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Traffic Study

Sleeping Giant Winery P15-00284
Planning Commission Hearing September 7, 2016

RSA+ | CONSULTING CIVIL ENGINEERS + SURVEYORS + | SERVING CALIFORNIA SINCE | 1980

1515 FOURTH STREET
NAPA, CALIFORNIA
94559
FAX | 707 | 252.4966
OFFICE | 707 | 252.3301

HUGH LINN, PE, QSD, QSP
PRINCIPAL + PRESIDENT
hLinn@RSAcivil.com

RYAN GREGORY, PE
PRINCIPAL + VICE PRESIDENT
rGregory@RSAcivil.com

CHRISTOPHER TIBBITS, PE, LS
PRINCIPAL + VICE PRESIDENT
cTibbits@RSAcivil.com

707 | 252.3301 | RSAcivil.com

RSAcivil.com

#4115030.0
January 7, 2016

Jeffrey Redding
2423 Renfrew Street
Napa, CA 94558

RE: Sleeping Giant Winery
Potential Traffic Impacts and Warrant for Traffic Study

Dear Jeff,

In response to your request, RSA+ has reviewed the W-Trans traffic study prepared for the Bouchaine Winery Expansion in April, 2015. The following report utilizes and relies on the W-Trans report to demonstrate that the Sleeping Giant Winery will have negligible impact on the levels of service on the surrounding road and intersections evaluated in that report.

Project Description:

The proposed Sleeping Giant Winery consists of the construction of a new 30,000-gallon per year winery on an 11-acre parcel located on the north side of Las Amigas Road in Carneros. Nearby wineries include Bouchaine Vineyards that is currently processing a permit modification. Sleeping Giant Winery will consist of a new combined production / hospitality facility where tastings by appointment and special events will be held. The Winery proposes an average of eight (8) visitors on the weekends and five (5) on weekdays and will employ three (3) full-time and two (2) part-time employees. Six (6) special events will be held each year with a maximum attendance of 50 persons. All food served at these events will be catered.

Objective:

The objective of this analysis is to evaluate the additional cumulative impacts of the proposed Sleeping Giant Winery on the road and intersections identified in the 2015 Traffic Study for the Bouchaine Winery Permit Modification by W-Trans (attached).

Approach:

Prior to completing this analysis and producing the letter report, RSA+ contacted Dalene Whitlock of W-Trans and obtained permission to reproduce and use the 2015 Bouchaine Vineyards Traffic Impact Study.

For simplicity and consideration of the highest potential impact, we assumed 100% of the peak hour trips from the Sleeping Giant highest peak hour condition would be added to the roadway segment and travel direction under the future cumulative project condition that was identified in the W-Trans Bouchaine Vineyards study as having the greatest traffic volume – Cuttings Wharf Road, Northbound direction.

Findings:

Highest Volume Segment Under Future plus Project Condition: Northbound Cuttings Wharf with a volume **148** vehicles per hour. (See attached Exhibit A – Segment Level of Service, Cuttings Wharf RD – Bouchaine Winery Traffic Report)

Capacity of Northbound Cuttings Wharf Segment: 900 vehicles per peak hour (vph). (See attached Exhibit A – Segment Level of Service, Cuttings Wharf RD – Bouchaine Winery Traffic Report)

Sleeping Giant highest Peak Hour Trips: 7 vehicles per hour (See attached Exhibit B, 6.25 trips on the weekend peak hour rounded to 7 trips)

Impact to Highest Volume Segment Under Cumulative Condition – Bouchaine + Sleeping Giant:

Volume/Capacity = (148 vph + 7 vph) = (155 vph/900 vph) = 0.17
Volume/Capacity required to change current Level of Service (LOS) A to (LOS) B = 0.6 (See attached Exhibit C)

Left Turn Lane Warrant:

The County of Napa Public Works has informed the Client that a Left Turn Lane at the intersection of the project access driveway and Las Amigas Road will not be required. Memorandum from Rick Marshall, Deputy Director of Public Works, is included in Exhibit D.

Conclusions:

- The Sleeping Giant Winery will generate an additional 7 peak hour trips on Cuttings Wharf Road northbound (assumes 100% of trips are northbound).
- The Cumulative peak hour trips post Bouchaine Use Permit Modification is 148 (from W-Trans Report).
- The Total peak hour trips after Bouchaine Winery Use Permit Modification and Sleeping Giant Winery development would be 155.
- The Volume to Capacity Ratio would be 0.17 under the cumulative condition.
- The Volume Capacity Ratio which would cause LOS to reduce to Level B would be 0.6.
- The Peak hour trips required to cause LOS to drop from A to B would be 540.

- The Additional peak hour trips generated by Sleeping Giant will not cause a decrease in Level of Service.
- A Left-turn lane is not required.

Based on the most conservative assumptions under the cumulative traffic development condition that was identified in the Bouchaine Vineyards Traffic Study, the Sleeping Giant Winery will not generate enough peak hour traffic to have an impact on the surrounding roadway system. Consequently, we conclude that an additional traffic study for the Sleeping Giant proposal would only reiterate the findings currently established in the Bouchaine Vineyards study that was completed in April of 2015.

Please do not hesitate to contact me should you have any questions regarding the above.

Respectfully,

Hugh Linn, PE, LEED AP
Principal + President

Enclosures: Exhibits A, B & C

HL/sb

EXHIBIT A

Traffic Impact Study for Bouchaine Vineyards

April 14, 2015

Mr. Michael Cook
Firma Design Group
1425 North McDowell Boulevard, Suite 130
Petaluma, CA 94954

Whitlock & Weinberger
Transportation, Inc.
490 Mendocino Avenue
Suite 201
Santa Rosa, CA 95401
voice 707.542.9500
fax 707.542.9590
web www.w-trans.com

Traffic Impact Study for the Expansion of Bouchaine Vineyards

Dear Mr. Cook;

As requested, Whitlock & Weinberger Transportation, Inc. (W-Trans) has prepared a traffic analysis addressing potential traffic impacts and circulation needs for the proposed expansion of facilities at the Bouchaine Vineyards, Inc. (Bouchaine) winery located at 1075 Buchli Station Road in the Carneros region of unincorporated Napa County. The traffic study was completed in accordance with the criteria established by the County of Napa, and is consistent with standard traffic engineering techniques. Further, comments from County staff on a draft version of this document have been addressed in this final version.

Study Area

The project site is located on the west side of Buchli Station Road, just south of its intersection with Las Amigas Road.

Carneros Highway (State Route 12-121) within the vicinity of the project site runs east-west and has a posted speed limit of 55 miles per hour (mph). SR 12 provides access to Sonoma County to the west and continues east through Napa County. SR 121 provides access from SR 37 in southern Sonoma County to the City of Napa.

Buchli Station Road is a local road that runs in the north-south direction with a posted speed limit of 35 miles per hour (mph) adjacent to the project site; it dead-ends approximately 0.4 miles south of the winery entrance.

Las Amigas Road has a posted speed limit of 45 mph and generally runs east-west, from its western terminus at Duhig Road to its eastern terminus at Cuttings Wharf Road.

Duhig Road is a local road that generally runs in the north-south direction, with its northern terminus at SR 12-121 and its southern terminus at Ramal Road.

Cuttings Wharf Road generally runs north south from SR 12-121 to the north to its terminus at Cuttings Wharf on the Napa River to the south. The posted speed limit is 45 mph.

Existing Volumes

Mechanical tube counts were collected at two locations on Buchli Station Road, two locations on Las Amigas Road, and on Duhig Road and Cuttings Wharf Road near the project site from Thursday, October 23, 2014, to Sunday, October 26, 2014. This time period was during the harvest season, which is the busiest time of year in the Napa Valley, and therefore results in a more conservative analysis. Counts from 2012 for SR 12-121 were obtained from Caltrans. It should be noted that higher than typical volumes were observed on Buchli Station Road south of the winery due to construction at the time the traffic

counts were taken. The existing traffic volumes on these segments are summarized in Table 1. The volume of traffic ranges from 160 trips per day on Buchli Station Road to 30,400 trips on SR 12-121.

Table 1
Existing Traffic Volumes

Study Segment	Weekday		Saturday	
	Daily	PM Peak Hour	Daily	Midday Peak Hour
Buchli Station Rd south of Bouchaine Winery	240	42	160	13
Buchli Station Rd north of Bouchaine Winery	350	54	290	25
Las Amigas Rd west of Buchli Station Rd	390	57	350	40
Las Amigas Rd east of Buchli Station Rd	640	81	520	26
Duhig Rd	1,650	101	520	46
Cuttings Wharf Rd	2,400	212	2,300	204
SR 12-121	28,500	2,276	30,400	2,432

Cumulative Conditions

Cumulative operating conditions were determined with trips generated by other approved projects within four miles of Bouchaine Vineyards added to existing volumes. As directed by County staff, the following projects were included to evaluate Cumulative Conditions.

- *Rocca Family Winery* – 129 Devlin Road, approximately 3.5 miles northeast of the project site; new winery with an annual production of 20,000 gallons; five full-time employees and five part-time employees; maximum of 32 visitors per day; maximum of 50 guests at food and wine pairing events
- *Mahoney Vineyards* – 1134 Dealy Lane, approximately 2.6 miles north of the project site; use permit update to produce 30,000 gallons annually; two full-time employees, and 15 visitors per day
- *Hyde Winery* – 1044 Los Carneros Avenue, approximately 2 miles north of the project site; approval of a use permit with 30,000 gallons of production annually, three full-time employees; 20 visitors per day
- *Farm Collective Winery* – 388 Devlin Road, approximately 3.8 miles east of the project site; new winery with 80,000 gallons of production annually; 10 full-time employees; 30 visitors per day
- *Suscol Creek Winery* – 1055 Soscol Ferry Road, approximately 3 miles northeast of the project site; 200,000 gallon per year winery; 13 full-time employees plus three additional full-time and five-part time employees during harvest; 25 visitors per day
- *Hudson Vineyards* – 5398 Sonoma Highway, approximately 3 miles northwest of the project site; use permit update to 80,000 gallons of production annually;', seven full-time and four part-time employees on weekdays; five full-time and four part-time employees on the weekends; 120 visitors daily
- *Truchard Vineyards* – 4062 Old Sonoma Road, approximately 3.8 miles north of the project site; use permit update to 100,000 gallons of production annually; five full-time employees and one part-time employee; 30 visitors per weekday and 60 visitors per day on the weekends

The traffic volumes on the study segments under cumulative conditions are summarized in Table 2. The volume of traffic ranges from 160 trips per day on Buchli Station Road to 30,560 trips on SR 12-121. None of the vehicle trips generated by the approved projects would be expected to use any of the study

segments except SR 12-121. Some visitors to Bouchaine Vineyards would be expected to visit multiple wineries during their time in Napa Valley, including those wineries included in the list of approved projects.

Table 2
Cumulative Traffic Volumes

Study Segment	Weekday		Saturday	
	Daily	PM Peak Hour	Daily	Midday Peak Hour
Buchli Station Rd south of Bouchaine Winery	240	42	160	13
Buchli Station Rd north of Bouchaine Winery	350	54	290	25
Las Amigas Rd west of Buchli Station Rd	390	57	350	40
Las Amigas Rd east of Buchli Station Rd	640	81	520	26
Duhig Rd	1,650	101	520	46
Cuttings Wharf Rd	2,400	212	2,300	204
SR 12-121	28,675	2,341	30,560	2,508

Roadway Operation

Due to the locations on the cumulative projects, the volumes on all of the study roadways except SR 12-121 are expected to remain unchanged from Existing conditions. Roadway operation was assessed for SR 12-121 under projected Cumulative conditions, and it was determined that the road is expected to operate deficiently at Level of Service (LOS) E in both directions. The roadway segment Levels of Service are summarized in Table 5 and calculations are enclosed.

Table 3
Cumulative and Cumulative plus Project Peak Hour Roadway Segment Levels of Service

Study Segments	Cumulative Conditions		Cumulative plus Project	
	Speed	LOS	Speed	LOS
SR 12-121				
Eastbound	**35**	**E**	**35**	**E**
Westbound	**34**	**E**	**34**	**E**

Notes: Speed is measured in miles per hour; LOS = Level of Service; **Bold** text = deficient operation

Future Conditions

Growth factors for the future 2030 volumes were developed based on the Napa County travel demand model. A growth factor of 1.05 was applied to volumes on Buchli Station Road, Las Amigas Road, and Duhig Road while a growth factor of 1.15 was applied to Cuttings Wharf Road and 1.10 was applied to volumes on SR 12-121. The projected future traffic volumes on these segments are summarized in Table 4.

Table 4
Future Traffic Volumes

Study Segment	Weekday		Saturday	
	Daily	PM Peak Hour	Daily	Midday Peak Hour
Buchli Station Rd south of Bouchaine Winery	250	44	170	14
Buchli Station Rd north of Bouchaine Winery	370	57	310	26
Las Amigas Rd west of Buchli Station Rd	410	60	360	42
Las Amigas Rd east of Buchli Station Rd	680	85	540	27
Duhig Rd	1,740	106	550	48
Cuttings Wharf Rd	2,790	244	2,670	235
SR 12-121	31,400	2,504	33,500	2,675

Roadway Operation

Volumes on Las Amigas Road and Buchli Station Road are and will remain below 750 vehicles per day. This is a reasonable volume for a rural two-lane local roadway, and is substantially below the volume of 2,000 vehicles per day that is often used in the industry as the highest volume that can be accommodated on a residential road while retaining its local street character.

Roadway operation was assessed for SR 12-121, Duhig Road and Cuttings Wharf Road under Future conditions. SR 12-121 is expected to operate deficiently at LOS E in both directions while Duhig Road and Cuttings Wharf Road are expected to operate acceptably at LOS A. The roadway segment Levels of Service are summarized in Table 5 and calculations are enclosed.

Table 5
Future and Future plus Project PM Peak Hour Roadway Segment Levels of Service

Study Segments	Future Conditions		Future plus Project	
	Speed	LOS	Speed	LOS
SR 12-121				
Eastbound	**34**	**E**	**34**	**E**
Westbound	**34**	**E**	**33**	**E**
Duhig Rd				
Northbound	35	A	35	A
Southbound	35	A	35	A
Cuttings Wharf Rd				
Northbound	35	A	35	A
Southbound	35	A	35	A

Notes: Speed is measured in miles per hour; LOS = Level of Service; **Bold** text = deficient operation

Information in the *Napa County General Plan Update Draft Environmental Impact Report*, February 2007 (GPUDEIR), indicates that under 2030 volumes SR 12-121 would operate at LOS F between Cuttings

Wharf Road and Stanly Lane (this is the nearest segment included in the analysis). Methodology from the Highway Capacity Manual was used to assess conditions based on calculated future volumes, resulting in LOS E. While the General Plan EIR indicates future operation at LOS F, the Measure of Effectiveness was used as a base in order to determine the effect of project volumes on the study segment.

Project Description

The proposed project consists of building a new hospitality center/office on site for hosting events, modifying the interior of the current Tasting Room/Office/Storage building (and renaming it to Wine Club/Office building), modifying the production building to increase the enclosed dry storage area, expanding the exterior crush pad and bin storage area, modifying and improving the visitor entrance road, expanding visitor parking options, and making other minor improvements to the operations of the facility. The winery plans to discontinue participation in some of the larger industry-wide events such as April in Carneros and Holiday in Carneros. Instead, special events will include additional private agricultural promotions and dinners, wine-related groups with a catered meal, and lunch or dinner meetings throughout the year, new special wine and food events, and a Chef's Dinner Series. Wine and food pairings also will be added to the wine tasting/tour "menu." Although the winery will stop participating in the larger special events, the increase in the smaller, more frequent events would lead to an increase in trips due to both visitors and employees throughout the year.

Trip Generation

The anticipated trip generation for a proposed project is typically estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition, 2012. However, the publication contains no such information for a winery. Therefore, the County of Napa's Winery Traffic Information/Trip Generation Sheet was used to determine the anticipated traffic that would be generated by the increase in wine production. A copy of this worksheet is enclosed for reference.

The County of Napa's Winery Traffic Information/Trip Generation Sheet does not include guidance on inbound versus outbound trips, and it was assumed that 75 percent of trips at the winery would be outbound during the weekday p.m. peak hour since many of the trips would be associated with employees and customers leaving at closure of the winery. For the weekend midday peak hour it was assumed that inbound and outbound trips for visitors would be evenly split.

According to the Winery Trip Generation Sheet, an increase of six employees would result in 16 additional trips on a daily basis, with 27 new trips associated with the increase of 35 tasting visitors, and two truck trips due to the conservative use of the maximum permitted production capacity. Trips related to production (including employees and truck traffic) for proposed conditions are the same as permitted conditions. Trips related to tasting room visitors were assessed based on existing and estimated future conditions rather than permitted conditions. A summary of the project's trip generation potential is provided in Table 6.

Table 6
Trip Generation Summary

	Daily		Weekday PM Peak Hour			Weekend Midday Peak Hour		
	Weekday	Weekend	Trips	In	Out	Trips	In	Out
Existing								
Employees	-43	-12	-14	-2	-12	-4	-2	-2
Tasting Visitors	-19	-64	-7	-2	-5	-36	-18	-18
Truck Traffic	-2	-0	-1	-0	-1	0	0	0
Subtotal	*-64*	*-76*	*-22*	*-4*	*-18*	*-40*	*-20*	*-20*
Proposed								
Employees	59	19	19	3	16	6	3	3
Tasting Visitors	46	111	17	4	13	63	31	32
Truck Traffic	4	0	2	1	1	0	0	0
Subtotal	*109*	*130*	*38*	*8*	*30*	*69*	*34*	*35*
Net New Trips	**45**	**54**	**16**	**4**	**12**	**29**	**14**	**15**

Note: Trip generation as estimated above does not include special events

Special Events

Currently, the largest special events at the project site are April in Carneros and Holiday in Carneros, which have a permitted maximum of 150 visitors per day during weekends in April and November. Using the County's standard of 2.8 persons per vehicle for occupancy, the existing events with 150 attendees generate approximately 108 trip ends for guests (54 inbound at the start of the event and 54 outbound at its conclusion) plus 14 trips for staff arriving and departing. In addition to the 150-guest events, there are 28 other events permitted to be held at the site with the maximum number of guests ranging from 12 to 80 people, depending on the event. On average, event traffic adds approximately four vehicle-trips per day.

Under the current Use Permit Modification application and associated proposed Marketing program, the largest special events would be the Chef's Dinner Series, which are projected to have a maximum of 80 attendees per event and occur 24 times per year from 7:00 p.m. to 10:00 p.m., well after the evening peak period. These events are typically held on Saturday (weekend) nights. The events with 80 attendees would be expected to generate 58 trip ends for guests (29 inbound at the start of the event and 29 outbound at its conclusion) plus ten trips for staff arriving and departing.

In addition to the 80-guest events, there would be 123 other events held at the site; the number of guests would range from 20 to 50 people per event. On average, there will be a net increase of 33 daily trips related to special events on-site with the project.

Trip Distribution

The pattern used to allocate new project trips to the street network was determined by reviewing existing average daily traffic volumes on the study segments. The resulting trip distribution is shown in Table 7.

Table 7
Trip Distribution Assumptions

Origin/Destination	Percent of Trips	Daily Trips*	PM Peak Trips	Weekend Trips	Weekend Midday Trips*
SR 12-121 west of Duhig Rd	50	23	8	27	15
SR 12-121 east of Cuttings Wharf Rd	50	22	8	27	14
TOTAL	**100**	**45**	**16**	**54**	**29**

Note: * Values do not equal trip generation exactly due to rounding

Plus Project Traffic Volumes

Conditions upon adding trips based on the trip generation assumptions were evaluated to provide an assessment of the potential impacts of the project. As can be seen by comparing the volumes in Table 8 and Table 9 with those in Table 2 and Table 4 respectively, the proposed project would result in a nominal increase in volumes (15 or fewer trips per hour, or one vehicle every four minutes) on any of the area's roadways.

Table 8
Cumulative plus Project Traffic Volumes

Study Segment*	Weekday		Saturday	
	Daily	PM Peak Hour	Daily	Midday Peak Hour
Buchli Station Rd north of Bouchaine Winery	395	70	344	54
Las Amigas Rd west of Buchli Station Rd	412	65	377	54
Las Amigas Rd east of Buchli Station Rd	663	89	547	41
Duhig Rd	1,672	109	547	60
Cuttings Wharf Rd	2,423	220	2,327	219
SR 12-121	28,720	2,357	30,614	2,537

Note: * Buchli Station Road south of Bouchaine Winery has no project-added trips

Table 9
Future plus Project Traffic Volumes

Study Segment*	Weekday		Saturday	
	Daily	PM Peak Hour	Daily	Midday Peak Hour
Buchli Station Rd north of Bouchaine Winery	415	73	364	55
Las Amigas Rd west of Buchli Station Rd	432	68	387	56
Las Amigas Rd east of Buchli Station Rd	703	93	567	42
Duhig Rd	1,762	114	577	62
Cuttings Wharf Rd	2,813	252	2,697	250
SR 12-121	31,445	2,520	33,554	2,704

Note: * Buchli Station Road south of Bouchaine Winery has no project-added trips

Roadway Operation

Upon adding project generated traffic, including trips associated with special events, to both Cumulative and Future volumes on Buchli Station Road and Las Amigas Road, the resulting volume would remain below 750 trips daily, and these roadways are therefore expected to continue operating within tolerable parameters.

Because the winery's existing Use Permit is believed to allow unrestricted tasting visitors, trips related to tasting room visitors were assumed to be already part of regional traffic increases reflected in the Future volumes, so these trips were not included in the Future plus Project operational analysis. Upon adding trips associated with the additional employees and maximum permitted production to both Cumulative and Future conditions, Duhig Road and Cuttings Wharf Road are expected to continue operating acceptably at LOS A. SR 12-121 would continue to operate deficiently at LOS E under all scenarios evaluated. Project-added trips cause no change in the Measure of Effectiveness; therefore the project would have a less-than-significant impact on the study roadways.

Access Analysis

Site Access

After construction of the Use Permit modification improvements, the site would continue to be accessed via existing driveways on Buchli Station Road 1,500 and 1,700 feet south of its intersection with Las Amigas Road.

Left-Turn Lane Warrants

The need for left-turn lanes on Buchli Station Road at the project driveways was evaluated based on criteria contained in the *Napa County Road and Street Standards*, 2011. Based on the segment volumes obtained north and south of the project driveway, Buchli Station Road has an average daily traffic (ADT) volume of 350 north of the project driveway and an ADT of 240 south of the project driveway. The proposed project would generate a weekday average of 45 trips and weekend average of 54 trips. Based on these traffic levels, a left-turn lane would not be warranted at the driveway serving the project site. A copy of the graph showing the results for the higher volume weekday conditions is enclosed.

It is further noted that Buchli Station Road dead-ends approximately 0.4 miles south of the project driveway, so guests traveling northbound on Buchli Station Road and turning left into the project site is unlikely, further reducing the potential need for a left-turn lane.

Conclusions and Recommendations

- The proposed project would increase the number of full-time and part-time employees and would eliminate the largest special events while adding smaller, more frequent special events.
- No expansion in wine production is being requested; use of the maximum permitted production was assumed for a conservative analysis.
- The proposed project would result in an increase of an average of 45 daily trips during the weekday, 16 trips during the p.m. peak hour, 54 trips during the weekend and 29 trips during the weekend

midday peak hour, including the change in tasting room visitors from existing conditions to the level proposed under plus project conditions.

- SR 12-121 is projected to operate deficiently at LOS E under Cumulative conditions.
- Under Future conditions, Duhig Road and Cuttings Wharf Road are expected to operate acceptably at LOS A. SR 12-121 is projected to operate deficiently at LOS E.
- The addition of project trips to either Cumulative or Future volumes results in no measurable change to operation on the study roadways.
- The proposed project would result in a nominal increase in trips on the study roadways.
- Left-turn lanes are not warranted at any of the project driveways.

Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

Sincerely,

Lauren Davini, EIT
Assistant Traffic Engineer

Smadar Boardman, EIT
Assistant Traffic Engineer

Dalene J. Whitlock, PE, PTOE
Principal

DJW/sab/NAX085.L1

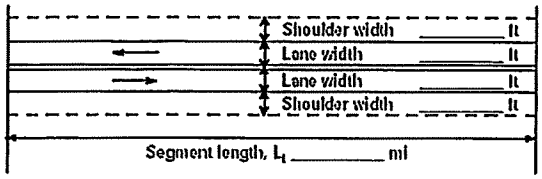
Enclosures: Roadway Level of Service Calculations
Napa County Winery Trip Generation
Napa County Left-Turn Lane Warrant

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Eastbound
Agency or Company	W-Trans	From/To	Duhig Rd to Cuttings Wharf Rd
Date Performed	11/21/2014	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Existing Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 1.00
No-passing zone 20%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points /mi 3/mi

Analysis direction vol., V_d 1141veh/h
Opposing direction vol., V_o 1136veh/h
Shoulder width ft 10.0
Lane Width ft 12.0
Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1141	1136

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	0.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	0.5 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	54.3 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	36.1 mi/h
		Percent free flow speed, PFFS	66.5 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1141	1136
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	82.5	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	10.9	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	88.0	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.67
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$ (Equation 15-11 - Class III only)	66.5

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1141.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.81
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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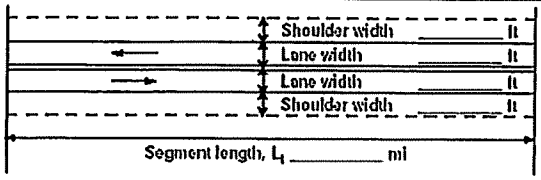
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Westbound
Agency or Company	W-Trans	From/To	Cuttings Wharf Rd to Duhig Rd
Date Performed	11/21/2014	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Existing Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 1.00

No-passing zone 20%

% Trucks and Buses, P_T 6 %

% Recreational vehicles, P_R 4%

Access points /mi 6/mi

Analysis direction vol., V_d 1136veh/h

Opposing direction vol., V_o 1140veh/h

Shoulder width ft 10.0

Lane Width ft 12.0

Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1136	1140

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.5 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	0.5 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	53.5 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	35.4 mi/h
		Percent free flow speed, PFFS	66.1 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1136	1140
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	82.4	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	10.9	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	87.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.67
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$ (Equation 15-11 - Class III only)	66.1

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1136.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_f (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.81
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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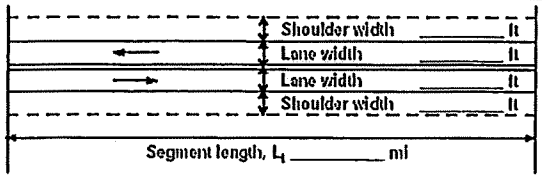
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Eastbound
Agency or Company	W-Trans	From/To	Duhig Rd to Cuttings Wharf Rd
Date Performed	4/9/15	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Cumulative Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 1.00
No-passing zone 100%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points mi 3/mi

Analysis direction vol., V_d 1165veh/h
Opposing direction vol., V_o 1176veh/h
Shoulder width ft 10.0
Lane Width ft 12.0
Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1165	1176

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	0.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	54.3 mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	35.1 mi/h
		Percent free flow speed, PFFS	64.6 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1165	1176
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	83.4	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	14.0	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	90.4	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.69
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	64.6

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1165.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_f (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.82
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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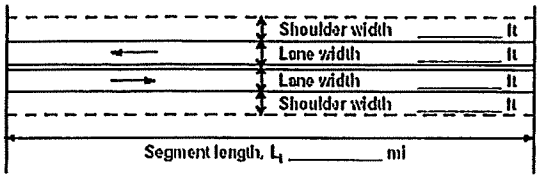
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Westbound
Agency or Company	W-Trans	From/To	Cuttings Wharf Rd to Duhig Rd
Date Performed	4/9/2015	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Cumulative Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 1.00

No-passing zone 100%

% Trucks and Buses , P_T 6 %

% Recreational vehicles, P_R 4%

Access points mi 6/mi

Analysis direction vol., V_d 1176veh/h

Opposing direction vol., V_o 1165veh/h

Shoulder width ft 10.0

Lane Width ft 12.0

Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1176	1165

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.5 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	53.5 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	34.3 mi/h
		Percent free flow speed, PFFS	64.1 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1176	1165
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	83.8	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	14.0	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	90.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.69
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$ (Equation 15-11 - Class III only)	64.1

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1176.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.83
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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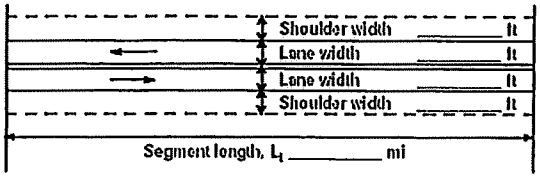
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Eastbound
Agency or Company	W-Trans	From/To	Duhig Rd to Cuttings Wharf Rd
Date Performed	4/9/2015	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Cumulative + Proj. Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 1.00
No-passing zone 100%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points /mi 3/mi

Analysis direction vol., V_d 1173veh/h
Opposing direction vol., V_o 1184veh/h
Shoulder width ft 10.0
Lane Width ft 12.0
Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1173	1184

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	0.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	54.3 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	35.0 mi/h
		Percent free flow speed, PFFS	64.4 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1173	1184
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	84.1	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	13.7	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	90.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.69
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$ (Equation 15-11 - Class III only)	64.4

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1173.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.83
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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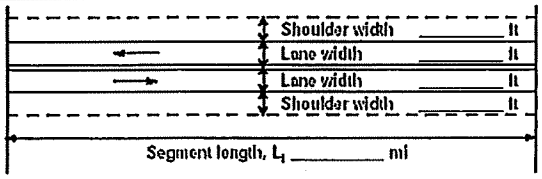
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Westbound
Agency or Company	W-Trans	From/To	Cuttings Wharf Rd to Duhig Rd
Date Performed	4/9/2015	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Cumulative + Proj. Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 1.00
No-passing zone 100%
% Trucks and Buses , P_T 6%
% Recreational vehicles, P_R 4%
Access points /mi 6/mi

Analysis direction vol., V_d 1184veh/h
Opposing direction vol., V_o 1173veh/h
Shoulder width ft 10.0
Lane Width ft 12.0
Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1184	1173

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	1.5 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	53.5 mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	34.2 mi/h
		Percent free flow speed, PFFS	63.9 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1184	1173
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	84.0	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	13.7	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	90.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.70
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	63.9

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1184.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.83
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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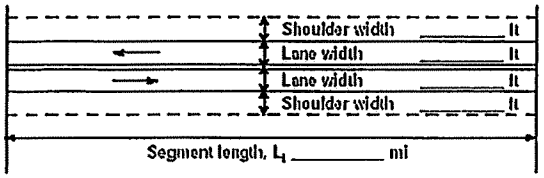
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Eastbound
Agency or Company	W-Trans	From/To	Duhig Rd to Cuttings Wharf Rd
Date Performed	11/21/2014	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Future Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 1.00

No-passing zone 100%

% Trucks and Buses , P_T 6 %

% Recreational vehicles, P_R 4%

Access points /mi 3/mi

Analysis direction vol., V_d 1255veh/h

Opposing direction vol., V_o 1250veh/h

Shoulder width ft 10.0

Lane Width ft 12.0

Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1255	1250

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	0.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	54.3 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	33.8 mi/h
		Percent free flow speed, PFFS	62.4 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1255	1250
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	86.0	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	11.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	91.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.74
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	62.4

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1255.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_i (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.86
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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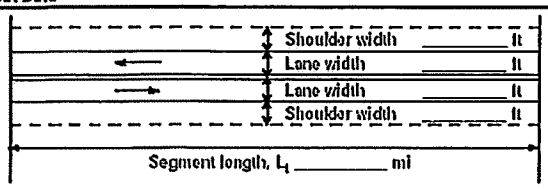
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Westbound
Agency or Company	W-Trans	From/To	Cutlings Wharf Rd to Duhig Rd
Date Performed	11/21/2014	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Future Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 1.00
No-passing zone 100%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points /mi 6/mi

Analysis direction vol., V_d 1250veh/h
Opposing direction vol., V_o 1255veh/h
Shoulder width ft 10.0
Lane Width ft 12.0
Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1250	1255

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.5 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	53.5 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	33.1 mi/h
		Percent free flow speed, PFFS	61.9 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1250	1255
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	85.9	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	11.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	91.7	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.74
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	61.9

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1250.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_i (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.86
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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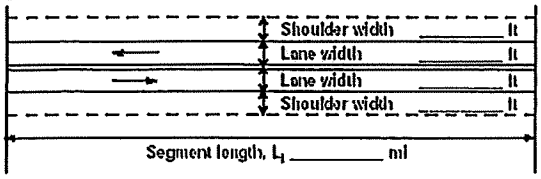
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Eastbound
Agency or Company	W-Trans	From/To	Duhig Rd to Cuttings Wharf Rd
Date Performed	11/21/2014	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Future plus Project Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down	
Peak-hour factor, PHF	1.00
No-passing zone	100%
% Trucks and Buses , P_T	6 %
% Recreational vehicles, P_R	4%
Access points /mi	3/mi
Analysis direction vol., V_d	1258veh/h
Opposing direction vol., V_o	1253veh/h
Shoulder width ft	10.0
Lane Width ft	12.0
Segment Length mi	1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1258	1253

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	0.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	54.3 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	33.8 mi/h
		Percent free flow speed, PFFS	62.3 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1258	1253
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	86.1	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	11.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	91.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.74
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	62.3

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1258.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_f (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.86
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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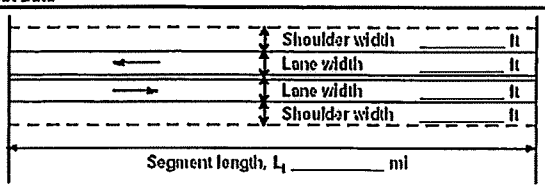
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	SAB	Highway / Direction of Travel	SR 12-121 Westbound
Agency or Company	W-Trans	From/To	Cuttings Wharf Rd to Duhig Rd
Date Performed	11/21/2014	Jurisdiction	County of Napa
Analysis Time Period	PM Peak Hour	Analysis Year	Future plus Project Conditions

Project Description: Bouchaine Vineyards

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 1.00
No-passing zone 100%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points /mi 6/mi

Analysis direction vol., V_d 1253veh/h
Opposing direction vol., V_o 1258veh/h
Shoulder width ft 10.0
Lane Width ft 12.0
Segment Length mi 1.0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	1253	1258

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	55.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.5 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	53.5 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	33.1 mi/h
		Percent free flow speed, PFFS	61.8 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	1253	1258
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	86.0	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	11.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	91.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.74
Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	61.8

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1253.0
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.86
Bicycle level of service (Exhibit 15-4)	B

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Segment Level of Service
Whitlock &Weinberger Transportation, Inc.

**Only fill in cells that are highlighted.*

Street	Duhig Rd		
Segment	From: SR 12-121	To: Las Amigas Rd	
Project Number	NAX085		
Max Speed (35 mph)	35		
Growth Rate Factor (1.0)	1.05		
Direction	NB	SB	
AM Peak Hour Vol.			
PM Peak Hour Vol.	22	60	
AM Approved Vol.			
PM Approved Vol.			
AM Project Vol.			
PM Project Vol.	3	1	
Number of Lanes (1)	1	1	

Criteria

Class III	
LOS	greater or equal to
A	30
B	24
C	18
D	14
E	10
F	0

Duhig Rd From: SR 12-121 To: Las Amigas Rd

Scenario	Max. Speed	Speed V/C=1	NB Vol.	NB Cap.	NB V/C	NB Speed	NB LOS	SB Vol.	SB Cap.	SB VC	SB Speed	SB LOS	Average of Both Directions Speed	Average of Both Directions LOS	Average of Both Directions Vol.
Existing Conditions															
P.M. Peak Hour	35	10	22	900	0.02	35	A	60	900	0.07	35	A	35	A	82
Future Conditions															
P.M. Peak Hour	35	10	23.1	900	0.03	35	A	63	900	0.07	35	A	35	A	86.1
Future plus Project Conditions															
P.M. Peak Hour	35	10	26.1	900	0.03	35	A	64	900	0.07	35	A	35	A	90.1

Segment Level of Service
Whitlock &Weinberger Transportation, Inc.

**Only fill in cells that are highlighted.*

Street	Cuttings Wharf Rd	
Segment	From: SR 12-121	To: Las Amigas Rd
Project Number	NAX085	
Max Speed (35 mph)	35	
Growth Rate Factor (1.0)	1.15	
Direction	NB	SB
AM Peak Hour Vol.		
PM Peak Hour Vol.	127	85
AM Approved Vol.		
PM Approved Vol.		
AM Project Vol.		
PM Project Vol.	2	0
Number of Lanes (1)	1	1

Criteria

Class III	
LOS	greater or equal to
A	30
B	24
C	18
D	14
E	10
F	0

Cuttings Wharf Rd From: SR 12-121 To: Las Amigas Rd

Scenario	Max. Speed	Speed V/C=1	NB Vol.	NB Cap.	NB V/C	NB Speed	NB LOS	SB Vol.	SB Cap.	SB VC	SB Speed	SB LOS	Average of Both Directions Speed	Average of Both Directions LOS	Average of Both Directions Vol.
Existing Conditions															
P.M. Peak Hour	35	10	127	900	0.14	35	A	85	900	0.09	35	A	35	A	212
Future Conditions															
P.M. Peak Hour	35	10	146.05	900	0.16	35	A	97.75	900	0.11	35	A	35	A	243.8
Future plus Project Conditions															
P.M. Peak Hour	35	10	148.05	900	0.16	35	A	97.75	900	0.11	35	A	35	A	245.8

Winery Traffic Information / Trip Generation Sheet

Project Name: Bouchaine Vineyards Project Scenario: Existing Conditions

Traffic during a Typical Weekday

Number of FT employees:	12	x 3.05 one-way trips per employee	=	37 daily trips.
Number of PT employees:	3	x 1.90 one-way trips per employee	=	6 daily trips.
Average number of weekday visitors:	25	/ 2.6 visitors per vehicle x 2 one-way trips	=	19 daily trips.
Gallons of production:	134819	/ 1,000 x .009 truck trips daily[3] x 2 one-way trips	=	2 daily trips.
		Total	=	64 **daily trips.**
(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38)			=	21 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays):	2	x 3.05 one-way trips per employee	=	6 daily trips.
Number of PT employees (on Saturdays):	3	x 1.90 one-way trips per employee	=	6 daily trips.
Average number of Saturday visitors:	90	/ 2. 8 visitors per vehicle x 2 one-way trips	=	64 daily trips.
		Total	=	76 **daily trips.**
(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57)			=	40 **PM peak trips.**

ffic during a Crush Saturday

Number of FT employees (during crush):	6	x 3.05 one-way trips per employee	=	18 daily trips.
Number of PT employees (during crush):	7	x 1.90 one-way trips per employee	=	13 daily trips.
Average number of Saturday visitors:	90	/ 2. 8 visitors per vehicle x 2 one-way trips	=	64 daily trips.
Gallons of production:	129682	/ 1,000 x .009 truck trips daily x 2 one-way trips	=	2 daily trips.
Avg. annual tons of grape on-haul:	550	/ 144 truck trips daily [4] x 2 one-way trips	=	8 daily trips.
		Total	=	105 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event):	7	x 2 one-way trips per staff person	=	14 trips.
Number of visitors (largest event):	150	/ 2.8 visitors per vehicle x 2 one-way trips	=	107 trips.
Number of special event truck trips (largest event):	4	x 2 one-way trips	=	8 trips.

Assumes 1.47 materials & supplies trips + 0.8 case goods trips per 1,000 gallons of production / 250 days per year (see *Traffic Information heet Addendum* for reference).
Assumes 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

Winery Traffic Information / Trip Generation Sheet

Project Name: Bouchaine Vineyards Project Scenario: Proposed Conditions

Traffic during a Typical Weekday

Number of FT employees:	16	x 3.05 one-way trips per employee	=	49 daily trips.
Number of PT employees:	5	x 1.90 one-way trips per employee	=	10 daily trips.
Average number of weekday visitors:	60	/ 2.6 visitors per vehicle x 2 one-way trips	=	46 daily trips.
Gallons of production:	225000	/ 1,000 x .009 truck trips daily[3] x 2 one-way trips	=	4 daily trips.
		Total	=	109 daily trips.
(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38)			=	38 PM peak trips.

Traffic during a Typical Saturday

Number of FT employees (on Saturdays):	3	x 3.05 one-way trips per employee	=	9 daily trips.
Number of PT employees (on Saturdays):	5	x 1.90 one-way trips per employee	=	10 daily trips.
Average number of Saturday visitors:	155	/ 2. 8 visitors per vehicle x 2 one-way trips	=	111 daily trips.
		Total	=	130 daily trips.
(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57)			=	69 PM peak trips.

ffic during a Crush Saturday

Number of FT employees (during crush):	4	x 3.05 one-way trips per employee	=	12 daily trips.
Number of PT employees (during crush):	7	x 1.90 one-way trips per employee	=	13 daily trips.
Average number of Saturday visitors:	155	/ 2. 8 visitors per vehicle x 2 one-way trips	=	111 daily trips.
Gallons of production:	225000	/ 1,000 x .009 truck trips daily x 2 one-way trips	=	4 daily trips.
Avg. annual tons of grape on-haul:	1100	/ 144 truck trips daily [4] x 2 one-way trips	=	15 daily trips.
		Total	=	155 daily trips.

Largest Marketing Event- Additional Traffic

Number of event staff (largest event):	5	x 2 one-way trips per staff person	=	10 trips.
Number of visitors (largest event):	80	/ 2.8 visitors per vehicle x 2 one-way trips	=	57 trips.
Number of special event truck trips (largest event):	3	x 2 one-way trips	=	6 trips.

[3] Assumes 1.47 materials & supplies trips + 0.8 case goods trips per 1,000 gallons of production / 250 days per year (see *Traffic Information Sheet Addendum* for reference).
[4] Assumes 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

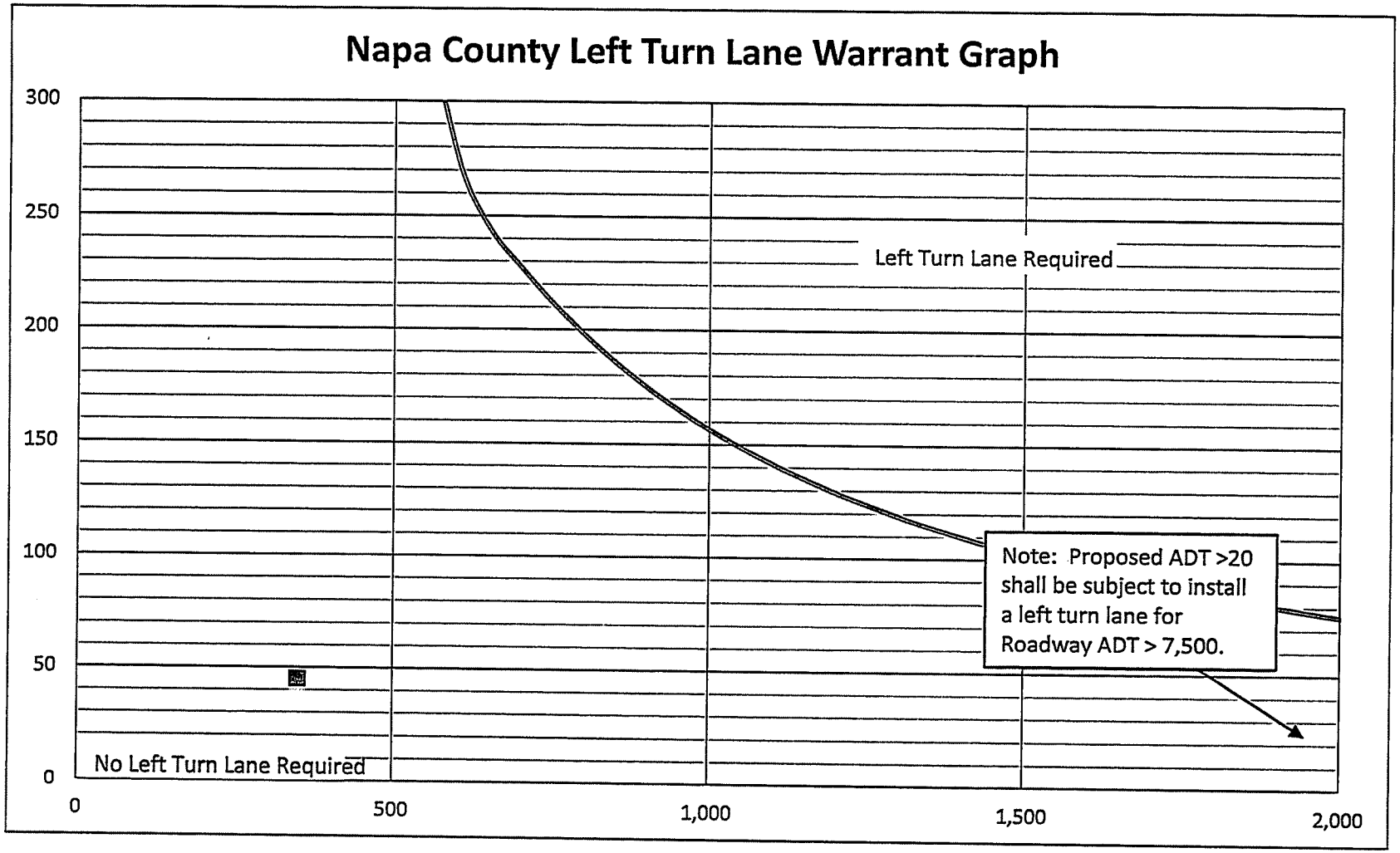
Napa County Left Turn Lane Warrant Graph
300
250
200
150
100
50
0
0
500
1,000
1,500
2,000
Left Turn Lane Required
Note: Proposed ADT >20 shall be subject to install a left turn lane for Roadway ADT > 7,500.
No Left Turn Lane Required

EXHIBIT B

Winery Traffic Information / Trip Generation Sheet
Sleeping Giant Winery

Winery Traffic Information / Trip Generation Sheet

Traffic during a Typical Weekday

Number of FT employees: 3 x 3.05 one-way trips per employee = 9.15 daily trips.

Number of PT employees: 2 x 1.90 one-way trips per employee = 3.80 daily trips.

Average number of weekday visitors: 5 / 2.6 visitors per vehicle x 2 one-way trips = 3.85 daily trips.

Gallons of production: 30,000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 0.54 daily trips.

Total = 17.34 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 5.67 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 1 x 3.05 one-way trips per employee = 3.05 daily trips.

Number of PT employees (on Saturdays): 4 x 1.90 one-way trips per employee = 7.60 daily trips.

Average number of Saturday visitors: 8 / 2. 8 visitors per vehicle x 2 one-way trips = 5.71 daily trips.

Total = 18.25 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 6.25 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 1 x 3.05 one-way trips per employee = 3.05 daily trips.

Number of PT employees (during crush): 3 x 1.90 one-way trips per employee = 5.70 daily trips.

Average number of Saturday visitors: 8 / 2. 8 visitors per vehicle x 2 one-way trips = 5.71 daily trips.

Gallons of production: 30,000 / 1,000 x .009 truck trips daily x 2 one-way trips = 0.54 daily trips.

Avg. annual tons of grape on-haul: 182 / 144 truck trips daily[4] x 2 one-way trips = 2.5 daily trips.

Total = 17.50 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 2 x 2 one-way trips per staff person = 4.00 trips.

Number of visitors (largest event): 50 / 2.8 visitors per vehicle x 2 one-way trips = 35.71 trips.

Number of special event truck trips (largest event): 1 x 2 one-way trips = 2.00 trips.

[3] Assumes 1.47 materials & supplies trips + 0.8 case goods trips per 1,000 gallons of production / 250 days per year (see *Traffic Information Sheet Addendum* for reference).

[4] Assumes 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

EXHIBIT C

CMP Level of Service Criteria for Arterials Based on Volume-to-Capacity Ratios

Table B-5
CMP Level of Service Criteria for Arterials[a] Based on Volume-to-Capacity Ratios

Level of Service	Description	V/C[b]
A	Free-flow conditions with unimpeded maneuverability. Stopped delay at signalized intersection is minimal.	0.00 to 0.60
B	Reasonably unimpeded operations with slightly restricted maneuverability. Stopped delays are not bothersome.	0.61 to 0.70
C	Stable operations with somewhat more restrictions in making mid-block lane changes than LOS B. Motorists will experience appreciable tension while driving.	0.71 to 0.80
D	Approaching unstable operations where small increases in volume produce substantial increases in delay and decreases in speed.	0.81 to 0.90
E	Operations with significant intersection approach delays and low average speeds.	0.91 to 1.00
F	Operations with extremely low speeds caused by intersection congestion, high delay, and adverse signal progression.	Greater Than 1.00

[a] For arterials that are multilane divided or undivided with some parking, a signalized intersection density of four to eight per mile, and moderate roadside development.

[b] Volume-to-capacity ratio.

≥ greater than or equal to.
< less than.

Source: Transportation Research Board, *Highway Capacity Manual, Special Report 209* (Washington, D.C., 1994).

EXHIBIT D

Left-Turn Lane Letter from County of Napa

A Tradition of Stewardship
A Commitment to Service

Department of Public Works

1195 Third Street, Suite 101
Napa, CA 94559-3092
www.countyofnapa.org/publicworks

Main: (707) 253-4351
Fax: (707) 253-4627

Steven Lederer
Director

MEMORANDUM

To:	PBES Staff	From:	Rick Marshall Deputy Director of Public Works
Date:	September 9, 2015	Re:	Sleeping Giant Winery P15-00284

Thank you for the opportunity to review the subject permit application. I offer the following comments from the Department of Public Works:

Left-Turn Lane not required. The project as proposed does not require the installation of a left-turn lane on Las Amigas Road at the project access driveway.

Encroachment Permit required. The plans indicate a new driveway connection to Las Amigas Road, a County-maintained road. An encroachment permit will be required during the building permit phase. Please contact the Roads office at (707) 944-0196 to initiate the encroachment permit process.

More information on these is available at our website:
http://www.countyofnapa.org/publicworks/roads/

Please contact me at Rick.Marshall@countyofnapa.org or call (707) 259-8381 if you have questions or need additional information.