	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	848	-	-	651	-	-	~ 40	55	303	21	48	403
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 40	55	-	21	48	-
Stage 1	-	-	-	-	-	-	281	309	-	315	305	-
Stage 2	-	-	-	-	-	-	265	302	-	158	278	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.1	$ 1141.9	236.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	68	848	-	-	651	-	-	42
HCM Lane V/C Ratio	3.25	0.021	-	-	0.124	-	-	0.833
HCM Control Delay (s)	$ 1141.9	9.3	-	-	11.3	-	-	236.4
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	22.8	0.1	-	-	0.4	-	-	3.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Appendix C

Napa County Winery Trip Generation Form

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Proposed Project Winery Traffic Information / Trip Generation

Determine Winery Daily Trips. ***Complete Sections J through R below to determine your winery project's estimated future and peak hour trips.***

Project Name: Frank Family Benjamin Ranch Winery **Project Scenario: Proposed**

Section J. Maximum Daily Weekday Traffic (Friday, non-harvest season)

1.	Total number of FT employees:	46	x 3.05 one-way trips per employee	=	140.3	daily trips
2.	Total number of PT employees:	15	x 1.90 one-way trips per employee	=	28.5	daily trips
3.	Maximum weekday visitors:	300	/2.6 visitors per vehicle x 2 one-way trips	=	230.8	daily trips
4.	Gallons of production: 475000		/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	8.6	daily trips
5.			TOTAL	=	408	daily trips

Section K. Maximum Daily Weekday Traffic (Friday, harvest season)

6.	Total number of FT employees:	46	x 3.05 one-way trips per employee	=	140.3	daily trips
7.	Total number of PT employees:	15	x 1.90 one-way trips per employee	=	28.5	daily trips
8.	Maximum weekday visitors:	300	/2.6 visitors per vehicle x 2 one-way trips	=	230.8	daily trips
9.	Gallons of production: 475000		/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	8.6	daily trips
10.	Avg. annual tons of grape on-haul:	2817	/ 144 truck trips x 2 one-way trips	=	39.1	daily trips
11.			TOTAL	=	447	daily trips

Section L. Maximum Daily Weekend Traffic (Saturday, non-harvest season)

12.	Total number of FT Sat. employees:	32	x 3.05 one-way trips per employee	=	97.6	daily trips
13.	Total number of PT Sat. employees:	10	x 1.90 one-way trips per employee	=	19.0	daily trips
14.	Maximum Saturday visitors:	300	/2.8 visitors per vehicle x 2 one-way trips	=	214.3	daily trips
15.	Gallons of Production: 475000		/1,000 x 0.009 daily truck trips x 2 one-way trips	=	8.6	daily trips
16.			TOTAL	=	340	daily trips

Section M. Maximum Daily Weekend Traffic (Saturday, harvest season)

17.	Total number of FT Sat. employees:	32	x 3.05 one-way trips per employee	=	97.6	daily trips
18.	Total number of PT Sat. employees:	15	x 1.90 one-way trips per employee	=	28.5	daily trips
19.	Maximum Saturday visitors:	300	/2.8 visitors per vehicle x 2 one-way trips	=	214.3	daily trips
20.	Gallons of production: 475000		/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	8.6	daily trips
21.	Avg. annual tons of grape on-haul:	2817	/ 144 truck trips x 2 one-way trips	=	39.1	daily trips
22.			TOTAL	=	388	daily trips

Section N. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Sum of daily trips from Sec. J, lines 3 and 4) x 0.064 + (No. of FTE) + (line 2 / 2) = 69 PM pk hr trips

Section O. PM Peak Hour Trip Generation (Friday, harvest season)

(Sum of daily trips, Sec. K, lines 8, 9, 10) x 0.064 + (No. of FTE) + (line 7 / 2) = 71 PM pk hr trips

Section P. PM Peak Hour Trip Generation (Saturday, non-harvest season)

(Daily trips from Sec. L, line 14 and 15) x 0.127 + (No. of FTE) + (line 13 / 2) = 65 PM pk hr trips

Section Q. PM Peak Hour Trip Generation (Saturday, harvest season)

(Sum of daily trips Sec. M, lines 19, 20, 21) x 0.127 + (No. of FTE) + (line 18 / 2) = 73 PM pk hr trips

Section R. Maximum Annual Trips (Note: max visitation of 150 Mon-Wed accounted for)

(Sec. J, line 5 x 206) + (Sec. K, line 11 x 55) + (Sec. L, line 16 x 82) + (Sec. M, line 22 x 22) -261*150*2/2.6 = 114934 Annual trips

Winery #1

Friday	
Peak Hour	30
Full Time Employees	28
Total Count	119
Percentage	2%

Saturday	
Peak Hour	41
Full Time Employees	11
Total Count	157
Percentage	19%

Winery #2

Friday	
Peak Hour	56
Full Time Employees	45
Total Count	219
Percentage	5%

Saturday	
Peak Hour	68
Full Time Employees	45
Total Count	226
Percentage	10%

Winery #3

Friday	
Peak Hour	35
Full Time Employees	10
Total Count	203
Percentage	12%

Saturday	
Peak Hour	47
Full Time Employees	10
Total Count	350
Percentage	11%

Winery #4

Friday	
Peak Hour	22
Full Time Employees	8
Total Count	189
Percentage	7%

Saturday	
Peak Hour	17
Full Time Employees	7
Total Count	76
Percentage	13%

Winery #5

Friday	
Peak Hour	15
Full Time Employees	13
Total Count	100
Percentage	2%

Saturday	
Peak Hour	22
Full Time Employees	13
Total Count	136
Percentage	7%

Winery #6

Friday	
Peak Hour	31
Full Time Employees	24
Total Count	282
Percentage	2%

Saturday	
Peak Hour	24
Full Time Employees	2
Total Count	172
Percentage	13%

Winery #7

Friday	
Peak Hour	14
Full Time Employees	3
Total Count	79
Percentage	14%

Saturday	
Peak Hour	14
Full Time Employees	2
Total Count	72
Percentage	17%

	Friday	Saturday
Winery #1	1.7%	19.1%
Winery #2	5.0%	10.2%
Winery #3	12.3%	10.6%
Winery #4	7.4%	13.2%
Winery #5	2.0%	6.6%
Winery #6	2.5%	12.8%
Winery #7	13.9%	16.7%
Average	6.4%	12.7%
Maximum	13.9%	19.1%

Appendix D

Maximum TWSC Queue Calculations

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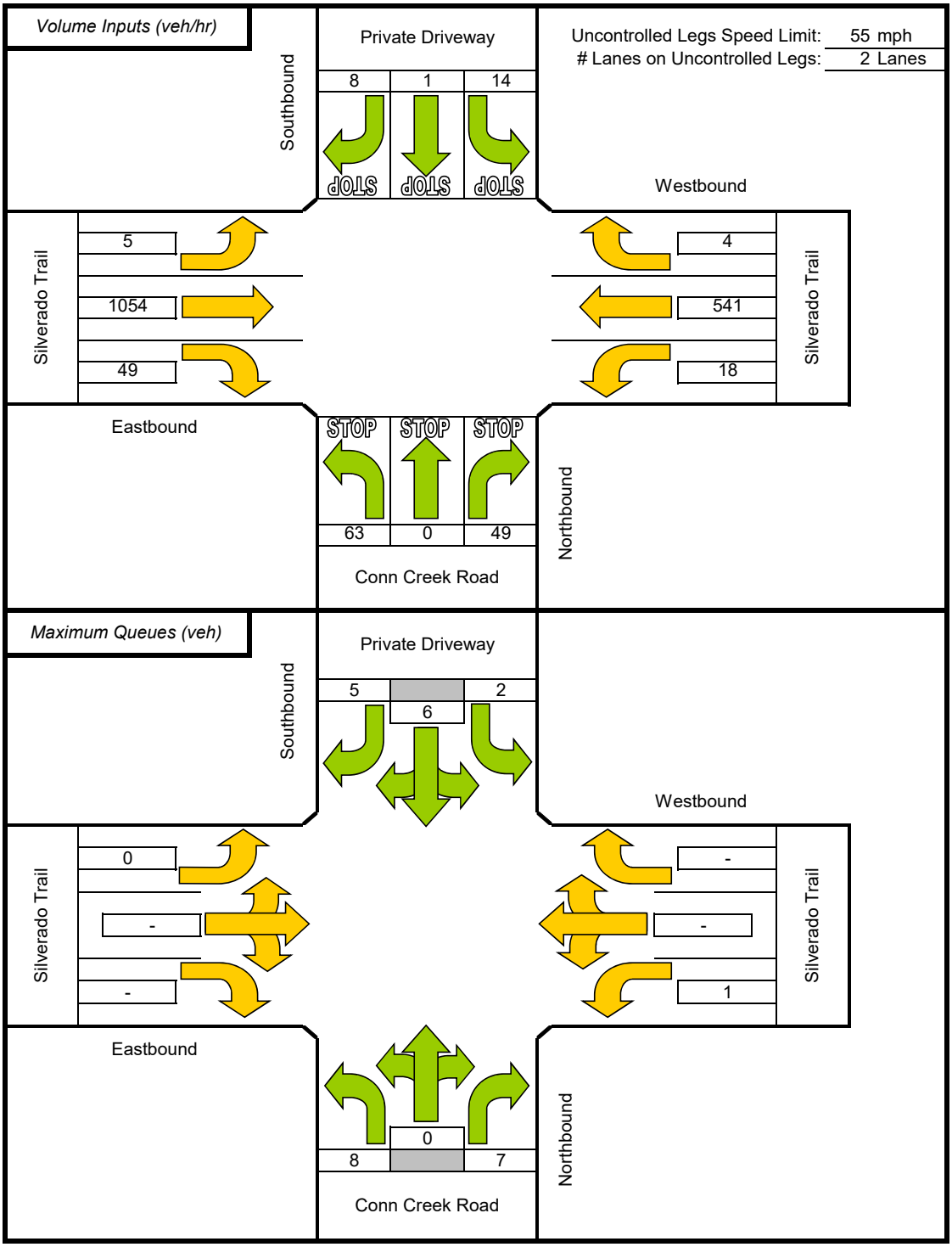
Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: PM Existing
Stop Controlled Legs: North/South

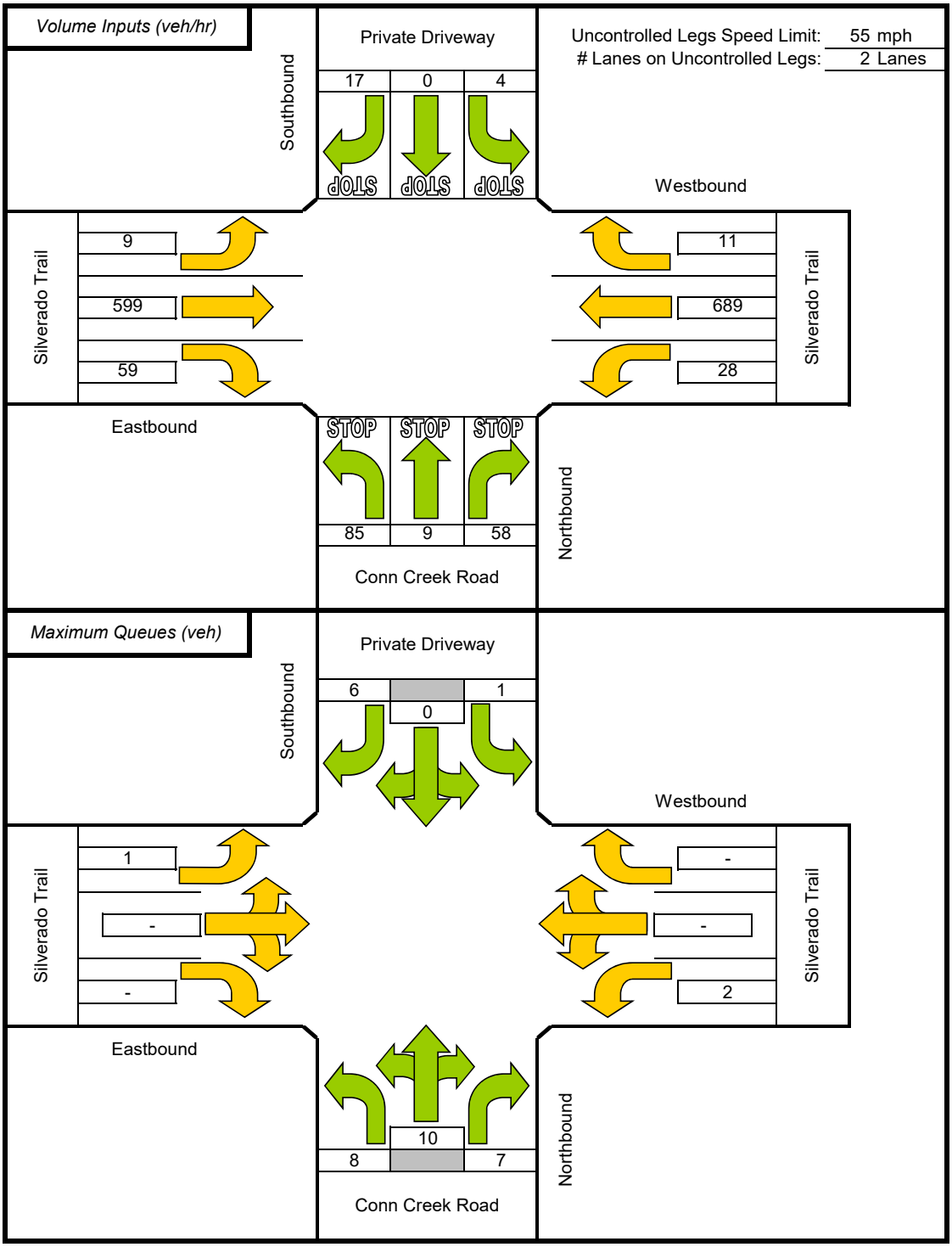


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: Wknd Existing
Stop Controlled Legs: North/South

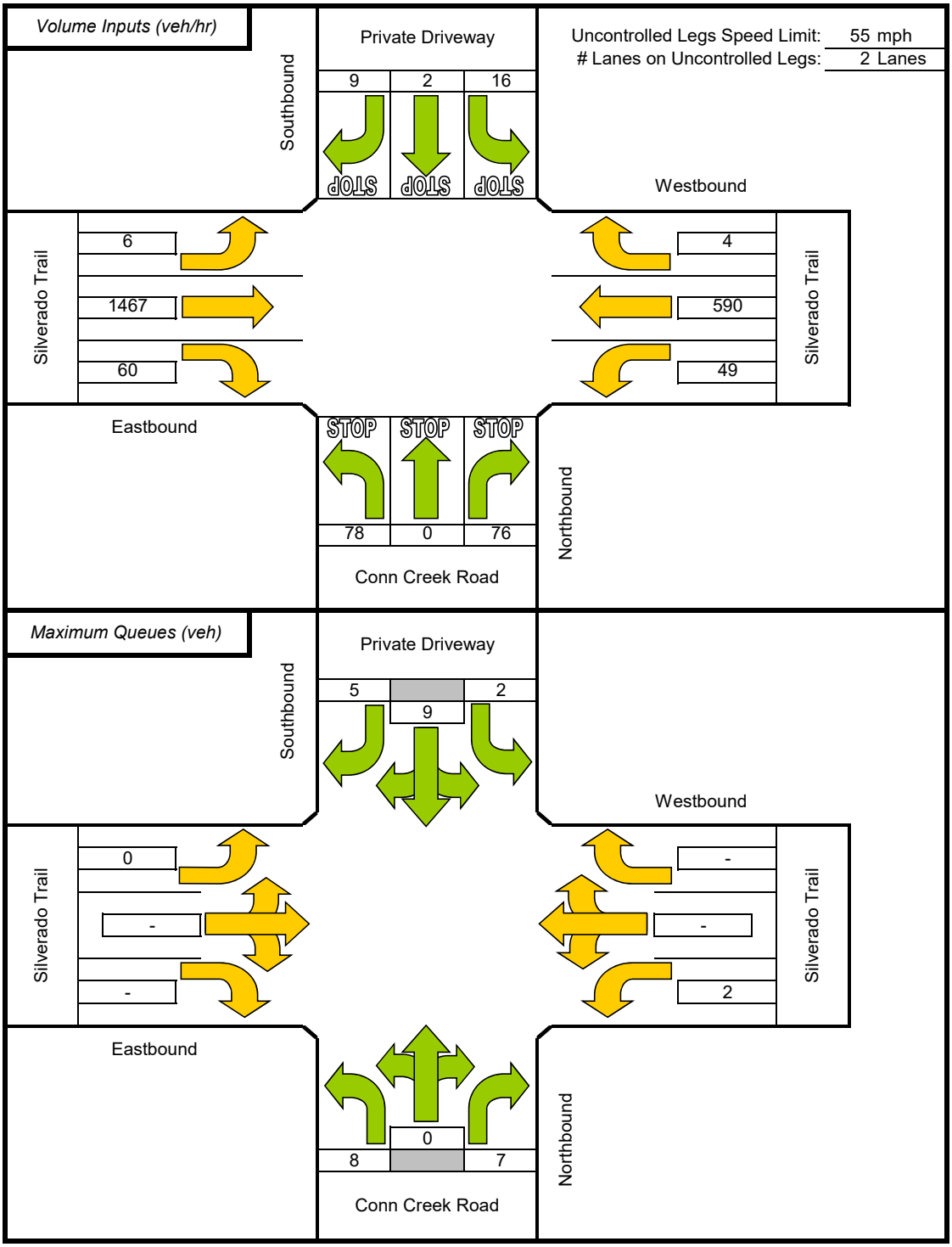


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: PM Future
Stop Controlled Legs: North/South

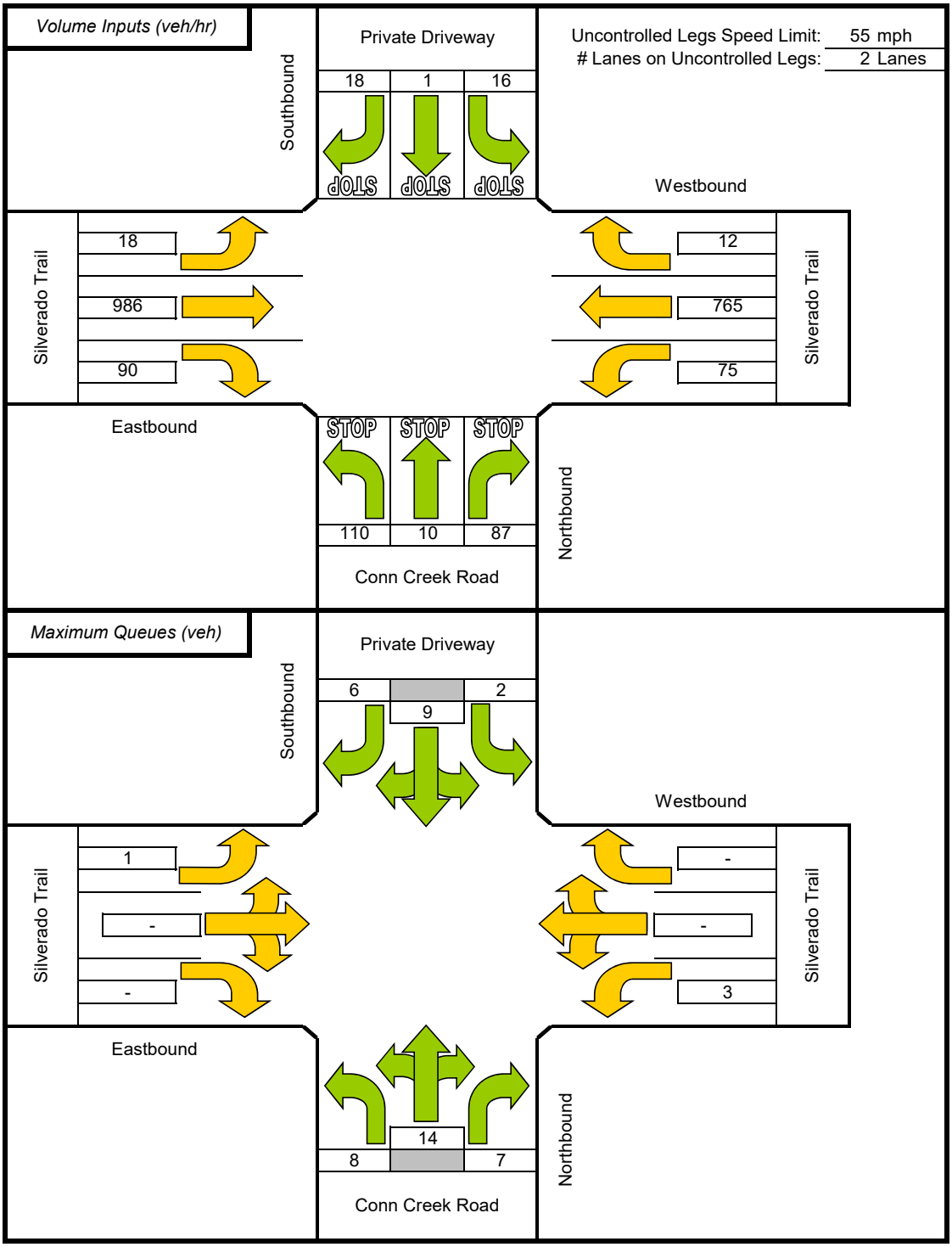


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: Wknd Future
Stop Controlled Legs: North/South

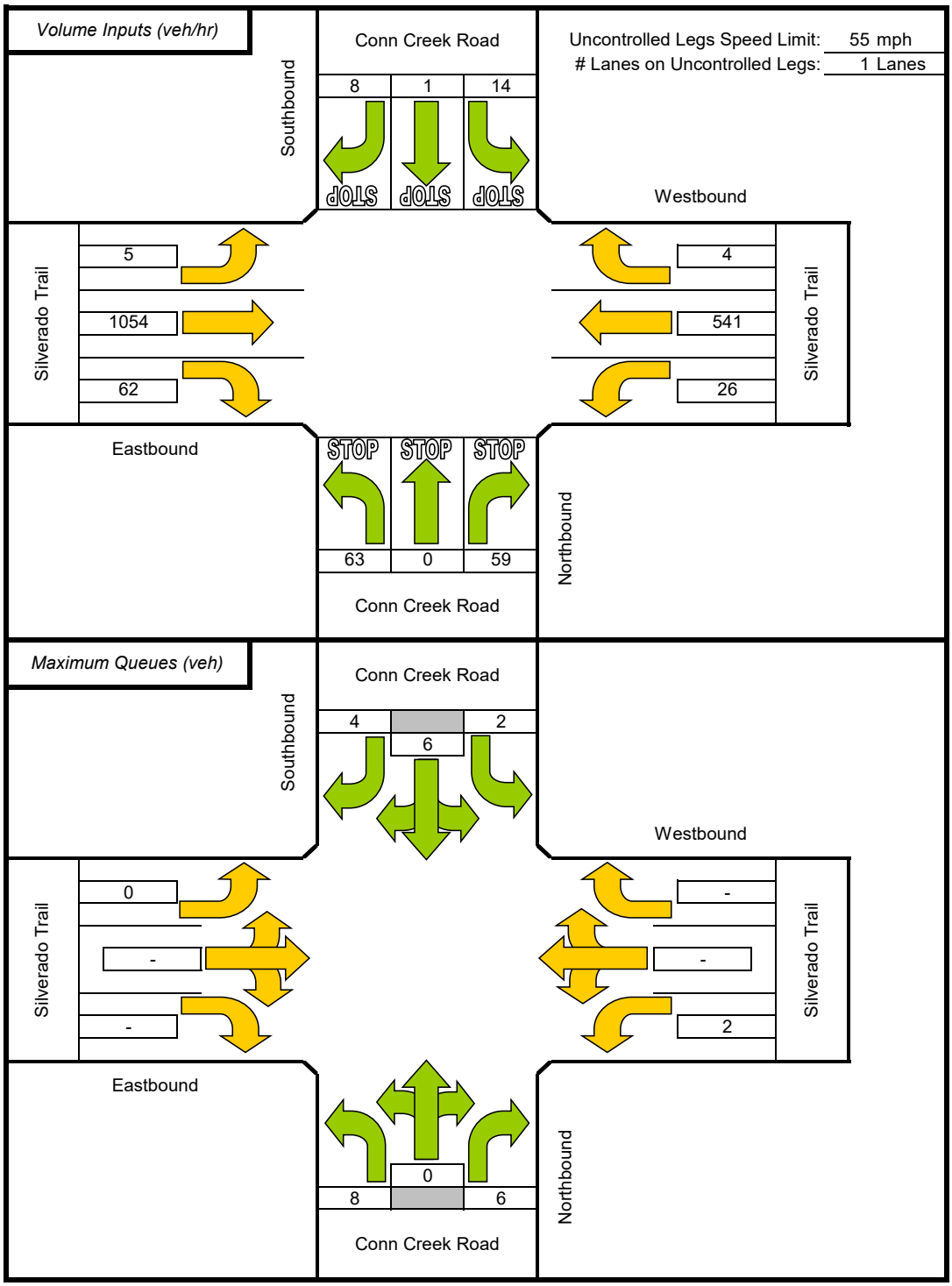


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: PM Existing plus Project
Stop Controlled Legs: North/South

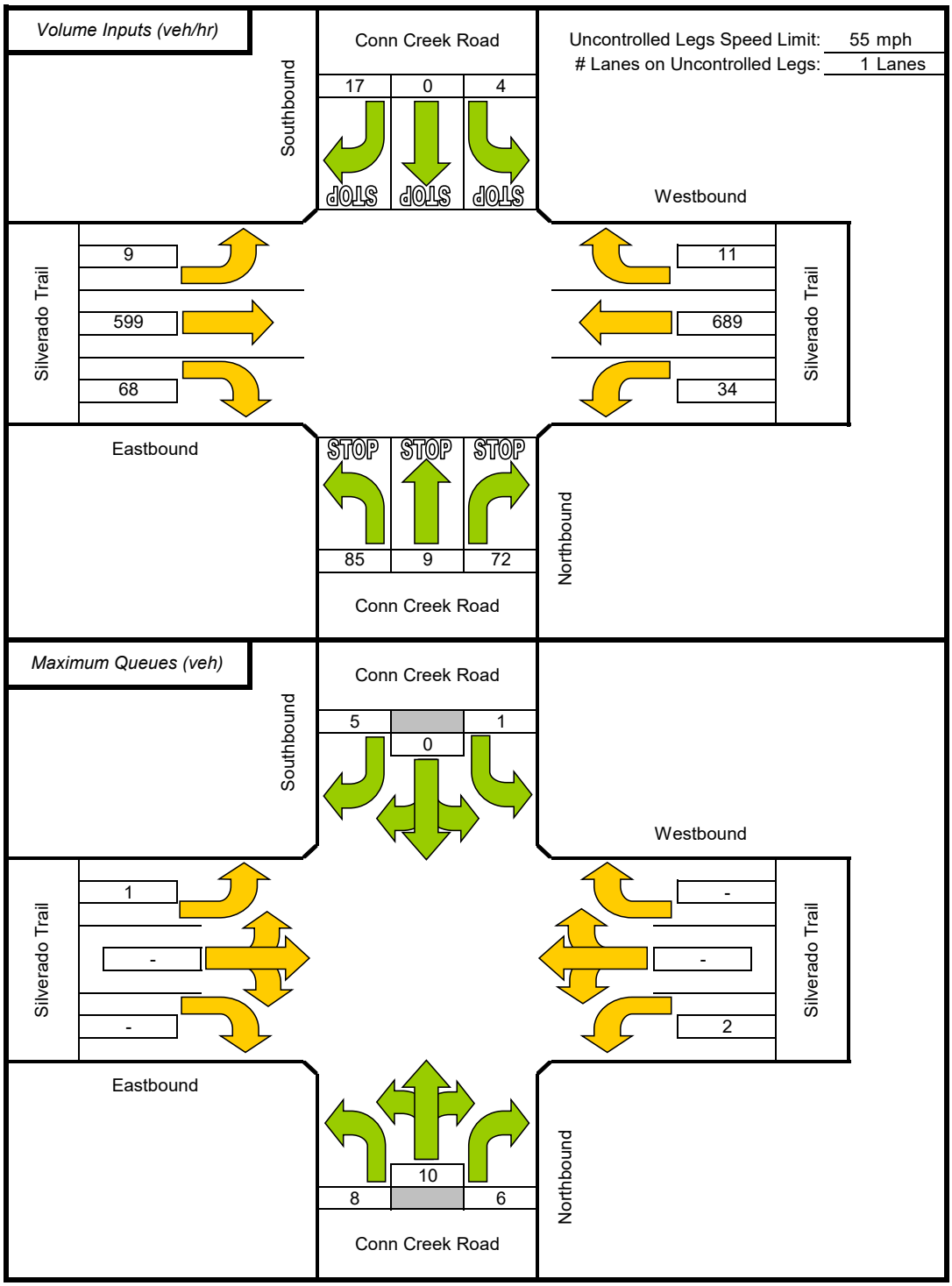


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: Wknd Existing plus Project
Stop Controlled Legs: North/South

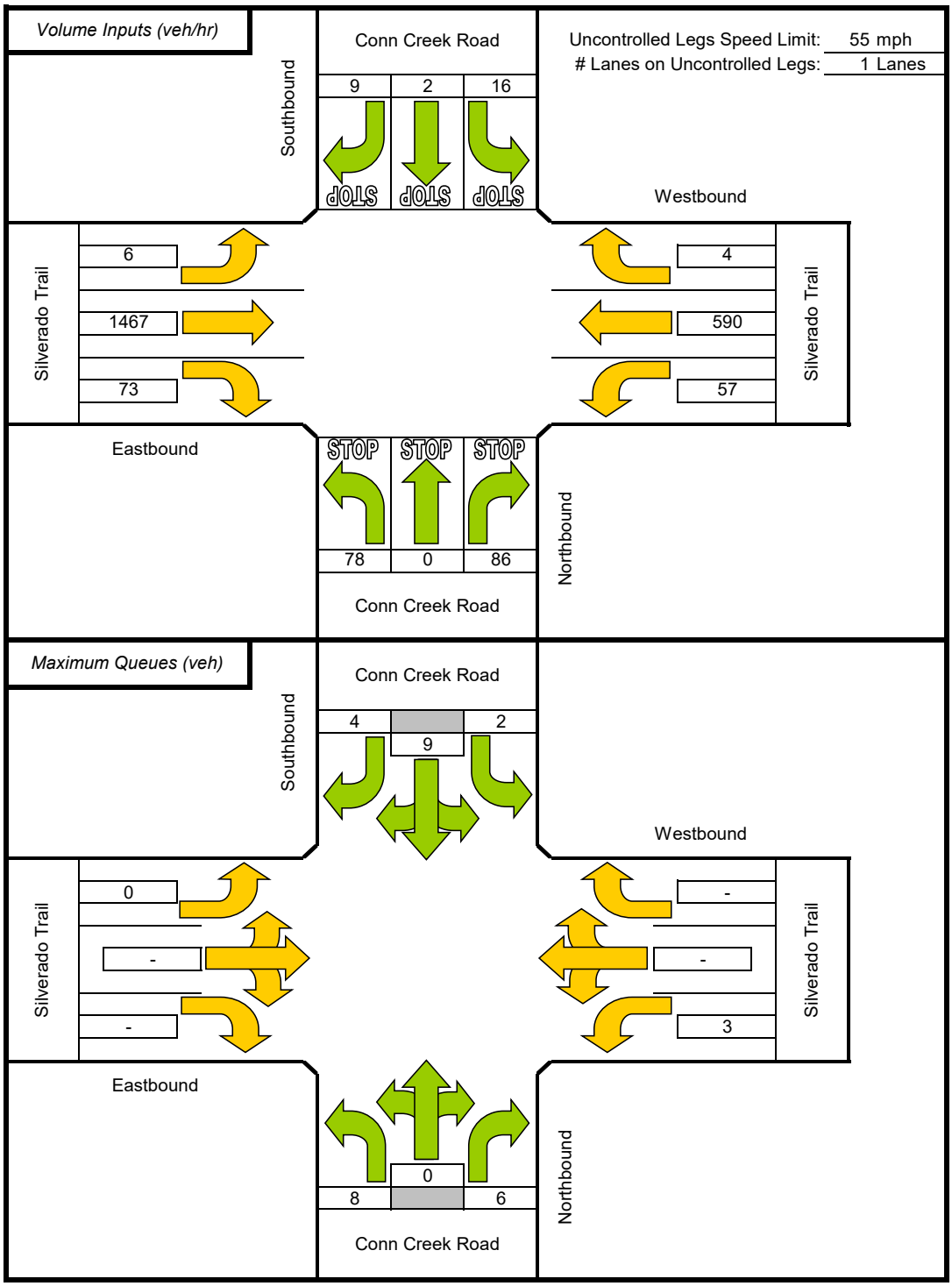


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: PM Future plus Project
Stop Controlled Legs: North/South

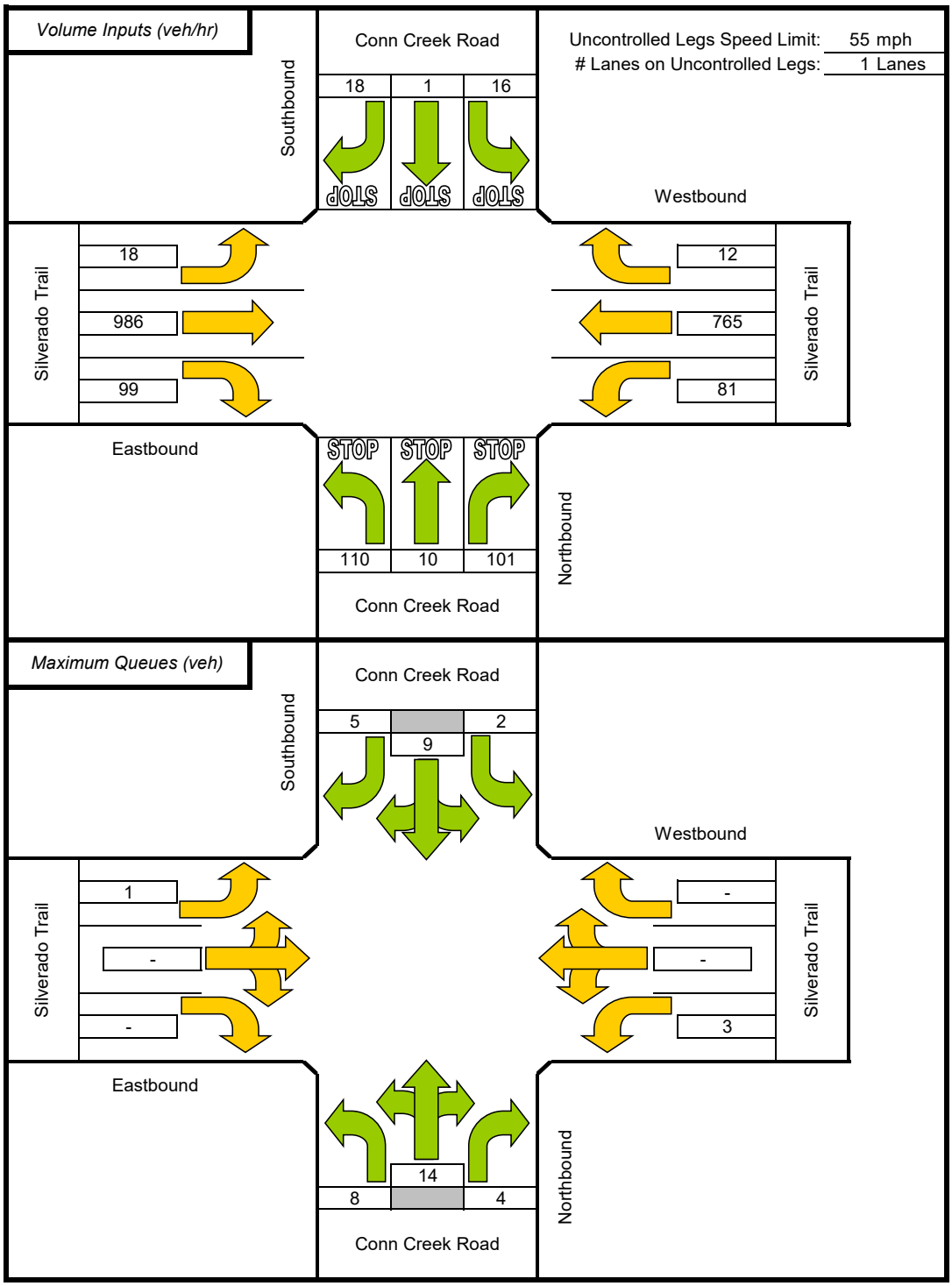


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Silverado Trail
Side Street: Conn Creek Road

Scenario: Wknd Future plus Project
Stop Controlled Legs: North/South

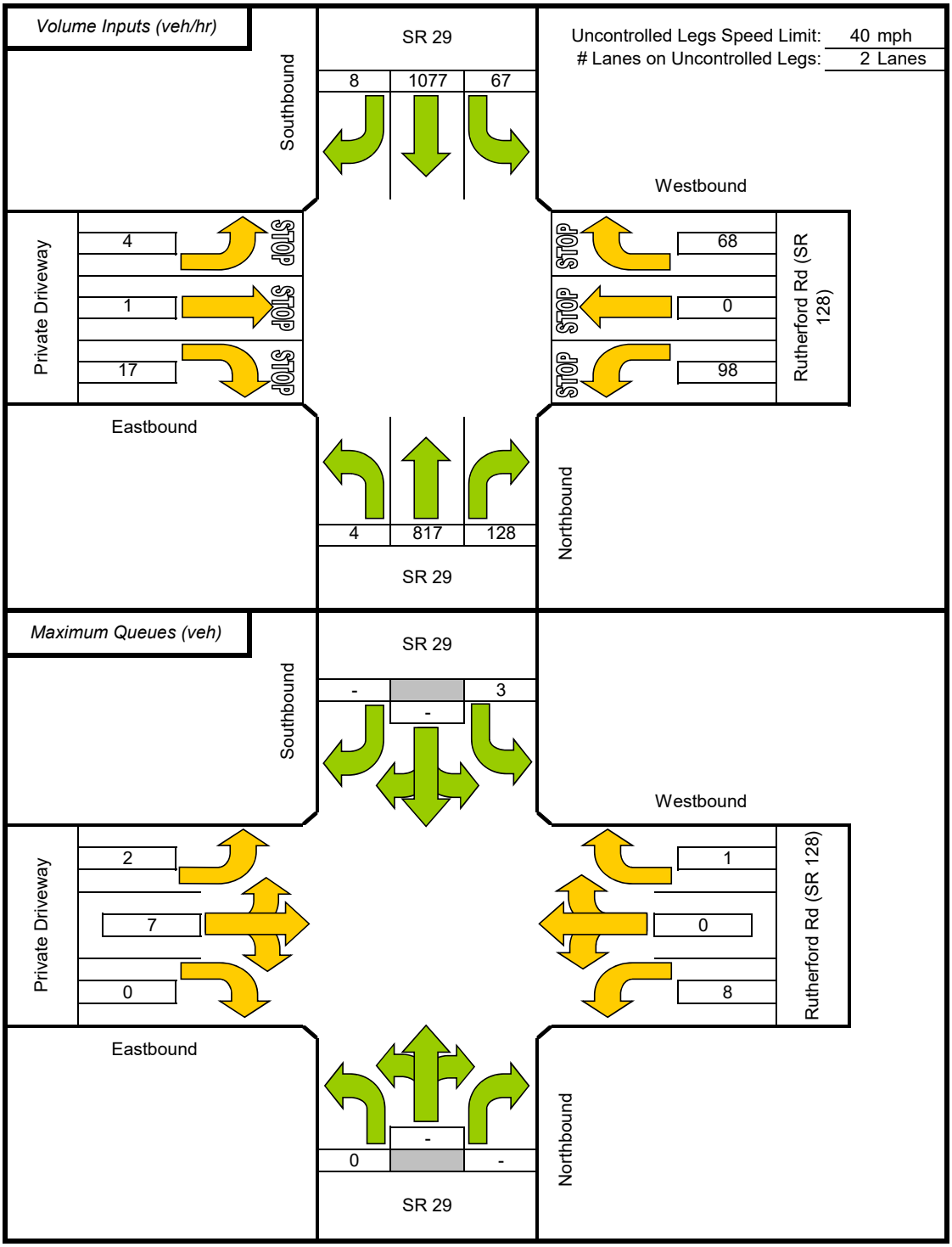


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Rd

Scenario: PM Existing
Stop Controlled Legs: East/West

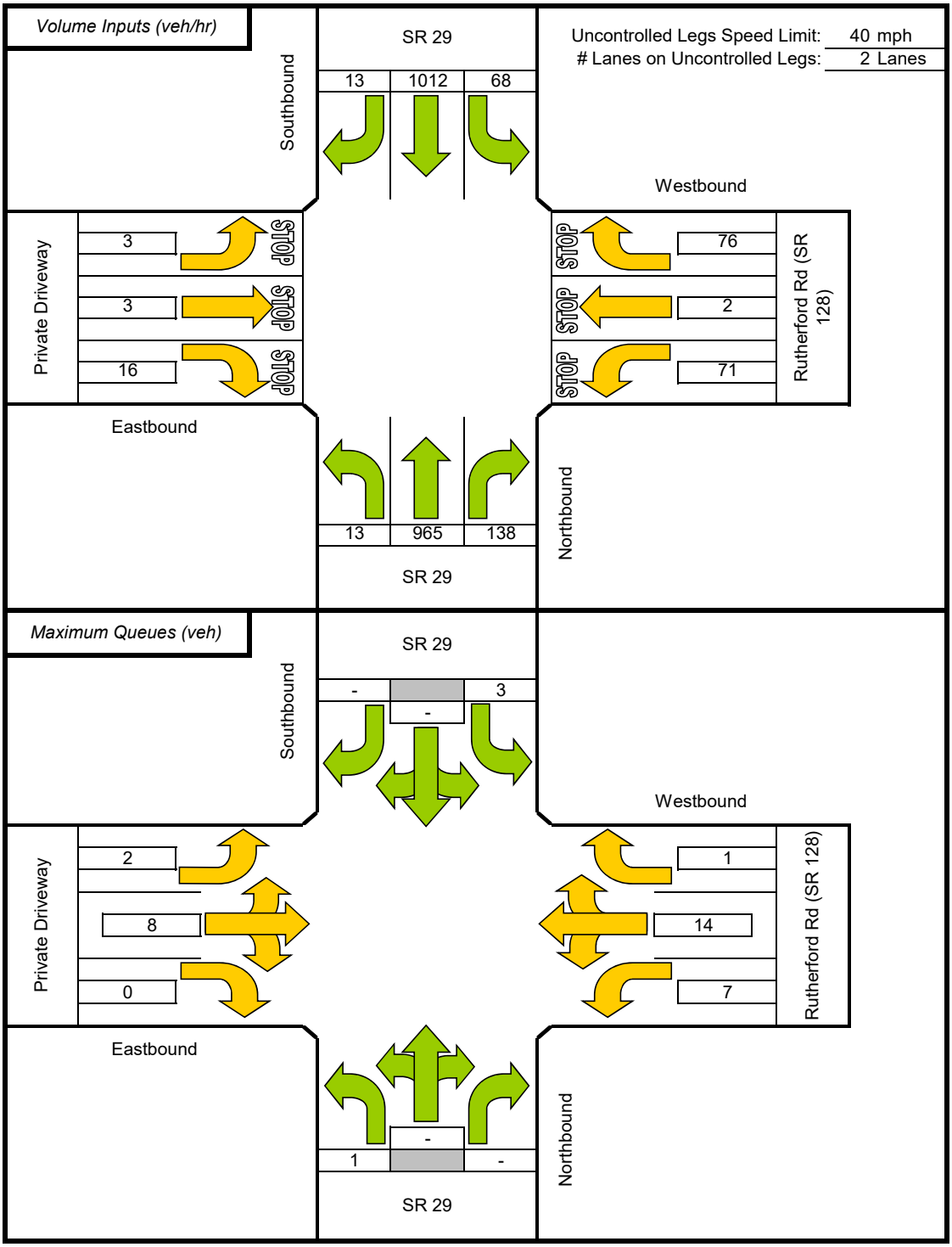


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Rd

Scenario: Wknd Existing
Stop Controlled Legs: East/West

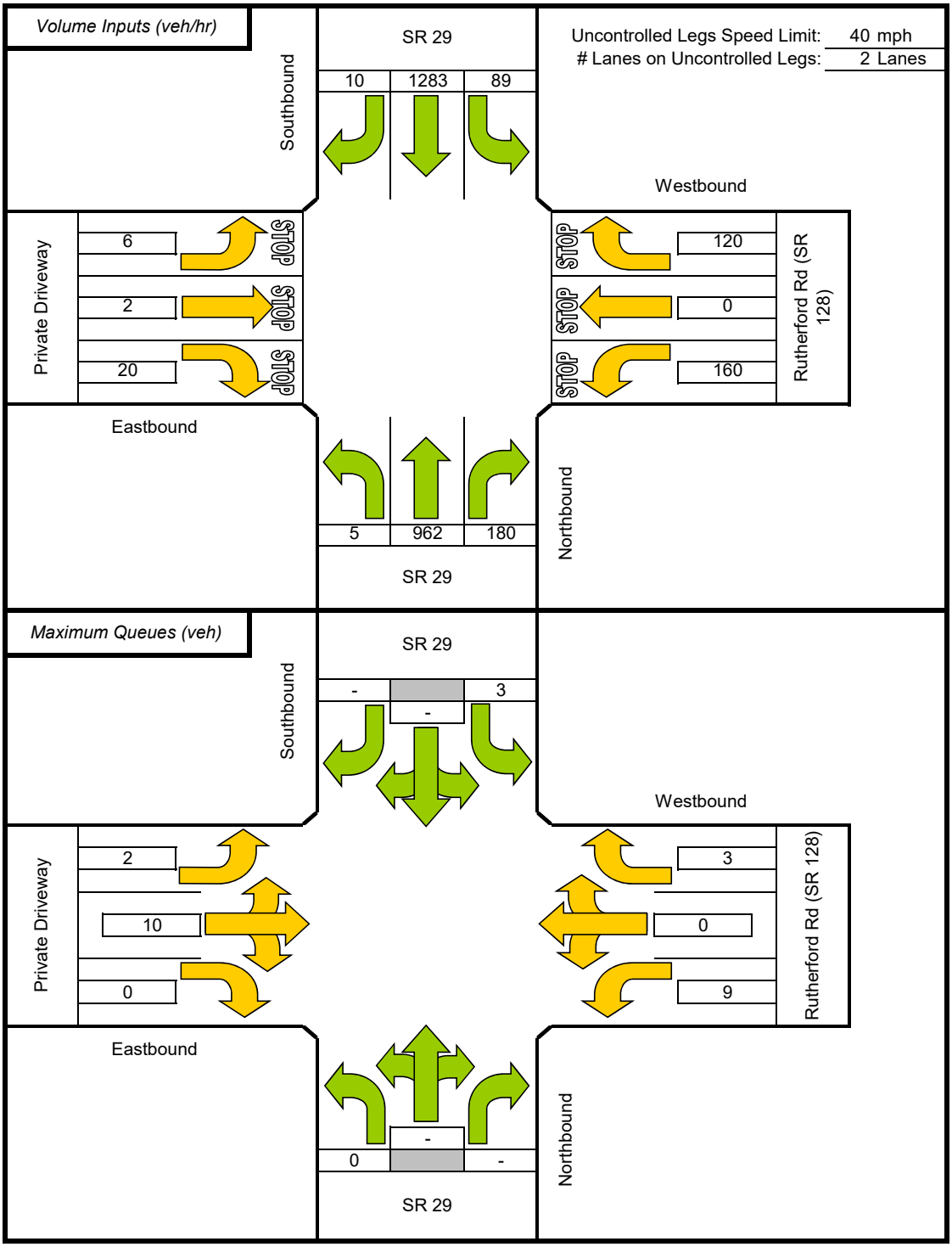


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Rd

Scenario: PM Future
Stop Controlled Legs: East/West

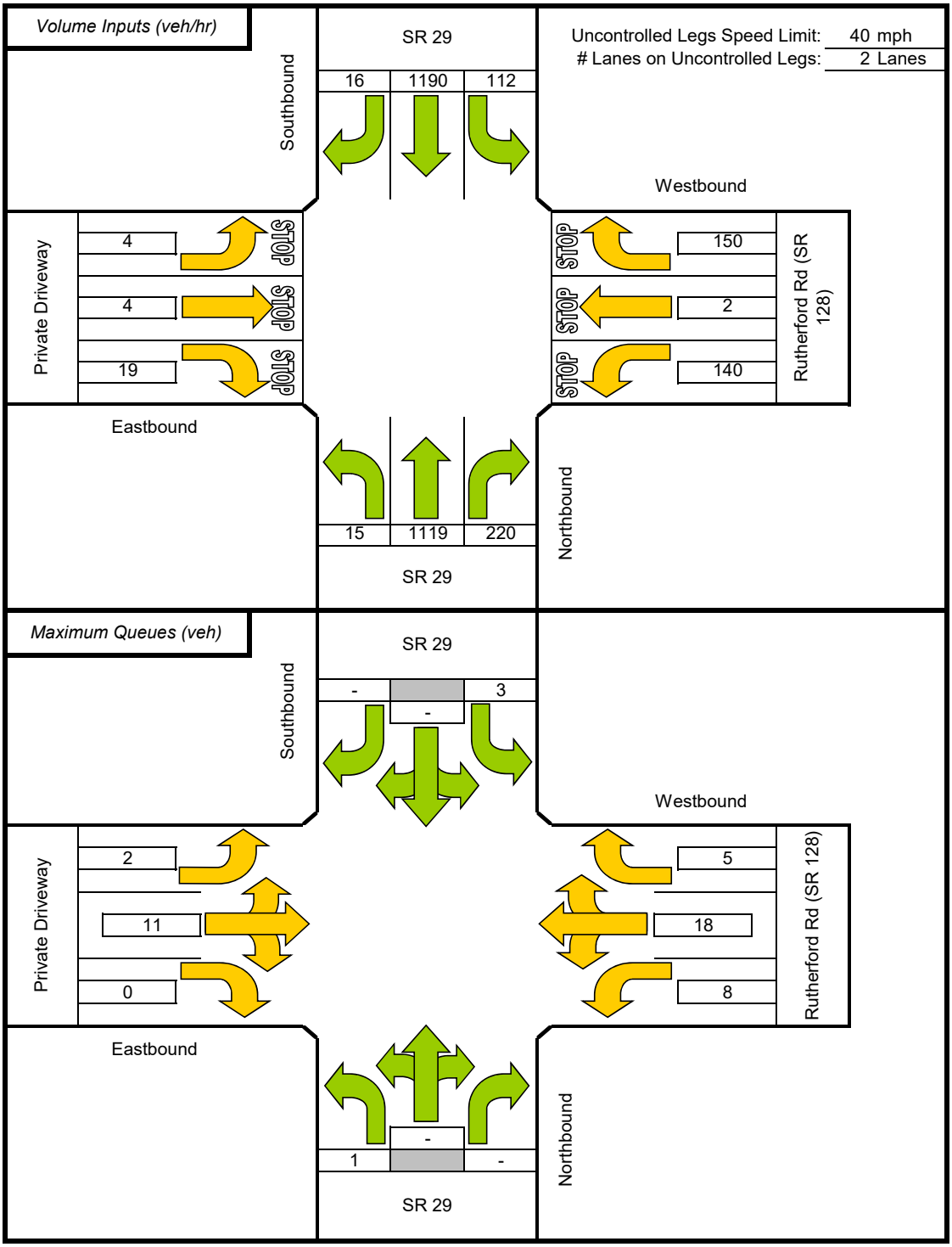


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Rd

Scenario: Wknd Future
Stop Controlled Legs: East/West

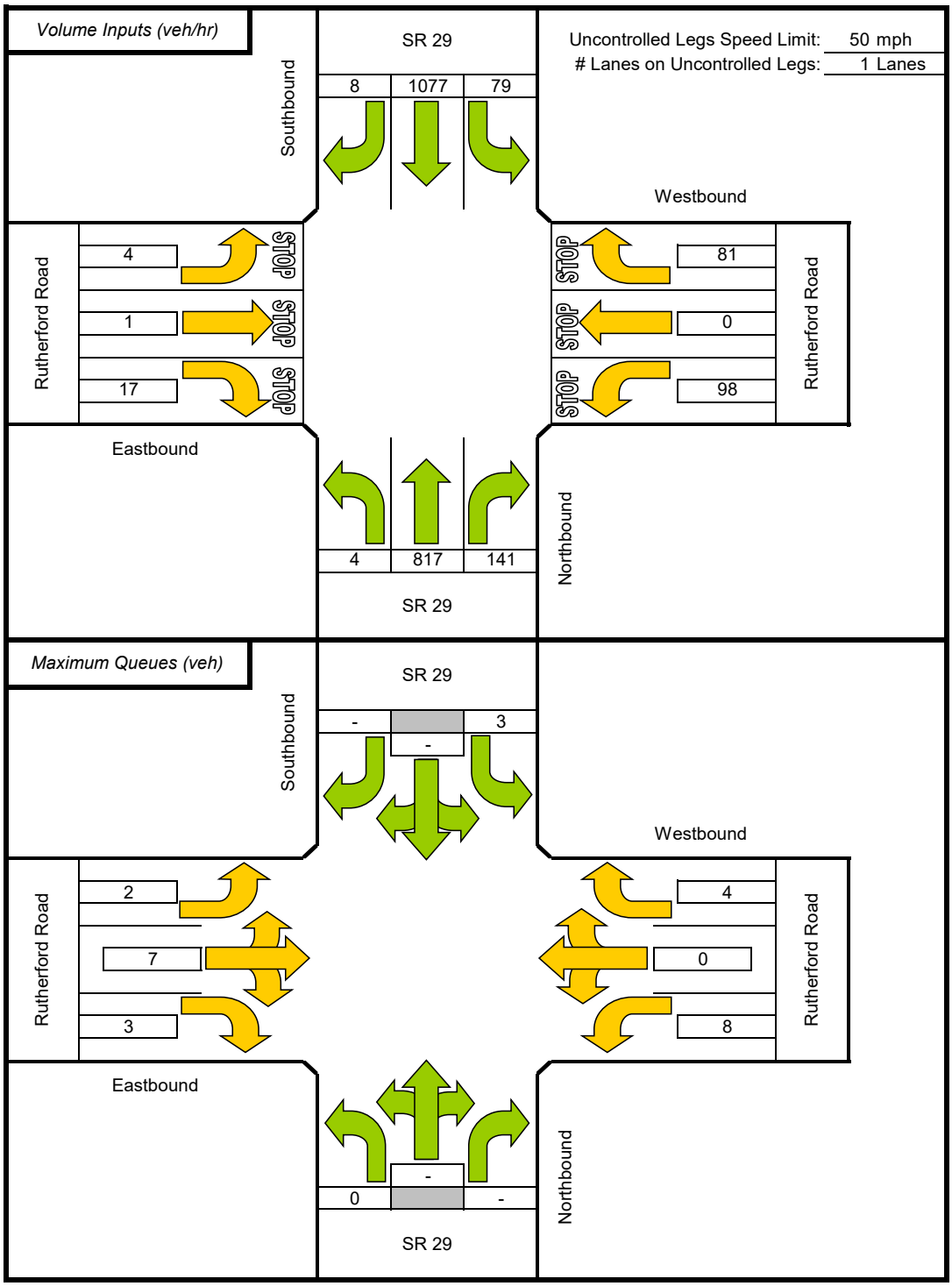


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Road

Scenario: PM Existing plus Project
Stop Controlled Legs: East/West

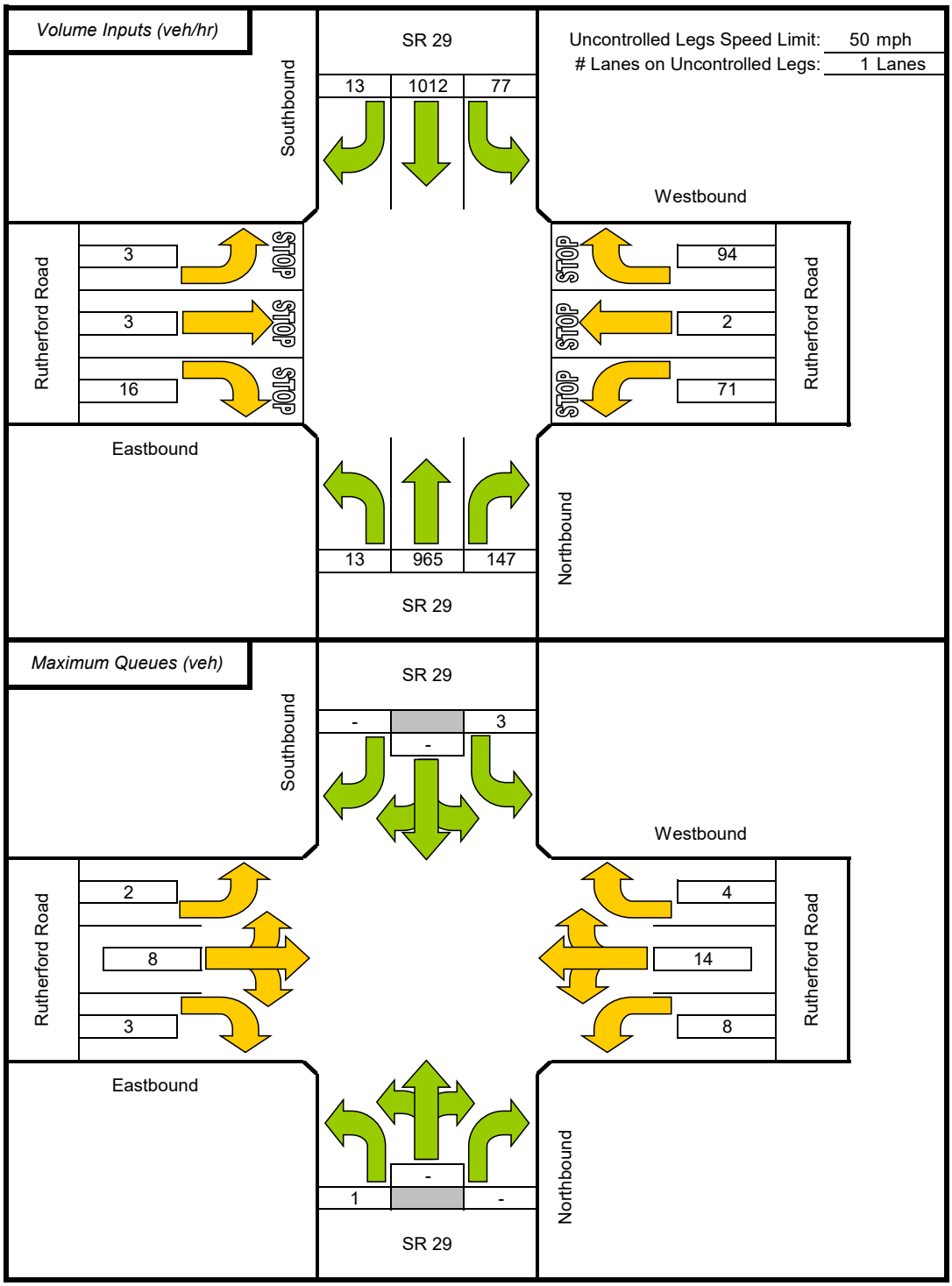


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Road

Scenario: Wknd Existing plus Project
Stop Controlled Legs: East/West

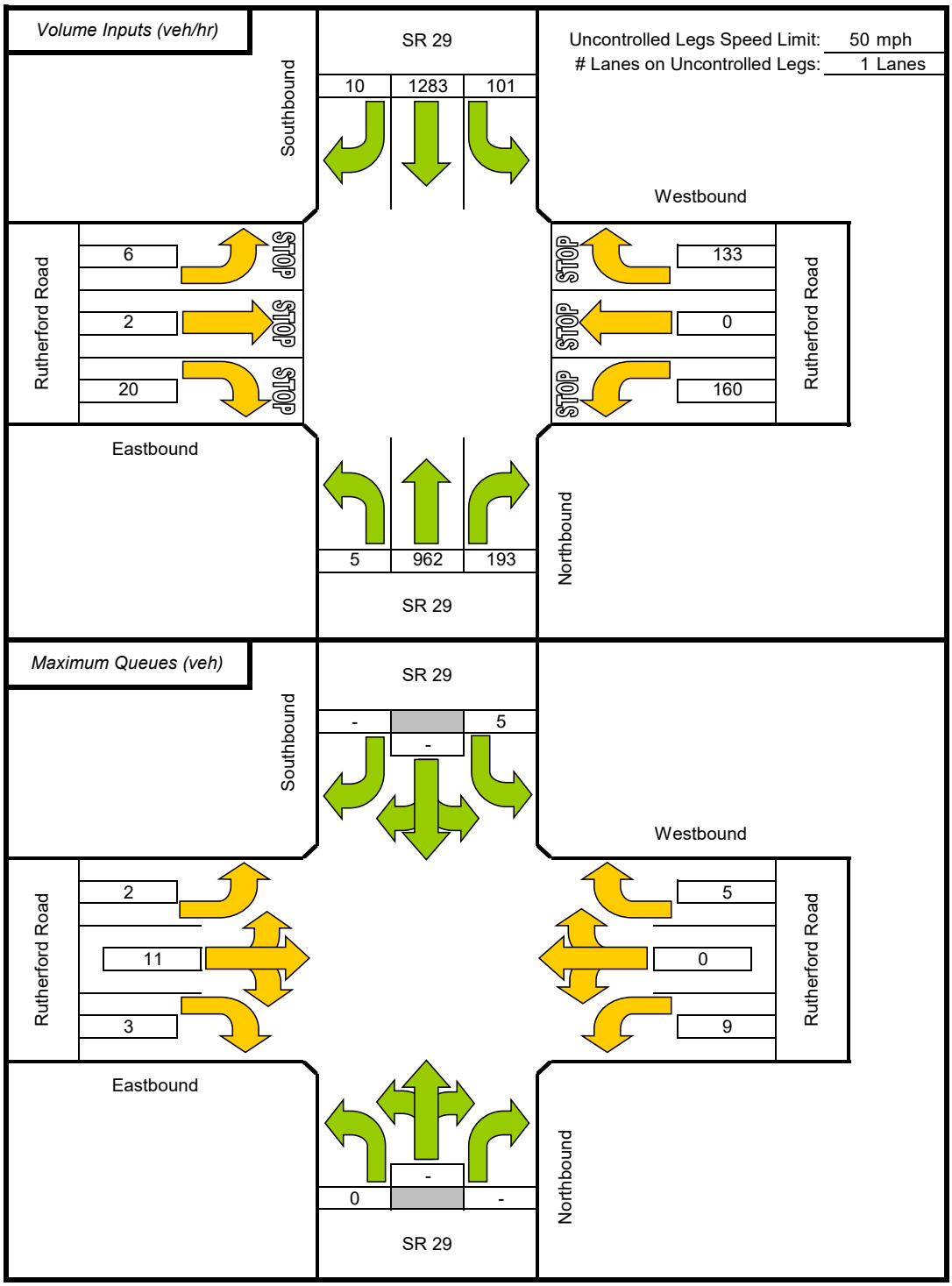


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Road

Scenario: PM Future plus Project
Stop Controlled Legs: East/West

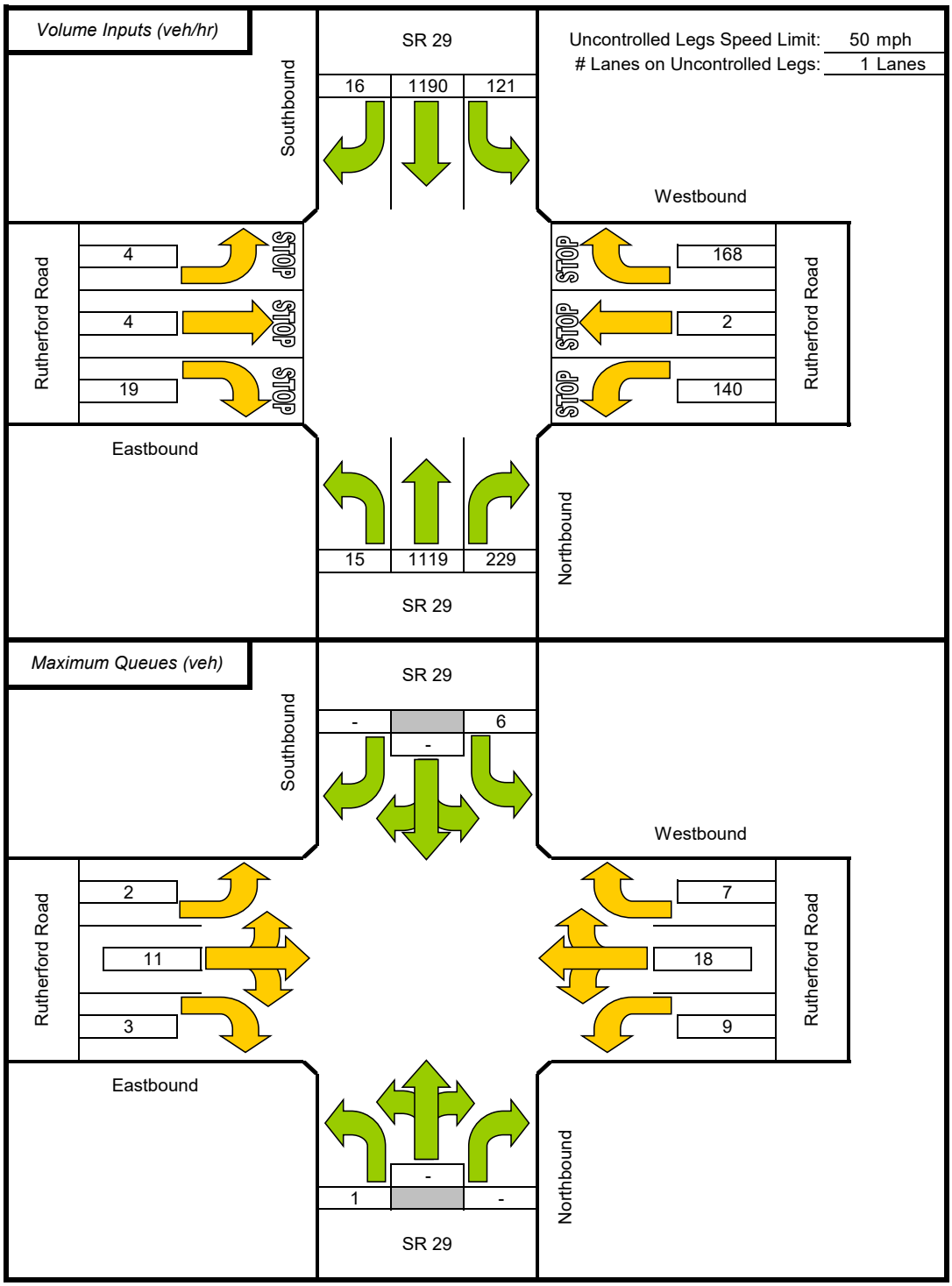


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: SR 29
Side Street: Rutherford Road

Scenario: Wknd Future plus Project
Stop Controlled Legs: East/West



Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Appendix E

Site Access and On-site Circulation

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Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: SR 128/winery driveway
Study Scenario: Weekday PM Existing Plus Project

Direction of Analysis Street: North/South
Cross Street Intersects: From the West

SR 128 - Conn Creek Rd

Southbound Volumes (veh/hr)
Through Volume = 112
Right Turn Volume = 5

Southbound Speed Limit: 40 mph
Southbound Configuration: 2 Lanes - Undivided

Project Driveway

SR 128 - Conn Creek Rd

Northbound Volumes (veh/hr)
99 = Through Volume
6 = Left Turn Volume

Northbound Speed Limit: 40 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1012.6
Advancing Volume	Va =	117
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

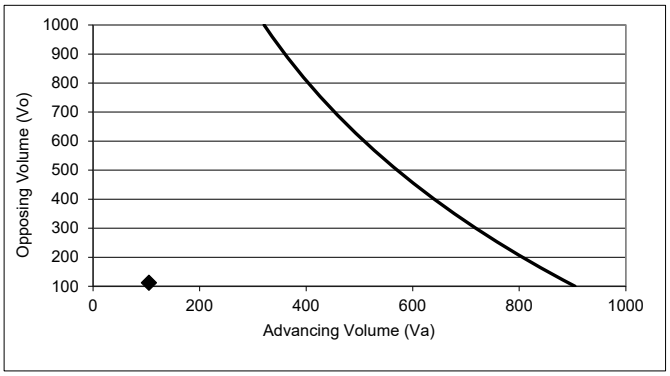
2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	117
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Northbound Left Turn Lane Warrants

Percentage Left Turns %lt 5.7 %
Advancing Volume Threshold AV 892 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 40 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: SR 128/winery driveway
Study Scenario: Weekend PM Existing plus Project

Direction of Analysis Street: North/South
Cross Street Intersects: From the West

SR 128 - Conn Creek Rd

Southbound Volumes (veh/hr)
Through Volume = 152
Right Turn Volume = 24

SR 128 - Conn Creek Rd

Northbound Volumes (veh/hr)
90 = Through Volume
30 = Left Turn Volume

Project Driveway

Southbound Speed Limit: 40 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Speed Limit: 40 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	870.1
Advancing Volume	Va =	176
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for taper

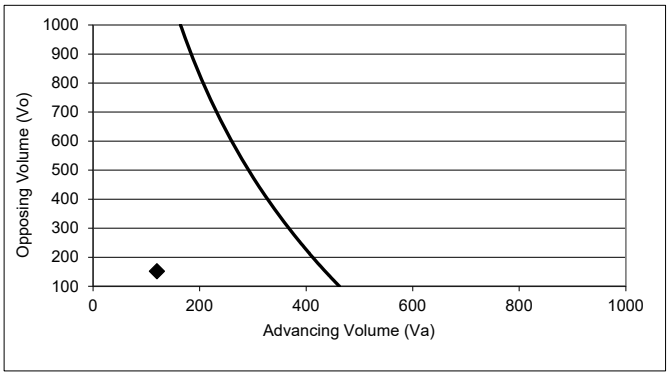
Advancing Volume Threshold	AV =	660
Advancing Volume	Va =	176
If AV<Va then warrant is met		No

Right Turn Taper Warranted: **NO**

Northbound Left Turn Lane Warrants

Percentage Left Turns	%lt	25.0 %
Advancing Volume Threshold	AV	436 veh/hr

If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 40 mph
Turn lane warranted if point falls to right of warrant threshold line

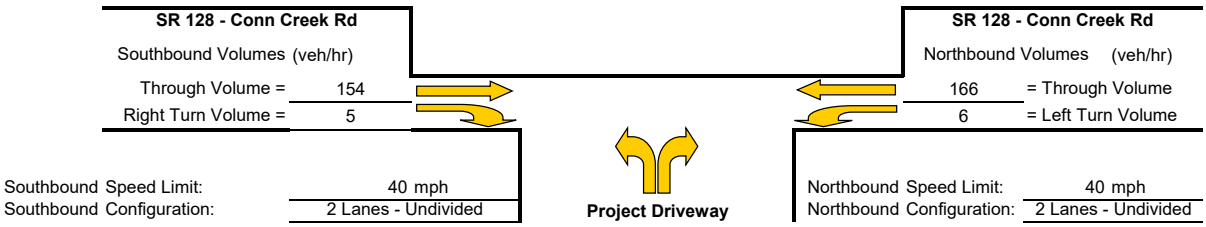
Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: SR 128/winery driveway
Study Scenario: Weekday PM Future Plus Project

Direction of Analysis Street: North/South
Cross Street Intersects: From the West



Southbound Speed Limit: 40 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Speed Limit: 40 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1012.6
Advancing Volume	Va =	159
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

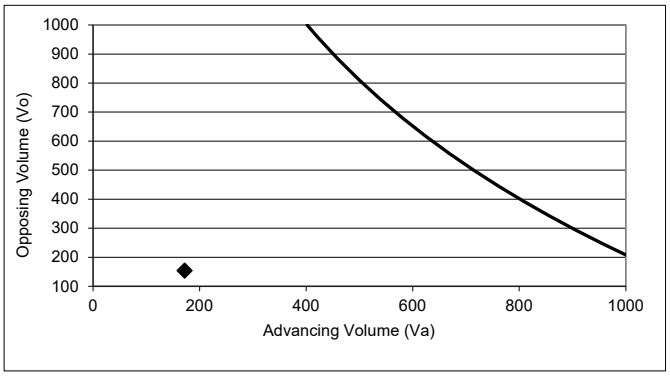
Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	159
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Northbound Left Turn Lane Warrants

Percentage Left Turns	%lt	3.5 %
Advancing Volume Threshold	AV	1064 veh/hr

If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 40 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: SR 128/winery driveway
Study Scenario: Weekend PM Future Plus Project

Direction of Analysis Street: North/South
Cross Street Intersects: From the West

SR 128 - Conn Creek Rd

Southbound Volumes (veh/hr)
Through Volume = 207
Right Turn Volume = 24

SR 128 - Conn Creek Rd

Northbound Volumes (veh/hr)
198 = Through Volume
30 = Left Turn Volume

Project Driveway

Southbound Speed Limit: 40 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Speed Limit: 40 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	870.1
Advancing Volume	Va =	231
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for taper

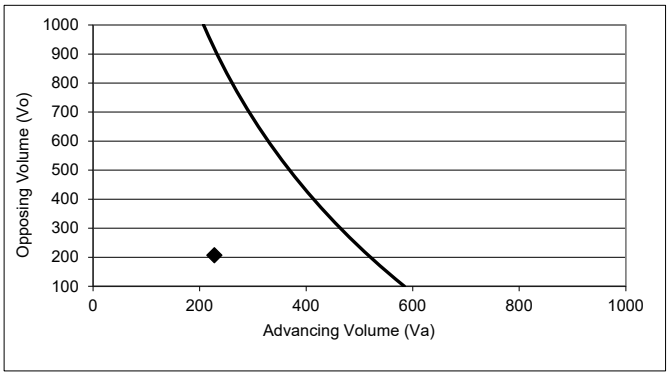
Advancing Volume Threshold	AV =	660
Advancing Volume	Va =	231
If AV<Va then warrant is met		No

Right Turn Taper Warranted: **NO**

Northbound Left Turn Lane Warrants

Percentage Left Turns	%lt	13.2 %
Advancing Volume Threshold	AV	517 veh/hr

If AV<Va then warrant is met



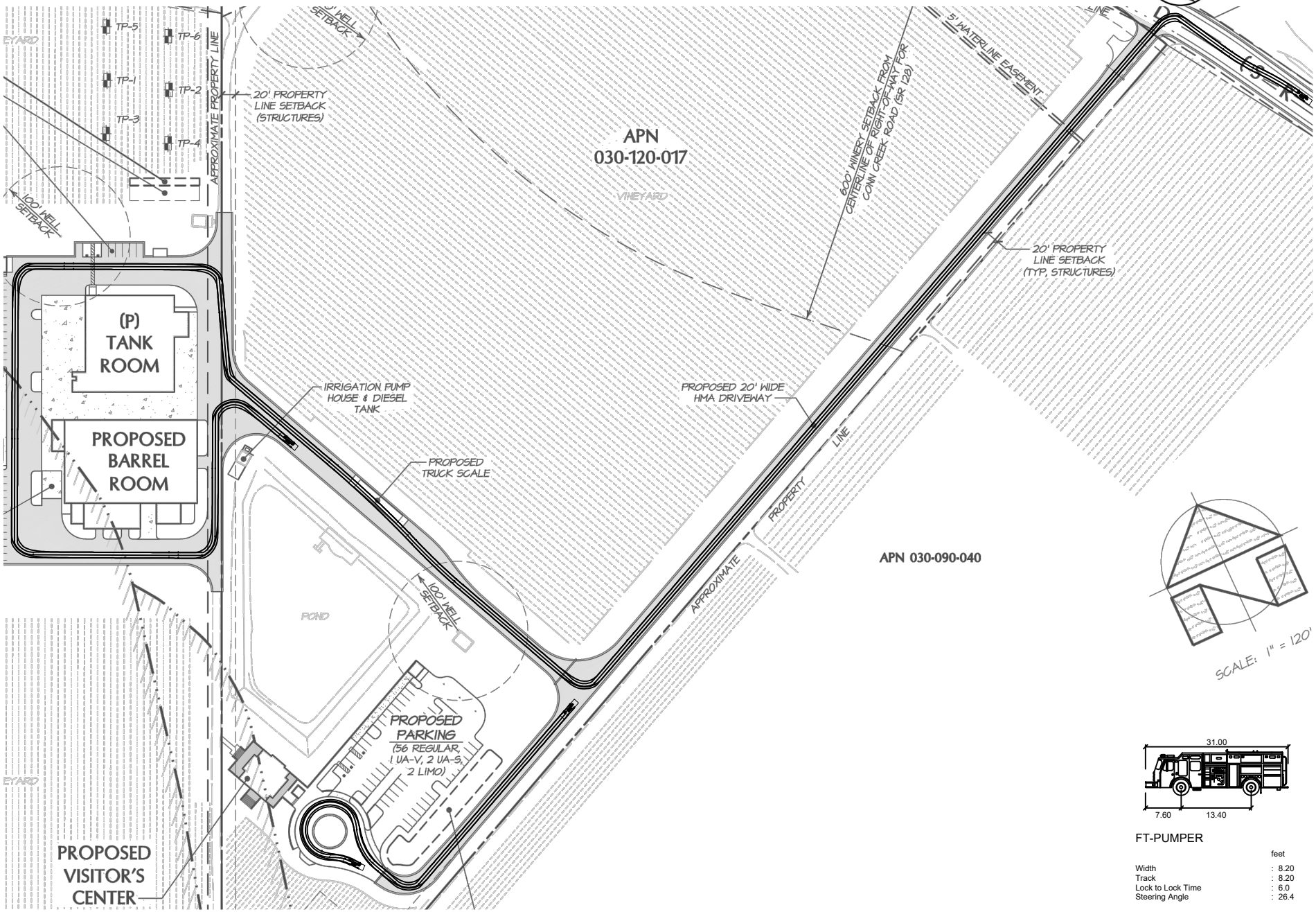
◆ Study Intersection
Two lane roadway warrant threshold for: 40 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Opposing Volume, VPH	Advancing Volume, VPH			
	5% Left Turns	10% Left Turns	20% Left Turns	30% Left Turns
40-mph Operating Speed				
800	330	240	180	160
600	410	305	225	200
400	510	380	275	245
200	640	470	350	305
100	720	575	390	340
50-mph Operating Speed				
800	280	210	165	135
600	350	260	195	170
400	430	320	240	210
200	550	400	300	270
100	615	445	335	295
60-mph Operating Speed				
800	230	170	125	115
600	290	210	160	140
400	365	270	200	175
200	450	330	250	215
100	505	370	275	240

Table V-1 Warrants for left-turn lanes on two-lane highways. (Source: Ref. 2)

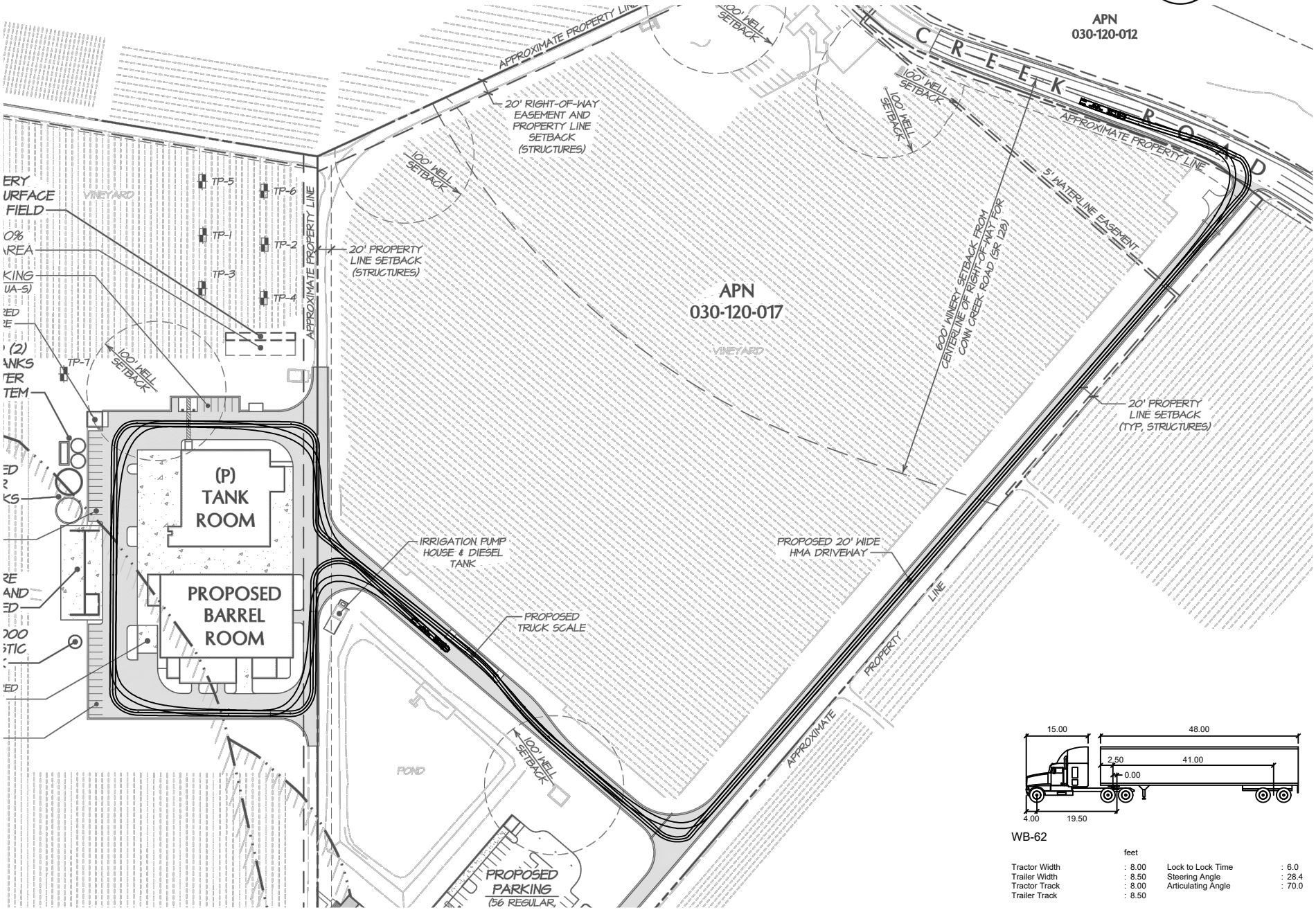


TIS for the Frank Family Benjamin Ranch Winery Project

Firetruck Access

NAX154-1

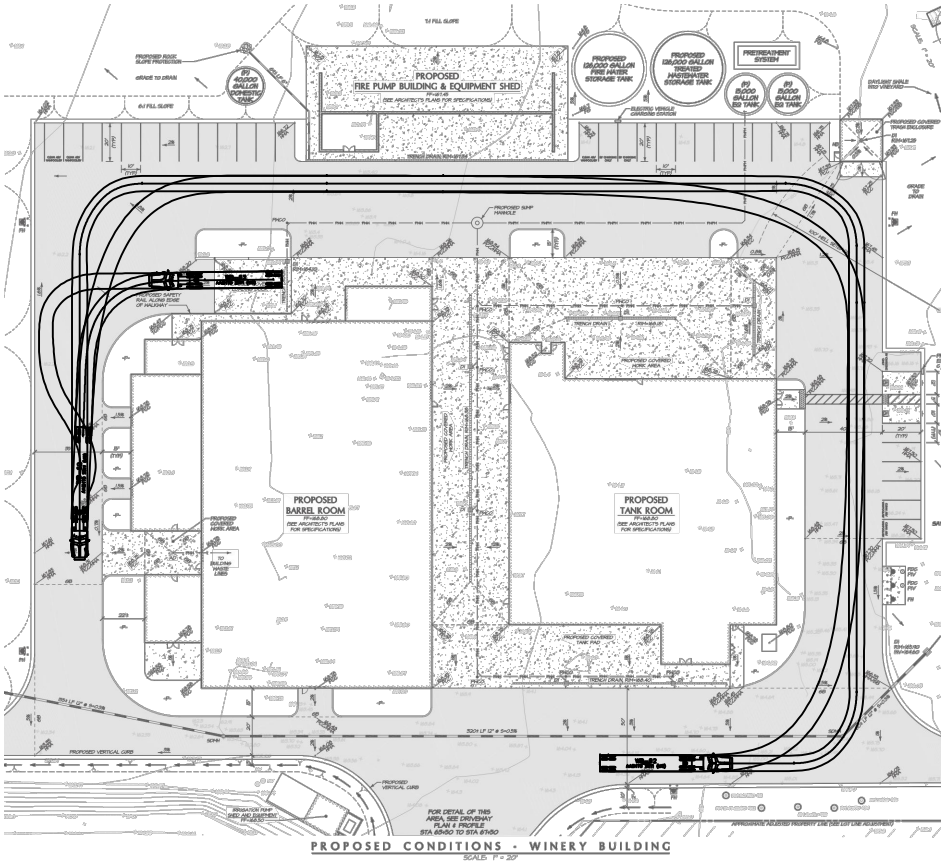
January 2020



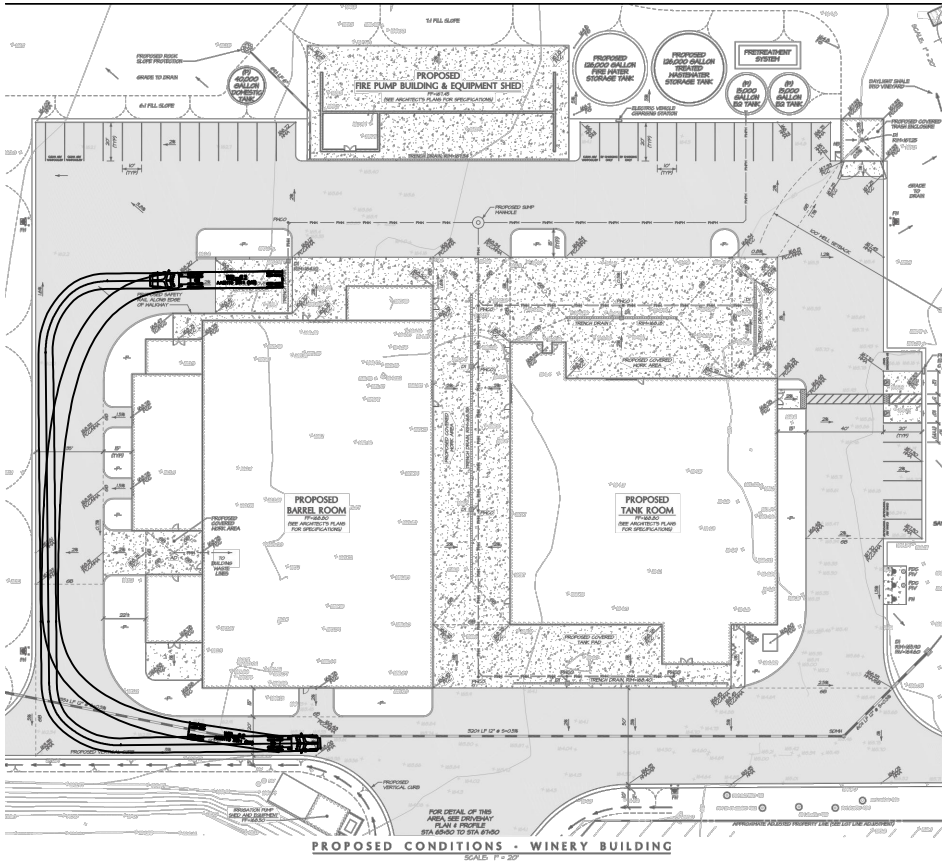
WB-62

feet

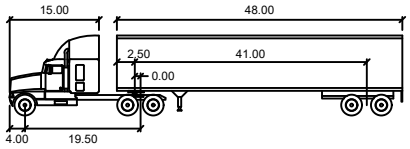
Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 70.0
Trailer Track	: 8.50		



Inbound to Loading Dock



Outbound from Loading Dock



WB-62

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 70.0
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