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**Traffic Study** 

April 14, 2015

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

### Traffic Impact Study for the Expansion of Bouchaine Vineyards

Dear Mr. Cook;

w-trans

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

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 I Existing Traffic Volumes

Study Segment	,	Weekday	Saturday		
Marian Maria Carana Car	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		
5.5011	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	18	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	Cumulative Conditions		
93840 200 TO 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	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 C	onditions	Future plus Project	
, , ,	Speed	LOS	Speed	LOS
SR 12-121				
Eastbound	34	E	34	E
Westbound	34	E	33	E
Duhig Rd			A-22	
Northbound	35	Α	35	Α
Southbound	35	Α	35	Α
Cuttings Wharf Rd				
Northbound	35	Α	35	Α
Southbound	35	Α	35	Α

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	ln	Out	Trips	In	Out	
Existing							55	125	
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								40	
Employees	59	19	19	3	16	6	3	3	
Tasting Visitors	46	111	17	4	13	63	31	32	
Truck Traffic	4	0	2	ı		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		
(1870년 1974년 - 1970년 전 <del>- 1</del> 1년 대한민국(1970년 1970년	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.

TR001552

Sincerely,

Lauren Davini, EIT

Assistant Traffic Engineer

Jamen I Davini

Smadar Boardman, EIT Assistant Traffic Engineer

Dalene J. Whitlock, PE, PTOE

Principal

Enclosures:

Roadway Level of Service Calculations

Napa County Winery Trip Generation Napa County Left-Turn Lane Warrant DJW/sab/NAX085.L1

	GHWAY SEGMENT WORKSH	
Seperal Information  Analyst SAB  Igency or Company  Jale Performed  Analysis Time Period  PM Peak Hour	Site Information Highway / Direction of Travel From To Jurisdiction Analysis Year	SR 12-121 Eastbound Duhig Rd to Cuttlings Wharf Rd County of Napa Existing Conditions
Project Description: Bouchaine Vineyards		
Shoulder width  Lone width  Lone width  Lone width  Shoulder vidids  It  Segment length, L <sub>1</sub> mi  Analysis direction vol., V <sub>d</sub> 1141veh/h  Deposing direction vol., V <sub>b</sub> 1130veh/h  Shoulder width ft 10.0  and Width ft 12.0	Terrain V Love Grade Length mi Peak-hour factor, PHF No-passing zone W Trucks and Buses , F % Recreational vehicle: Access points m/	Up/down 1,00 20% 7 6 %
Segment Length mi 1.0		
Average Travel Speed	Analysis Direction (d)	Opposing Direction (a)
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)	t,0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1.0	1.0
eavy-vehicle edjustment factor, $f_{HVATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1,000
irado adjustment factor <sup>1</sup> . I <sub>a.ATA</sub> (Exhibit 15-9)	1,00	1.00
remand flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> / (PHF* f <sub>aATA</sub> * (HvATA)	1141	1136
Free-Flow Speed from Field Measurement	Estimated  Base free-flow speed <sup>4</sup> , BFFS	Free-Flow Speed 55.0 mi/h
Nean speed of sample <sup>3</sup> , S <sub>FM</sub> Fotal demand flow rate, both directions, <i>v</i> Free-flow speed, FFS=S <sub>FM</sub> +0.00776(wf <sub>FN,ATS</sub> )  Adj. for no-passing zones, f <sub>np,ATS</sub> (Exhibit 15-15)  0.5 mi/h	Adj. for lane and shoulder width, 4 f <sub>1.6</sub> (Exhibit Adj. for access points 4, f <sub>2</sub> (Exhibit 15-8) Free-flow speed, FFS (FSS=BFFS-f <sub>1.5</sub> -f <sub>2</sub> ) Average travel speed, ATS <sub>d</sub> =FFS-0.00776(v <sub>4</sub> Percent free flow speed, PFFS	0.8 min 54.3 min
ercent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (a)
assenger-car equivalents for trucks, E <sub>7</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
assenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
leavy-vehicle adjustment factor, 1-ty-1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1,000	1,000
Grude adjustment factor <sup>1</sup> , I <sub>9,PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1,00	1.00
irectional flow rate <sup>2</sup> , v <sub>(</sub> pch) v <sub>1</sub> =V <sub>/</sub> (PHF*f <sub>HV,PTSF</sub> * f <sub>g,PTSF</sub> )	1141	1136
lase percent time-spent-following <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-e <sup>3/d</sup> )		82.5
		10,9
d, for no-passing zone, f <sub>np.PTSF</sub> (Exhibit 15-21)		88.0
Percent time-spent-following, PTSF <sub>d</sub> (%)=BPTSF <sub>d</sub> +1 <sub>npPTSF</sub> *(v <sub>d,PTSF</sub> /v <sub>d,PTSF</sub> +v <sub>o,PTSF</sub> )  Level of Service and Other Performance Measures		
evel of service, LOS (Exhibit 15-3)		E 0,67
folume to capacity ratio, w/c	The state of the s	1700
apacity, C <sub>d,ATS</sub> (Equation 15-12) pc/h		1700
apacity, C <sub>d,PTSF</sub> (Equation 15-13) porh		66.5
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only)		
licycle Level of Service irectional damand flow rate in outside lane, v <sub>OL</sub> (Eq. 15-24) veh/h		1141.0
Iffective width, Wv (Eq. 15-29) fl.		32.00
flective speed factor, S, (Eq. 15-30)		4,79
icycle level of service score, BLOS (Eq. 15-31)		1.81
Skycle level of service (Exhibit 15-4)		8
Notes  Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base congrain.  If \( \lambda_q \text{ or } v_q \rangle >= 1.700 pc/h, terminate analysis—the LOS is F.  For the analysis direction only and for v>200 vervh.  For the analysis direction only and for v>200 vervh.  For the analysis direction only.		ecific downgrade segments are treated as lave
<ol> <li>Use elternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrate copyright © 2013 University of Florida, All Rights Reserved</li> </ol>	te.  HCS 2010 <sup>TM</sup> Version 6.50	Generaled: 11/21/2014 3

DIRECTIONAL	L TWO-LANE HIGHWAY SEGMENT WORK	CSHEET
General Information	Site Information Highway / Direction of Travel	SR 12-121 Westbound
Analyst SAB Agency or Company W-Trans	From/To	Cuttings Wharf Rd to Dunig Rd County of Napa
Agency or Company W-Trans Date Performed 11/21/2014 Analysis Time Period PM Peak Hour	Jurisdiction Analysis Year	Existing Candillans
Project Description. Bouchaine Vineyards		
Input Data		
\$ Shouldet width	11	
Lone width		way 🔲 Class II highway 🔲 Class III highway
Lane width Shoulder width		Level Raling
	Grade Length Peak-hour factor,	mi Up/down PHF 1.00
Segment length, L <sub>1</sub> mi	No-passing zone	2016
Analysis direction vol., V <sub>d</sub> 1136/veh/h	New limits Arrow % Trucks and Bus	
Opposing direction vol., V <sub>p</sub> 1140veh/h	% Recreational ve	ehides, P <sub>R</sub> 4% Gimi
Shoulder width ft 10.0	Access points mi	Onto
Lane Width It 12.0 Segment Length mi 1.0		
Average Travel Speed		Opposing Direction (o)
	Analysis Direction (d)	1.0
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)	1.0	
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, f <sub>NVATS</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub>	-1)) 1.000	1,000
Grade adjustment factor <sup>1</sup> , f <sub>g.ATS</sub> (Exhibit 15-9)	1,00	1,00
Demand flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> / (PHF* f <sub>aATS</sub> * f <sub>hVATS</sub> )	1136	1140
Free-Flow Speed from Field Measurem	nent Estim	nated Free-Flow Speed
	Base free-flow speed*, BFFS	55.0 min
Mean speed of sample <sup>3</sup> , S <sub>FM</sub>	Adj. for lane and shoulder width, 4 f <sub>Le</sub> (Ex	xhibit 15-7) 0.0 mi/h
Total demand flow rate, both directions, v	Adj, for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 15-8)	1.5 mi/h
Free-flow speed, FF5=S <sub>FM</sub> +0.00776(W1 <sub>HV,ATS</sub> )	Free-flow speed, FFS (FSS=BFFS-fLS-	-f <sub>A</sub> ) 53.5 mi/h
Adj for no-passing zones, fro ATS (Exhibit 15-15)	0.5 milhi Average travel speed, ATS <sub>d</sub> =FFS-0.007	
	Percent free flow speed, PFFS	66.1 95
Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (a)
5 (5) by 45 40 × 45 40	1.0	1.0
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)		1,000
Heavy-vehicle adjustment factor, f <sub>HV</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1,000	
Grade adjustment factor <sup>1</sup> , f <sub>il.PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1,60	1,00
Directional flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> (PHF*f <sub>HV,PTSF</sub> * f <sub>g,PTSF</sub> )	1136	1140
Base percent time-spent-following <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-e <sup>3V</sup> d <sup>b</sup> )		82.4
Adj. for no-peasing zone, f <sub>np.PTSF</sub> (Exhibit 15-21)		10.9
Percent time-spent-following, PTSF <sub>d</sub> (%)=8PTSF <sub>d</sub> +t <sub>np.PT\$F</sub> (v <sub>d.PT</sub>	res / V. DYRE * V. BYSE)	87.8
Level of Service and Other Performance Measures	SP UPTER UPTER	
Level of service, LOS (Exhibit 15-3)		E
Volume to capacity ratio, v/c		0.67
Capacity, C <sub>d,ATS</sub> (Equation 15-12) pch		1700
Capacity, C <sub>d,PTSF</sub> (Equation 15-13) po/h		1700
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only)		66.1
Bicycle Level of Service		
Directional demand flow rate in outside tane, v <sub>OL</sub> (Eq. 15-24) veh/h		1136.0
Effective width, VW (Eq. 15-29) ft		32.00
Effective speed factor, S, (Eq. 15-30)		4,70
Bicycle level of service score, BLOS (Eq. 15-31)		1,81
Bicycle level of service (Exhibit 15-4)		В
Mater		al specific desengands comments are trapled at level
<ol> <li>Note that the adjustment factor for level terrain is 1.00,as level to terrain.</li> </ol>	errain is one of the base conditions. For the purpose of grade adjustmen	int, specific downgrade segments are realed as level
2. If v <sub>i</sub> (v <sub>d</sub> or v <sub>o</sub> ) >=1,700 pc/h, terminate analysisthe LOS is F.		
3. For the analysis direction only and for v>200 velvh		
4. For the analysis direction only	on a transfer of the angles of the second street	
<ol><li>Use alternative Exhibit 15-14 if some trucks operate at crawl spe</li></ol>	oods on a specific downgrade.	Generaled: 11/21/2014 3:11
Copyright © 2013 University of Florida, All Rights Reserved	HCS 2010 <sup>TM</sup> . Version 6.50	Sulpianed: Interest 4 a. II

	GHWAY SEGMENT WORKSHE	51	
General Information Applicat SAB	Site Information Highway / Direction of Travel	SR 12-121 Eastbound	
Agency or Company W-Trans	From/Ta	Duhig Rd to Cuttings Wharf Rd County of Napa	
Date Performed 4/9/15 Analysis Time Period PM Peak Hour	Jurisdiction Analysis Year	Cumulative Conditions	
Project Description: Bouchaine Vineyards	in the second second		
Input Dala			
\$ Shoulder width It			
Lane width it	☑ Class I highway	Class II highway Class III highway	
Shoulder width It	Terrain 🗹 Level	Rolling	
	Peak-hour factor, PHF	Upldown 1,00	
Segment length, L <sub>t</sub> mi	No-passing zone	100%	
Analysis direction vol., V <sub>e</sub> 1165veh/h	Sand Hards Fernal % Trucks and Buses , P7	5 %	
Opposing direction vol., V <sub>o</sub> 1176veh/h	% Recreational vehicles, Access points mi	P <sub>R</sub> 4% 3/mi	
Shoulder width ft 10.0 Lane Width ft 12.0	Toolse Paritie Va		
Segment Length mi 1.0			
Average Travel Speed	Analysis Direction (d)	Opposing Direction (o)	
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)	1.0	1.0	
Passenger-car equivalents for RVs, E <sub>B</sub> (Exhibit 15-11 or 15-13)	1.0	1.0	
Heavy-vehicle adjustment fector, $f_{\text{TVATS}}=1/(1+P_{\text{T}}(E_{\hat{\Gamma}}-1)+P_{\hat{R}}(E_{\hat{R}}-1))$	1,000	1.000	
A STATE OF THE STA	1.00	1.00	
Grade adjustment factor <sup>1</sup> , f <sub>g.ATS</sub> (Exhibit 15-9)	1165	1176	
Demand flow rate <sup>2</sup> , v <sub>i</sub> (pch) v <sub>i</sub> v <sub>i</sub> / (PHF* f <sub>p,ATS</sub> * f <sub>tV,ATS</sub> )  Free-Flow Speed from Field Measurement	0/12/2	re-Flow Speed	
Proe-Flow speed from Field Moasurement	Base free-flow speed <sup>4</sup> , BFFS	55.0 muh	
	Adj. for tane and shoulder width, 4 f <sub>LS</sub> (Exhibit 15	-7) 0.0 milh	
Mean speed of sample <sup>3</sup> , S <sub>EM</sub> Fotal demand flow rate, both directions, v	Adj. for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 15-8)	as mith	
Free-flow speed, FFS=S <sub>FM</sub> +0.00778(w I <sub>NVATS</sub> )	Free-flow speed, FFS (FSS=BFFS-(Ls-fa)	54,3 min	
Adj. for no-gessing zones, f <sub>rp.ATS</sub> (Exhibit 15-15) 1.0 mith	Average travel speed, ATS <sub>d</sub> =FFS-0.00776(v <sub>d.A</sub>	70 + V. 270) -1-270 35.1 milh	
300 NORTH STANDARD CONTROL CON	Percent free flow speed, PFFS	64.6 %	
Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (o)	
Communication of the State of t	1.0	1.0	
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-18 or 15-19)	1.0	1.0	
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)		1.000	
Heavy-vehicle adjustment factor, f <sub>HV</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1))	1.000		
Grade adjustment factor <sup>1</sup> , f <sub>g.PTSF</sub> (Exhibit 16-16 or Ex 15-17)	1.00		
Directional flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>f</sub> (PHF*( <sub>NV,PTSF</sub> * ( <sub>g,PTSF</sub> ))	1165	1176	
Base percent time-spent-fotowing <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-e <sup>Wr</sup> d <sup>5</sup> )		63.4	
Adj. for no-passing zone, f <sub>no.PTSF</sub> (Exhibit 15-21)		14.0	
		90.4	
Percent time-spent-following, PTSF <sub>d</sub> (%)=8PTSF <sub>d</sub> +f <sub>np,PTSF</sub> (V <sub>d,PTSF</sub> / V <sub>d,PTSF</sub> + V <sub>d,PTSF</sub> )	<del>-                                    </del>		
Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3)		E	
Volume to capacity ratio, w/c		0.69	
Capacity, C <sub>d,ATS</sub> (Equation 15-12) pc/h		1700	
Capacity, C <sub>d.PTSF</sub> (Equation 15-13) pc/h		1700	
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only)		64.6	
Bicycle Level of Service			
Directional demand flow rate in outside sans, vol. (Eq. 15-24) veh/h		165.0	
Effective width, Wv (Eq. 15-29) ft		12.00	
Effective speed factor, S, (Eq. 15-30)		4,79	
Bicycle level of service score, BLOS (Eq. 15-31)		1.82	
Bicycle level of service (Exhibit 15-4)		В	
Notes  1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base cor	utilions. For the purpose of grade adjustment, speci	fic downgrade segments are treated as lav	
<ol> <li>Note that the adjustment factor for level terrain is 1,00, as level terrain is one of the base cor terrain.</li> </ol>	inneres. For the believes of Bone ordennings, shore		
2. If v <sub>i</sub> (v <sub>d</sub> or v <sub>o</sub> ) >=1,700 poth, terminale analysis—the LOS is F.			
<ol> <li>For the analysis direction only and for v&gt;200 vohith.</li> <li>For the analysis direction only</li> </ol>			
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.	in.		
<ol> <li>Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgray.</li> </ol>	HCS 2010 <sup>TM</sup> Version 6 50	Generaled, 4/10/2015	

Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)  Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)  1.0	Dunig Rd s
Analysis Time Petiod  Analysis Direction (d)  Opposing  Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-13)  T.0  Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	Dunig Rd s
Determined Analysis Time Period PM Peak Hour Analysis Year County of Napa Analysis Time Period Project Description: Bouchaine Vineyards    Shoulder width   II	A CAMPA D'ANT TOUCHUN DE
Project Description: Boucheine Vineyards    Shoulder width   H     Lane width   H     Lane width   H     Shoulder width   H     Segment length   L     Opposing direction vol., V <sub>d</sub>   176/eh/h     Shoulder width   10.0	A CAMPA D'ANT TOUCHUN DE
Shoulder width  Lane width  Shoulder width  Shoulder width  Shoulder width  Shoulder width  Shoulder width  II  Shoulder width  II  Shoulder width  Shoulder width  II  Something Grade Length mi  Peak-hour factor, PHF  No-passing zene  100%  No-passing zene  100%  Recreational vehicles, P <sub>R</sub> Recreational	Class III nighway
Shoulder width II  Lane width II  Lane width II  Shoulder width II  Segment length Li III  Segment length Li III  Segment length Li III  Segment length III  Segment III  Segment III  Segment III  Shoulder width II  Shoulde	] Class III nighway
Lane width  Lane width  Lane width  Shoulder width  Shoulder width  II  Shoulder width  Shoulder width  II	Class III Nighway
Late width  Shoulder width  Shoulder width  Something the pak-hour factor, PHF  1.00  Sogment length, L <sub>1</sub> mil  Analysis direction vol., V <sub>0</sub> 1176 veh/h  Disposing direction vol., V <sub>0</sub> 1165 veh/h  Shoulder width 10.0  Lane Width 1 12.0  Segment Length mil  Access points mil  Acc	J Class III nighway
Shoulder width II  Segment length, Li mil  Segment length, Li mil  Analysis direction vol., V <sub>d</sub> 1176/reh/h  Disposing direction vol., V <sub>b</sub> 1165/reh/h  Shoulder width it 10.0  Lane Width it 12.0  Segment Length mil 1.0  Average Travel Speed  Analysis Direction (d)  Disposing direction vol., V <sub>b</sub> 1165/reh/h  Access points mil 6/mil  Access points mil 6/mil  Disposing direction vol., V <sub>b</sub> 1165/reh/h  Access points mil 6/mil  Access points mil 6/mil  Disposing direction (d)  Disposing direction (d)  Access points mil 6/mil  Access points mil 6/mil  Disposing direction (d)  Disposing direction	
Segment length, L <sub>1</sub> mil  Segment length, L <sub>2</sub> mil  Analysis direction vol., V <sub>d</sub> 1176/veh/h  Disposing direction vol., V <sub>e</sub> 1185/veh/h  Disposing direction vol., V <sub>e</sub> 1185/veh/h  Shoulder width th 10.0  Lane Width th 12.0  Segment Length mil 1.0  Average Travel Speed  Analysis Direction (d)  Disposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Access points mil 6/mil  Apposing direction vol., V <sub>e</sub> 1185/veh/h  Access points mil 6/mil  Access points mil 7/mil  Access points m	
Segment length. L <sub>1</sub> mil No-passing zone 100%  Analysis direction vol., V <sub>d</sub> 1178 veh/h Deposing direction vol., V <sub>b</sub> 168 veh/h Shoulder width 1 10.0  and Width It 12.0  Segment Length mil 1.0  Average Travel Speed  Analysis Direction (d)  Deposing  Analysis Direction (d)  Opposing  Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-13)  T.0	
Analysis direction vol., V <sub>d</sub> 1176/veh/h  Stred likelih filter  *** Trucks and Buses , P <sub>T</sub> 6 %  *** Recreational vehicles, P <sub>R</sub> 6 %  *** Recreational vehicles, P <sub>R</sub> 6 %  *** Recreational vehicles, P <sub>R</sub> 6 %  *** Access points mil 6 mi	
Analysis direction vol., V <sub>d</sub> 1775-velash % Recreational validies, P <sub>R</sub> 4% Access points mil 6/mil 10.0 sihouder width ft 10.0 signment Length mil 1.0 signment Length mil 1.0 segment mil	
Shoulder width ft 10.0 and Width ft 12.0 segment Length mi 1.0 segment mi	
Analysis Direction (d)  Opposing  Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)  To  Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)  To  The state of trucks are considered as the sta	
Analysis Direction (d)  Opposing  Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)  Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)  1,0	
Analysis Direction (d) Opposition (d) Analysis Direction (d) Opposition (d) Composition (d) Co	
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)  Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)  1.0	g Direction (o)
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)  1.0	1.0
assenger-car equivalence for now, e <sub>R</sub> (Extract 1-11 of 1-17)	
	1.0
leavy-vehicle adjustment factor, f <sub>HVATS</sub> =1/(1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1)) 7,000	1.000
	1.00
Grade adjustment factor', r <sub>g,ATS</sub> (Exhibit 15-9)	
Demand flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> / (PHF* f <sub>g.ATS</sub> * f <sub>HV.ATS</sub> ) 1176	1165
Free-Flow Speed from Field Measurement Estimated Free-Flow Speed	
Base free-flow spoad*, BFFS	55.0 mi/h
Add Sentence and absolute \$ 6 (Euclide 15.7)	0.0 min
fean speed of sample. S <sub>FM</sub> (otal demand flow rate, both directions, v  Adj. for access points. 1, (Exhibit 15-8)	1.5 min
ree-flow speed, FFS=S <sub>FM</sub> +0.00776(v/ t <sub>HV,ATS</sub> )  Free-flow speed, FFS (FSS=BFFS-f <sub>LS</sub> -f <sub>A</sub> )	53.5 mith
Adj. for no-passing zones, f <sub>no.ATS</sub> (Exhibit 15-15)  1.0 m/m  Average travel speed, ATS <sub>d</sub> =FFS-0.00776(v <sub>d.ATB</sub> + v <sub>e.ATB</sub> ) - f <sub>np.ATS</sub>	34.3 mith
Percent free flow speed, PFFS	64.7 %
Parant Time Scont Following	
Analysis Direction (d) Oppositi	g Direction (e)
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-18 or 15-19)	1.0
	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-16 or 15-19)	1,000
Heavy-vehicle adjustment factor, f <sub>NV</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1)) 1.000	147,000000
Grade adjustment factor <sup>1</sup> , I <sub>a.PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1.00
	1165
Directional flow rate <sup>2</sup> , v <sub>i</sub> (poh) v <sub>i</sub> PV <sub>i</sub> (PHF*t <sub>HV,PTSF</sub> *t <sub>Q,PTSF</sub> ) 1776	
Base percent time-speni-following <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-a <sup>nr</sup> d <sup>5</sup> )	
Adj. for no-passing zono, f <sub>np.PTSF</sub> (Exhibit 15-21)	
recent line-speni-tonowing, Plan (W)-orlong the prise ("dPISE" "dPISE" "o.PISE"	
evel of Service and Other Performance Measures	
evel of service, LOS (EXRIBIT 15-3)	
Volume to capacity ratio, we	
Capacity, C <sub>d,ATS</sub> (Equation 15-12) port	
Capacity, C <sub>d,PTSF</sub> (Equation 15-13) pc/h	
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only) 64.1	
Bicycle Level of Service	
1176.0	
Directional demand flow rate in outside lane, V <sub>QL</sub> (Eq. 15-24) vah/h	
ffedive width, WV (Eq. 15-29) R	
Effective speed factor, S <sub>2</sub> (Eq. 15-30)	
Sicycle level of service score, BLOS (Eq. 15-31)	
Bicycle level of service (Exhibit 15-4)	
	ste nen franket da fa
	na are neated as lev
<ol> <li>Note that the acquairment factor for level terrain is 1,00, as level terrain is one of the base conditions. For the purpose of grade acquairment, specific downgrade segment</li> </ol>	
<ol> <li>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 segmenterain.</li> </ol>	
<ol> <li>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 segmenterrain.</li> <li>If y<sub>1</sub> y<sub>2</sub> or y<sub>2</sub>) &gt;=1,700 pc/h, terminate analysis—the LOS is F.</li> </ol>	
<ol> <li>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 segmenterrain.</li> <li>If \(\gamma_0 \to \colon_0 \times = 1,700\) pc/h, terminate analysis—the LOS is F.</li> <li>For the analysis direction only and for v&gt;200 veh/h.</li> <li>For the analysis direction only.</li> </ol>	
<ol> <li>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 segment terrain.</li> <li>If Y<sub>1</sub>(Y<sub>0</sub> or Y<sub>0</sub>) ≥=1,700 pc/h, terminate analysis—the LOS is F.</li> <li>For the analysis direction only and for y&gt;200 yea/h.</li> <li>For the analysis direction only</li> <li>Exhibit 15-20 provides coefficients a and b for Equation 15-10.</li> <li>Exhibit 15-20 provides coefficients a good to greatly a great specific downgrade.</li> </ol>	praied: 4/10/2015

General Information	HWAY SEGMENT WORKSHEET	
	Site Information Highway / Direction of Travel SR 1.	2-121 Eastbound
Analyst SAB Anancy or Campany W-Trans	From/To Duhis	g Rd to Cultings Wharf Rd ity of Napa
Agency or Company NATions Date Performed 4/N/2015 Applicate Time Period PM Feek Hour	Jurisdiction Count Analysis Year Cum	ulative + Proj. Conditions
Analysis Time Period PM Peak Hour  Project Description: Bouchaine Vineyards	American Company of the Company of t	
nput Data		
1 Shoulder width		
Lorie width	☑ Class I highway ☐ Cla	ss II highway 🔲 Class III highway
Larse width It	7.3	Relling
\$ Shoulder width	Grade Length mi Up/do	wn
	Peak-hour factor, PHF No-passing zone	1.00
Segment length, L <sub>1</sub> mi	M. Trucks and Ruses . P-	6%
Analysis direction vol., V <sub>d</sub> 1173veh/h	Similar Arrest % Recreational vehicles, PR	4%
Opposing direction vol., V <sub>e</sub> 1184veN/h	Access points mi	3/ml
Shoulder width ft 10.0		
Lane Width ft 12.0 Segment Length mi 1.0	4	
Average Travel Speed	Analysis Direction (d)	Opposing Direction (o)
		1,0
Passenger-car aquivalents for trucks, E <sub>7</sub> (Exhibit 15-11 or 15-12)	1.0	1,0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1.0	
Heavy-vehicle adjustment factor, $I_{HVATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1,000	1,000
Grade adjustment factor <sup>†</sup> . 「 <sub>BATS</sub> (Exhibit 15-9)	1.00	1.00
	1173	1184
Demand flow rate <sup>2</sup> , v <sub>i</sub> (בְּבוֹח) אָיִי V <sub>i</sub> / (PHF* (בְּבְּדָה * יְּיִנְיּעְבְּדָה)  Free-Flow Speed from Field Measurement	Estimated Free-Fig	
Little - 194 abase Hall I late and an arrangement	Base free-flow speed*, BFFS	55.0 min
	Adj. for lane and shoulder width, 4 f <sub>LS</sub> (Exhibit 15-7)	0.0 min
Mean speed of sample <sup>3</sup> . S <sub>EM</sub> Total demand flow rate, both directions, v	Adj. for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 15-8)	O.B mith
Free-flow speed, FFS=S <sub>FM</sub> +0.00778(v/ I <sub>HV,ATS</sub> )	Free-flow speed, FFS (FSS=BFFS-(LS-(A)	54.3 min
Adj. for no-passing zones, fine ATS (Exhibit 15-15) 1,0 milh	Average travel speed, ATS_=FFS-0.00776(v_ATS + V	()-1 35.0 mi/h
nad to the passeng statement ap ATS	Percent free flow speed, PFFS	64.4 %
Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (e)
	1.0	1.0
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)		1.000
Heavy-vehicle adjustment factor, f <sub>HV</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1,000	
Grade adjustment factor <sup>1</sup> , f <sub>g,PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1,00	1.00
Oirectional flow rate <sup>2</sup> , v <sub>i</sub> (poln) v <sub>i</sub> =V <sub>i</sub> (PHF*f <sub>HV.PTSF</sub> * f <sub>g.PTSF</sub> )	1173	1184
Base percent time-spent-following <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-e <sup>av_d<sup>b</sup></sup> )	84.1	
Aq. for no-passing zone, f <sub>np.PTSF</sub> (Exhibit 15-21)	13.7	
Percent time-spent-following, PTSF <sub>d</sub> (%)=BPTSF <sub>d</sub> +f <sub>np.PTSF</sub> *(Y <sub>d.PTSF</sub> / Y <sub>d.PTSF</sub> + Y <sub>o.PTSF</sub> )	90.9	
Level of Service and Other Performance Messures		
Level of service, LOS (Exhibit 15-3)	E	
Volume to capacity ratio, wo	0.69	
Capacity, C <sub>d.ATS</sub> (Equation 15-12) pcm	1790	
Capacity, C <sub>d.PTSF</sub> (Equation 15-13) polit	1700	
Percent Free-Flow Speed PFFS <sub>a</sub> (Equation 15-11 - Class III only)	64.4	
Bicycle Level of Service		
Directional demand flow rate in outside lane, v <sub>OL</sub> (Eq. 15-24) vehilh	1173.0	
	32.00	
Effective width, VV (Eq. 15-29) ft	4.79	
Effective width, Wv (Eq. 15-29) ft  Effective speed factor, S <sub>c</sub> (Eq. 15-30)		
	1.83	
Effective speed factor, S <sub>c</sub> (Eq. 15-30) Bicycle level of service score, BLOS (Eq. 15-31) Bicycle level of service (Exhibit 15-4)	1.63 B	
Effective speed factor, S <sub>c</sub> (Eq. 15-30) Bicycle level of service score, BLOS (Eq. 15-31)	В	wngrade segments are treated as leve
Effective speed factor, S <sub>2</sub> (Eq. 15-30)  Bicycle level of service score, BLOS (Eq. 15-31)  Bicycle level of service (Exhibit 15-4)  Mates  1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditorrain.  2. If v <sub>i</sub> (v <sub>g</sub> or v <sub>e</sub> ) >=1,700 pc/h, terminate analysis—the LOS is F.  3. For the analysis direction only and for v>200 veh/h.	В	wngrade segments are treated as lev
Effective speed factor, S <sub>2</sub> (Eq. 15-30) Bioycle level of service score, BLOS (Eq. 15-31) Bioycle level of service (Exhibit 15-4) Mates  1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conductorial.  2. If y/(y <sub>a</sub> or y <sub>a</sub> ) >=1,700 pc/b, terminate analysis—the LOS is F	B lisons. For the purpose of grade adjustment, specific do	wingrade segments are treated as level  Generated: 4/10/2015 2

Page 1 of 1

	DIRECTIONAL TWO-LANE	HIGHWAY SEGMENT WOR	NOUCEI	
General Information	SAB	Site Information Highway / Direction of Travel	SR 12-121 Westbound	
Analyst Agency or Company Date Performed	W-Trans	From/To	Cuttings Wharf Rd to Dullig Rd County of Napa	
Oate Performed Analysis Time Period	4/9/2018 PM Peak Hour	Jurisdiction Analysis Year	Cumurative + Proj. Conditions	
Project Description: Bouchaine V				
Input Data				
	Shoulder width h			
-	Lane width II	☑ Class I high	Tway Class II highway Class III highway	
	Lane width It		Level Rolling	
	Shoulder width	Grade Length	mi Up/down ,	
Segment	lenoth L mi	Peak-hour fector No-pessing zone	r, PHF 1.00 100%	
J. Salarian		M. Toucks and B.	COMPONED SAND	
Analysis direction vol., V <sub>d</sub>	1184yetuh	She flirthfree % Recreational	vehicles, Pp. 4%	
Opposing direction val., V <sub>e</sub>	1173veh/h	Access points /	1249/490000000000000000000000000000000000	
Shoulder width fit Lane Width ft	10.0			
Segment Length mi	1.0			
Average Travel Speed		Analysis Direction (d)	Opposing Direction (e)	
Passenger-car equivalents for true	tis F. (Exhibit 15-11 or 15-12)	1.0	1.0	
	Half Marian Control works and the con-	1.0	1,0	
Passenger-car equivalents for RV		1,000	1,000	
	HVATS=1/(1+PT(ET-1)+PR(ER-1))		1.00	
Grade adjustment factor <sup>1</sup> , fgATS	(Exhibit 15-9)	1.00		
Demand flow rate <sup>2</sup> , v <sub>r</sub> (pch) v <sub>i</sub> =v <sub>i</sub> / (PHF* ( <sub>gATS</sub> * ( <sub>revATS</sub> )		1184	1173	
Free-Fl	ow Speed from Field Measurement		mated Free-Flow Speed 55.0 m/h	
=/		Base free-flow speed*, BFFS	172	
Moon speed of sample <sup>3</sup> , S <sub>FM</sub>		Adj. for lane and shoulder width, 4 fest	Commit 15-17	
Total demand flow rate, both directions, v Free-flow speed, FFS=S <sub>FM</sub> +0.00776(v/ t <sub>MV-ATS</sub> )		Adj. for access points*, f <sub>A</sub> (Exhibit 15-	- 144	
	A 1005000 CAL SINGE	Free-flow speed, FFS (FSS=BFFS-f		
Adj. for no-passing zones, f <sub>ep.ATS</sub> (Exhibit 15-15) 1.0 m/h		Average travel speed, ATS <sub>d</sub> =FFS-0.0 Percent free flow speed, PFFS	0776(v <sub>dATS</sub> + v <sub>e,ATS</sub> ) - f <sub>re,ATS</sub> 34.2 m/n 53.9 %	
Percent Time-Spent-Following		Perceta fine flow above, 111.5		
		Analysis Direction (d)	Opposing Direction (o)	
Passonger-car equivalents for true	oks, E <sub>T</sub> (Exhibit 15-16 or 15-19)	1,0	1,0	
Passenger-car equivalents for RV	s, E <sub>R</sub> (Exhibit 15-18 or 15-19)	1.0	1.0	
Heavy-vehicle adjustment factor, f	/ <sub>HV</sub> =1/(1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1))	1.000	1.000	
Grade adjustment factor <sup>1</sup> , f <sub>g.PTSF</sub>		1.00	1.00	
Directional flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V		1184	1173	
Base percent time-spent-following	The state of the s	84.0		
			13.7	
Adj. for no-passing zone, f <sub>sp,PTSF</sub>			90.9	
	if <sub>d</sub> (%)=BPTSF <sub>d</sub> +f <sub>rep.PTBF</sub> *(V <sub>d.PT3F</sub> / V <sub>d.PT3F</sub> + V <sub>o.PTSF</sub>	3	90,9	
Level of Service and Other Perf			E	
Level of service, LOS (Exhibit 15- Volume to capacity ratio, w/c	3)		0.70	
Capacity, C <sub>d.ATS</sub> (Equation 15-12	) os/h		1700	
The state of the s			1700	
Capacity, C <sub>d,PTSF</sub> (Equation 15-1			62.9	
Percent Free-Flow Speed PFFS <sub>et</sub>	Equation 15-11 - Class III only)			
Bicycle Level of Service			1184.0	
Directional demand flow rate in ou	itside lane, V <sub>OL</sub> (Eq. 15-24) Venin		32.00	
Effective width, VV (Eq. 15-29) ft			4,79	
Effective speed factor, S, (Eq. 15	AVAILABLE DE LA COMPANIE DE LA COMPA		1.83	
Bicycle level of service score, BLC			θ	
Bicycle level of service (Exhibit 15	toric			
Notes  1. Note that the adjustment factor	for level terrain is 1.00,as level terrain is one of the ba-	se conditions. For the purpose of grade adjustm	nent, specific downgrade segments are treated as level	
terrain,		7.8		
2. If v <sub>i</sub> (v <sub>d</sub> or v <sub>a</sub> ) >=1,700 path, terr	ninate analysis—the LOS is F.			
3. For the analysis direction only :	and (ot A>500 Aethy)			
For the analysis direction only     Exhibit 15-20 provides coefficie	ints a end b for Equation 15-10. some trucks operate at crawl speeds on a specific dow	voorade.		
	some sucks operate at Case species on a species of	HCS 2010 <sup>TM</sup> Version 6.50	Generated: 4/10/2015 4:20	

	GHWAY SEGMENT WORKSH	EET
General Information Analyst SAB	Site Information Highway / Direction of Travel	SR 12-121 Eastbound
Agency or Company W-Trans	From/To	Duhig Rd to Cuttings Wherf Rd County of Napa
Date Performed 11/21/2014 Analysis Time Period PM Peak Hour	Jurisdiction Analysis Year	Future Conditions
Project Description: Bouchaine Vineyards		
Input Data		
Shoulder width It	1	
Lane width It	☑ Class I highway	Class II highway 🔲 Class III highway
Lane width It Shoulder width It	Terrain 🗹 Level	Rolling
	Grade Length mi Peak-hour factor, PHF	Upidown f.00
Segment length, L <sub>i</sub> mi	No-passing zone	10016
Analysis direction vol., V <sub>d</sub> 1255veh/h	Shee Best Arres % Trucks and Buses , P.	M. 1503
Opposing direction vol., V <sub>e</sub> 1250/eh/h	% Recreational vehicles Access points mi	PR 414 3tmi
Shoulder width ft 10.0 Lane Width ft 12.0	Access bottle in	
Segment Length ms 1.0		The state of the s
Average Travel Speed	Analysis Direction (d)	Opposing Direction (o)
Passenger-oar equivalents for trucks, E <sub>x</sub> (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $I_{HV,ATS}=1/\{1+P_T(E_T-1)+P_R(E_R-1)\}$	1.000	1,000
Grade edjustment fector <sup>1</sup> , f <sub>g.ATS</sub> (Exhibit 15-9)	1.00	1.00
Demand flow rate <sup>2</sup> , v, (pc/h) v,=V,/ (PHF* ( <sub>p.ATS</sub> * (HV.ATE)	1255	1250
Free-Flow Speed from Field Measurement	Estimated F	ree-Flow Speed
	Base free-flow speed*, BFFS	55.0 mi/h
Mean speed of semple <sup>3</sup> , S <sub>FM</sub>	Adj. for lane and shoulder width, 4 fLs(Exhibit 1	5-7) 0.0 m/h
Total demand flow rate, both directions, v	Adj. for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 15-6)	0.8 mits
Free-flow speed, FFS=S <sub>FM</sub> +0.00776(W I <sub>HV.ATS</sub> )	Free-flow speed, FFS (FSS=BFFS-fLS-fA)	54,3 mi/h
Adj. for no-passing zones, f <sub>np,ATB</sub> (Exhibit 15-15) 1.0 ml/h	Average travel speed, ATS <sub>d</sub> =FFS-0.00776(v <sub>d.</sub>	
	Percent free flow speed, PFFS	62.4 %
Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (o)
Passanger-car equivalents for trucks, E <sub>1</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-19 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $I_{HV}=1/(1+P_{T}(E_{T}-1)+P_{R}(E_{R}-1))$	1.000	1.000
Grade adjustment factor <sup>1</sup> , f <sub>aPTEF</sub> (Exhibit 15-15 or Ex 15-17)	1.00	1.00
Directional flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> (PHF*1 <sub>HV.PTBF</sub> *1 <sub>e,PTSF</sub> )	1255 1250	
Base percent time-spent-following <sup>4</sup> , BPTSF <sub>4</sub> (%)=100(1-e <sup>2V</sup> d <sup>b</sup> )		86.0
Adj. for no-passing zone, f <sub>np.PTSF</sub> (Exhibit 15-21)	y	11.6
Percent time-spent-following, PTSF <sub>d</sub> (%)=8PTSF <sub>d</sub> +f <sub>np</sub> PTSF *(v <sub>d,PTSF</sub> / v <sub>d,PTSF</sub> + v <sub>o,PTSF</sub> )		91.8
Level of Service and Other Performance Measures		
Level of service, LOS (Exhibit 15-3)		E
Volume to capacity ratio, w/c		0.74
Capacity, C <sub>d,ATS</sub> (Equation 15-12) pc/h		
Capacity, C <sub>d,PTSF</sub> (Equation 15-13) pc/h		1700
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only)		62.4
Bicycle Level of Service		1255.0
Directional demand flow rate in cutside lane, v <sub>OL</sub> (Eq. 15-24) veh/h		32.00
Effective width, Wv (Eq. 15-29) It		4.79
Effective speed factor, S <sub>7</sub> (Eq. 15-30)		1.96
Bicycle level of service score, BLOS (Eq. 15-31) Bicycle level of service (Exhibit 15-4)		8
Notes		
1. Note that the adjustment factor for level terrain is 1,00,as level terrain is one of the base cor	ditions. For the purpose of grade adjustment, spec	dific downgrade segments are treated as level
terrain. 2. If v <sub>i</sub> (v <sub>d</sub> or v <sub>o</sub> ) >=1,700 pch, terminate analysis—the LOS is F.		
<ol><li>For the analysis direction only and for v&gt;200 veh/h.</li></ol>		
4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.		
<ol> <li>Use allemative Exhibit 15-14 if some trucks operate at crawf speeds on a specific downgrad</li> </ol>	le.	Granded 11010014 5 58 D

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	GHWAY SEGMENT WORKSHEE	
General Information Analyst SAB	Site Information Highway / Direction of Travel	SR 12-121 Westbound
Agency of Company W-Trans	From/To	Cuttings Wharf Rd to Duhig Rd County of Napa
Date Performed 11/21/2014 Analysis Time Period PM Peak Hour		Suture Conditions
Project Description: Bouchaine Vineyards		
nput Data		
Simulder wiellt		
Lane width It	Class I highway	Class II highway Class III highway
Lano width	Terrain 🗹 Level	Rolling
I Shoulder width	Grade Length mi Up	o/down
Sogner# length, L <sub>t</sub> mi	Peak-hour factor, PHF No-passing zone	1.00
	New Belfsteron % Trucks and Buses, PT	6%
Analysis direction vol., V <sub>d</sub> 1250veh/h	% Recreational vehicles, Pp	4%
Opposing direction vol., V <sub>a</sub> 1255veh/h Stoulder width ft 10.0	Access points mi	6/mi
ane Width ft 12.0		
Segment Length mi 1.0		
Average Travel Speed	Analysis Direction (d)	Opposing Direction (a)
Passonger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1.0	1.0
	1,000	1,000
teavy-vehicle edjustment factor, f <sub>NV,ATS</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1.00	1.00
Grade adjustment factor <sup>1</sup> , f <sub>SATS</sub> (Exhibit 16-9)		1255
Demand flow rate <sup>2</sup> , v <sub>i</sub> (poh) v <sub>i</sub> =v <sub>i</sub> / (PHF* f <sub>pATS</sub> * (HVATS)	1250 Estimated Free	
Free-Flow Speed from Field Measurement	Base free-flow speed*, BFFS	55,0 mi/h
(2	Adj. for lane and shoulder width, fig (Exhibit 15-7	
dean speed of sample <sup>3</sup> , S <sub>FM</sub>		1.5 m/h
otal demand flow rate, both directions, v	Adj. for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 16-8)	53.5 milh
ree-flow speed, FFS=S <sub>FM</sub> +0.00778(W f <sub>NVATS</sub> )	Free-flow speed, FFS (FSS=BFFS-f <sub>LS</sub> -f <sub>A</sub> )	
Adj. for no-passing zones, f <sub>re-ATS</sub> (Exhibit 15-15) 1.0 mi/h	Average travel speed, ATS <sub>d</sub> =FFS-0.00776(V <sub>d,ATS</sub> Percent free flow speed, PFFS	61.9 %
Percent Time-Spent-Following		Opposing Direction (a)
	Analysis Direction (d)	1.0
Passanger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-18 or 15-19)	1.0	
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
feavy-vehicle adjustment factor, f <sub>MV</sub> =1/ {1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) }	1.000	1,000
Grade adjustment factor <sup>1</sup> , f <sub>g.PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1.60	1,00
Directional flow rate <sup>2</sup> , y(pc/h) y=\/(PHF*f <sub>HV.PTSF</sub> * f <sub>p.PTSF</sub> )	1250	1255
Base percent sme-spent-following*, BPTSF <sub>d</sub> (%)=100(1-e <sup>wd</sup> )	85	10
	71	.6
Ad, for no-passing zone, f <sub>re,PTSF</sub> (Exhibit 15-21)	91	1.7
Percent sime-spent-following, PTSF <sub>d</sub> (%)=8PTSF <sub>d</sub> +f <sub>np,PTEF</sub> *(V <sub>d,PTSF</sub> / V <sub>d,PTSF</sub> + V <sub>e,PTSF</sub> )		200
evel of Service and Other Performance Measures evel of service, LOS (Exhibit 15-3)		
/olume to capacity ralio, wit	0.	74
Capacity, C <sub>d,ATS</sub> (Equation 15-12) pc/h	4 17	00
Capacity, C <sub>d,PTSF</sub> (Equation 15-13) po/h	17	00
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only)	61	.9
Bicycle Level of Service		
Directional demand flow rate in outside lane, v <sub>OL</sub> (Eq. 15-24) veh/h	125	50.0
Effective width, Wv (Eq. 15-29) ft	32	00
Effective speed factor, S, (Eq. 15-30)	4.	79
Dicycle level of service score, BLOS (Eq. 15-31)	1.	86
Ricycle level of service (Exhibit 15-4)		
Voles		
<ol> <li>Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base co</li> </ol>	ndillons. For the purpose of grade adjustment, specific	cowngrade segments are treated as lev
terrain. 2. If v <sub>i</sub> (v <sub>d</sub> or v <sub>e</sub> ) >=1,700 pc/h, terminate enalysis⊷the t.OS is F.		
3. For the analysis direction only and for v>200 veh/h.		
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.		
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 downgra	de.	
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DIRECTIONAL TWO-LANE HI	GHWAY SEGMENT WORKS	HEET
General Information	Site Information	
Analyst SAB Agency or Company W-Trans Date Performed 11/21/2014 Analysis Time Period PM Peak Hour	Highway / Direction of Travel From/To Junisction Analysis Year	SR 12-121 Eastbound Dubig Rd to Cuttings Wharl Rd County of Napa Foture plus Project Continons
Project Description: Bauchaine Vineyards		
Input Data		
Shoulder width It  Lane width It  Lane width It  Shoulder width It  Shoulder width It  Shoulder width It  Analysis direction vol., V <sub>d</sub> 1258 withth  Opposing direction vol., V <sub>d</sub> 1253 vehith  Shoulder width It  Lane Width It  Segment Length It  1258 vehith  Shoulder width It  1258 vehith  1258 vehith  1258 vehith  1258 vehith  Shoulder width It  1258 vehith  1258 vehith	Terrain Le Les Grade Length mi Peak-hour factor, PHI No-passing zone % Trucks and Buses % Recreational vahid Access points mi	vel Rolling Upidown f 1.00 100%
Average Travel Speed	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-11 or 15-12)	1.0	1.0
	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1,000	1,000
Heavy-vehicle adjustment factor, t <sub>HV,ATS</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1,00	1.00
Grade adjustment factor <sup>1</sup> , I <sub>g.ATS</sub> (Exhibit 15-9)	1258	1253
Demand flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> / (PHF* f <sub>g.ATS</sub> * f <sub>hV.ATS</sub> )  Free-Flow Speed from Field Measurement		d Free-Flow Speed
Mean speed of sample <sup>3</sup> , S <sub>FM</sub> Total demand flow rate, both directions, v  Free-flow speed, FFS=S <sub>FM</sub> *0.00776(wf <sub>W</sub> , <sub>ATS</sub> )  Adj. for no-passing zones, f <sub>ro-ATS</sub> (Exhibit 15-15)  1.0 min	Base free-flow speed <sup>4</sup> , BFFS  Adj. for lane and shoulder width. <sup>4</sup> f <sub>LS</sub> (Exhib  Adj. for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 15-8)  Free-flow speed, FFS (FSS=8FFS-f <sub>LS</sub> -f <sub>A</sub> )  Average travel speed, ATS <sub>d</sub> **FFS-0.00776(  Percent free flow speed, PFFS	0,8 m/n 54.3 m/n
Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (a)
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 15-18 or 15-19)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)	1.0	1,0
Heavy-vehicle adjustment factor, f <sub>PC</sub> **1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1))	1.000	1.000
Grade adjustment factor <sup>1</sup> , f <sub>n,PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate <sup>2</sup> , v(pcfh) v <sub>i</sub> =V/(PHF <sup>+</sup> I <sub>HV</sub> ,ptsF <sup>+</sup> I <sub>a</sub> ptsF)	1258	1253
		86.1
Base percent lime-spent-following <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-e <sup>av</sup> c <sup>b</sup> )		17.6
Adj. for no-passing zone, f <sub>sp.PTSF</sub> (Exhibit 15-21)		
Percent time-spent-following, PTSF <sub>d</sub> (%)=BPTSF <sub>d</sub> +f <sub>sp,PTSF</sub> *(v <sub>d,PTSF</sub> /v <sub>d,PTSF</sub> +v <sub>s,PTSF</sub> )		91.9
Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3)		E
Volume to capacity ratio, w/c		0.74
Capacity, C <sub>d.ATS</sub> (Equation 15-12) pc/h		1700
Capadity, C <sub>d.PTSF</sub> (Equation 15-13) pc/h		1700
Percent Free-Flow Speed PFF5 <sub>d</sub> (Equallon 15-11 - Class III only)		62.3
Bicycle Level of Service		1258.0
Directional demand flow rate in outside lane, v <sub>OL</sub> (Eq. 15-24) vetuh		32.00
Effective width, WV (Eq. 15-29) ft		4.79
Effective speed factor, S <sub>2</sub> (Eq. 15-30)		1.06
Bioyde level of service score, BLOS (Eq. 15-31) Bioyde level of service (Exhibit 15-4)		6
Notes  Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conterrain.  If v <sub>i</sub> (v <sub>d</sub> or v <sub>o</sub> ) >=1,700 pc/h, terminate analysisthe LOS is F.  For the analysis direction only and for v>200 veh/h.  For the enalysis direction only  Exhibit 15-20 provides coefficients a and b for Equation 15-10.  Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgra		specific downgrade segments are treated as level

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	GHWAY SEGMENT WORKSHE	ET
General information	Site Information Highway / Direction of Travel	SR 12-121 Westbound
Analyst SAB Agency or Company W-Trans	Fram/To	Cuttings Wharf Rd to Duhig Rd County of Napa
Date Performed 11/21/2014 Analysis Time Period PM Peak Hour	Jurisdiction Analysis Year	Future plus Project Conditions
Project Description: Bouchaine Vineyards		
Input Data		
1 Shoulder width		
Lone width	Class I highway	Class II highway Class III highway
Lone width	Terrain 🗹 Level	Rolling
Shoulder width II _	Grade Length mi U	p/down 1.00
Segment length, L <sub>t</sub> mi	Peak-hour factor, PHF No-passing zone	100%
	Steer Bettli Arroll % Trucks and Buses , PT	6 %
Analysis direction vol., V <sub>d</sub> 1253/veh/h	% Recreational vehicles, P	R 4%
Opposing direction val., V <sub>a</sub> 1258veh/h Shoulder width ft 10.0	Access points mi	6kmi
Lane Width ft 12.0		
Segment Length mi 1.0 Average Travel Speed		
Average Traval Spoto	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E <sub>7</sub> (Exhibit 15-11 or 15-12)	1.0	1.0
Pessenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, f <sub>HVA15</sub> =1/ (1+ P <sub>7</sub> (E <sub>7</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1.000	1.000
	1.00	7.00
Grade adjustment factor <sup>1</sup> , f <sub>p.AT2</sub> (Exhibit 15-9)	1253	125ē
Demand flow rate <sup>2</sup> , v <sub>i</sub> (pc/h) v <sub>i</sub> =V <sub>i</sub> / (PHF* ( <sub>uATS</sub> * (HVATS)	Estimated Fre	
Free-Flow Speed from Field Measurement		55.0 mith
	Base free-flow speed*, BFFS  Adj. for lane and shoulder width,* f <sub>i.5</sub> (Exhibit 15-	
Mean speed of sample <sup>3</sup> , S <sub>FM</sub> Total demand flow rate, both directions, v	Adj. for access points <sup>4</sup> , f <sub>A</sub> (Exhibit 15-8)	1.5 min
ree-flow speed, FFS=S <sub>FM</sub> +0.00776(N f <sub>HV,ATE</sub> )	[10] [4] [4] [4] [4] [4] [4] [4] [4] [4] [4	53.5 mi/h
65 M (18)	Free-flow speed, FFS (FSS=BFFS-f <sub>LS</sub> -f <sub>A</sub> )	
Aq. for no-passing zones, f <sub>np.ATS</sub> (Exhibit 15-15) 7.0 mm	Average travel speed, ATS <sub>d</sub> =FFS-0.00776(V <sub>d,AT</sub> ) Percent free flow speed, PFFS	61.8 %
Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (c)
	1,0	1.0
Passenger-car equivalents for trucks, E <sub>Y</sub> (Exhibit 15-18 or 15-19)		1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 15-18 or 15-19)	1.0	
Heavy-vehicle adjustment factor, f <sub>HV</sub> =1/ (1+ P <sub>T</sub> (E <sub>T</sub> -1)+P <sub>R</sub> (E <sub>R</sub> -1) )	1.000	1.000
Grade adjustment factor <sup>1</sup> , f <sub>g,PTSF</sub> (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate <sup>2</sup> , v/po/h) v/=V/(PHF*f <sub>HV,PTSF</sub> * f <sub>g,PTSF</sub> )	1253	1258
Base percent time-spent-following <sup>4</sup> , BPTSF <sub>d</sub> (%)=100(1-0 <sup>1V</sup> d <sup>b</sup> )		8.0
Ad, for no-passing zone, f <sub>np.PYSF</sub> (Exhibit 15-21)		1.6
Percent time-spent-following, PTSF <sub>d</sub> (%)=8PTSF <sub>d</sub> +f <sub>np.PTSF</sub> *(V <sub>d.PTSF</sub> f V <sub>d.PTSF</sub> + V <sub>d.PTSF</sub> )	9	1.0
Level of Service and Other Performance Measures		
Level of service, LOS (Exhibit 15-3)		E
Volume to capacity ratio, w/c		74
Capacity, C <sub>d,ATS</sub> (Equation 15-12) pc/h	17	700
Capacity, C <sub>a,PTSP</sub> (Equation 15-13) pc/h	Time to the second seco	700
Percent Free-Flow Speed PFFS <sub>d</sub> (Equation 15-11 - Class III only)	6	1.8
Bicyclo Level of Service		
Directional demand flow rate in outside lane, v <sub>OL</sub> (Eq. 15-24) yeh/h	12	53.0
Effective width, Wv (Eq. 15-29) ft	3;	2,00
Effective speed factor, S <sub>r.</sub> (Eq. 16-30)	4	79
Bicycle level of service score, BLOS (Eq. 15-31)		86
Bicycle level of service (Exhibit 15-4)		0
Notes  1. Note that the adjustment factor for level terrain is 1,00, as level terrain is one of the base conternin.	nditions. For the purpose of grade adjustment, specifi	c downgrade segments are treated as level
2. If v <sub>i</sub> (v <sub>d</sub> or v <sub>o</sub> ) >=1,700 pc/h, terminate analysis—the LOS is F.  3. For the analysis direction only and for v>200 velvh.  4. For the analysis direction only		
<ol> <li>Exhibit 15-20 provides coefficients a end b for Equation 15-10.</li> <li>Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrad</li> </ol>	10.	
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# Segment Level of Service

w-trans





and the second s	0.0			
Street	Duhig Rd			
Segment	From: SR 12-121	2-121	To: Las Amigas Rd	s Rd
Project Number	NAX085			
Max Speed (35 mph)	3	5		Criteria
Growth Rate Factor (1.0)	11	:05		Class III
Direction AM Peak Hour Vol.	NB	SB	S07	S greater or equal to
PM Peak Hour Vol.	22	09	Y	30
AM Approved Vol.			B	24
PM Approved Vol.			0	18
AM Project Vol.			D	14
PM Project Vol.	3	-	Э	10
Number of Lanes (1)	1	1	F	0

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Duhig Rd			Fron	From: SR 12-121	12-12	11		To: ]	Las A	To: Las Amigas Rd	s Rd				
	Max.	Speed			NB					SB			Average	Average of Both Di	rections
Scenario	Speed	N/C=1	Vol.	Cap.	V/C	Speed	V/C Speed LOS Vol. Cap.	Vol.	Cap.	VC	VC Speed LOS	LOS	Speed	ros	Vol.
Existing Conditions									1						
P.M. Peak Hour	35	10	22	006	0.02 35	35	A	9	900	0.07 35	35	45	35	A	85
Future Conditions															
P.M. Peak Hour	35	10	23.1	006	900 0.03 35	35	A	63 900	900	0.07 35	35	A	35	A	86.1
Future plus Project Conditi	ions														
P.M. Peak Hour	35	10	26.1	006	0.03 35	35	V	64	900	0.07 35	35	<	35	V	90.1



## Segment Level of Service

Whitlock & Weinberger Transportation, Inc.



	: Rd		Criteria	Class III	greater or equal to	30	24	18	14	10
	To: Las Amigas Rd				TOS	A	В	ပ	D	33
harf Rd	2-121		35	.15	SB	85				0
Cuttings Wharf Rd From: SR 12-121 NAX085		From: SR 12-121 NAX085		_	SE SE	127				2

imper of Lanes (1)		

Cuttings Wharf Rd	Rd		From: SR 12-121	:: SR	12-12	1		To: Las Amigas Rd	A SEL	miga	s Rd				
0	Max	Speed			SB					SB			Average	Average of Both Directi	rections
Scenario	Speed	V/C=1	Vol. Cap.	Cap.	VIC	Speed	V/C Speed LOS Vol. Cap.	Vol.	Carp.	VC	VC Speed LOS	ros	Speed	S07	Vol.
Existing Conditions		i i						-					3		1
P.M. Peak Hour	35	10	127	006	900 0.14 35	35	V	85 900 0.09 35	006	0.09	35	٧	35	七	212
Future Conditions												1	į		
P.M. Peak Hour	35	10	146.05 900 0.16 35	006	91.0	35	A	97.75 900 0.11 35	006	0.11	×	Å	33	V	243.8
Future plus Project Condit	ions							1							
P.M. Peak Hour	35	10	148.05	006	0.16	35	900 0.16 35 A 97.75 900 0.11 35	97.75	006	0.11	33	ď	35	A	245.8

Win	ery Trai	fic Information / Trip Ger	ieration she	iet -	
Project Name: Bouchain		ls Project Sc	enario: Existing	Conditions	
Traffic during a Typical We	ekday			195	
Number of FT employees:	12×3.	05 one-way trips per employee		37	daily trips.
Number of PT employees:	3 × 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		x .009 truck trips daily <sup>3</sup> x 2 one-way trips		2	daily trips.
		To	tal = _	64	daily trips.
(Nº of FT employees) + (Nº of PT	employees	/2) + (sum of visitor and truck trips $\times$ .38)		21	PM peak trips.
Traffic during a Typical Saf	turday				
Number of FT employees (on Saturdays):		2 x 3.05 one-way trips per emp	oloyee #	6	daily trips.
Number of PT employees (on Saturdays):			oloyee = _	6	daily trips.
Average number of Saturday visitors:	90	/ 2. 8 visitors per vehicle x 2 one-way		64	daily trip:
Average manner of a state of the state of th		То		76	dally trips.
(Ne of FT en	nployees) +	(No of PT employees/2) + (visitor <u>trips</u> x .5	57) × _	40	PM peak trips.
Traffic during a Crush Satu	ırday				
Number of FT employees (during crush): _		6 x 3.05 one-way trips per emp	loyee = _	18	daily trips.
Number of PT employees (during crush):				13	daily trips.
Average number of Saturday visitors:	90	/ 2. 8 visitors per vehicle x 2 one-way		64	daily trip
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:	cro	/ 144 truck trips daily <sup>4</sup> x 2 one-way tr	ips =	8	daily trips
Avg. annual tons of grape of Friday.	3	727	tal = .	105	dally trips.
Largest Marketing Event- A	ddition	al Traffic			
Number of event staff (largest event):	7	x 2 one-way trips per staff perso	n = .	14	trips.
Number of visitors (largest event):	150	/ 2.8 visitors per vehicle x 2 one-way trip	s =	107	trips.
Number of special event truck trips (largest	event):	4 x 2 one-way t	rips =	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 Sheet Addendum for reference).

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

Wine	ery Traffic Information / Trip Genera	tion Sheet		
Project Name: Bouchaine	Addition in the second	o: Proposed Co	nditions	
Traffic during a Typical Wee				
Number of FT employees:	6 x 3.05 one-way trips per employee	-	49	daily trips.
Number of PT employees:	x 1.90 one-way trips per employee		10	daily trips.
Average number of weekday visitors:	/ 2.6 visitors per vehicle x 2 one-way trips		46	daily trips.
Gallons of production: 225000	/ 1,000 x .009 truck trips daily x 2 one-way trips		4	daily trips.
Gallons of production:	Total		109	daily trips.
(Ng of FT employees) + (Ng of PT	employees/2) + (sum of visitor and truck $trips \times .38$ )	-	38	PM peak trips.
Traffic during a Typical Sat	urday			
Number of FT employees (on Saturdays): _	3 x 3.05 one-way trips per employee		9	daily trips.
Number of PT employees (on Saturdays):_			10	daily trips.
Average number of Saturday visitors:	155		111	daily trips
Average number of saturary visitors.	Total		130	daily trips.
(Ng of FT em	ployees) + (No of PT employees/2) + (visitor $\frac{trips}{t} \times .57$ )		69	PM peak trips.
Traffic during a Crush Satu	rday			
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 trip:
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:			15	dally trips.
NAP. OHIO OF STATE OF	Total		155	daily trips.
Largest Marketing Event- A	dditional 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	The state of the s		6	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 Sheet Addendum for reference).

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

