w-trans

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January 6, 2014

Ms. Eileen Crane
Domaine Carneros Winery
1240 Duhig Road
Napa, CA 94559

Focused Traffic Impact Study for Domaine Carneros Winery

Dear Ms. Crane;

As requested, Whitlock & Weinberger Transportation, Inc. (W-Trans) has prepared a focused traffic analysis relative to the proposed modifications to the Use Permit for the Domaine Carneros Winery located at 1240 Duhig Road, southwest of the City of Napa in unincorporated Napa County. This study focuses on the traffic that would be generated by the proposed project on a typical weekday and its potential impact on adjacent roadways. The purpose of this is study is to provide a review of the Initial Study Checklist prepared by County Staff and determine if there is evidence to support staff's finding that the proposed project would have a less than significant impact related to transportation/traffic.

Existing Conditions

The Domaine Carneros Winery is located on the southwest corner of Duhig Road and State Route (SR) 12-121. Access to the site is taken via three driveways on Duhig Road. Based on the adjacent land uses and the nearby transportation network, it is expected that the vast majority of drivers would reach the site via SR 12-121. Therefore, SR 12-121, which is also identified as Carneros Highway, was the focus of this analysis. This route generally runs east-west and is a major regional route. Along the project frontage, the road has one travel lane in each direction plus paved shoulders.

The intersection of SR 12-121/Duhig Road is uncontrolled on the SR 12-121 approaches and is stop-controlled on the Duhig Road approach. There is a westbound left-turn lane on SR 12-121 to turn onto Duhig Road and a westbound acceleration lane is provided on SR 12-121 to allow drivers turning left onto SR 12-121 from Duhig Road to do so in two stages.

Project Description

The proposed use permit application would allow for increased visitation and special events, but would not modify allowable wine production. Currently the winery is permitted to host a daily average of 360 visitors. The permit modification would allow for the visitation to increase to 460 visitors on weekdays and 960 visitors on weekend days, an increase of 100 and 600 daily visitors, respectively. Additional marketing and special events would be allowed, but the maximum size of event attendance would not be increased. The winery is currently permitted to employ 30 people on a full-time basis and an additional 15 people on a part-time basis, which would be unchanged.

Trip Generation

The anticipated daily trip generation for the proposed project was estimated using rates established by the Napa County Conservation, Development and Planning Department and published in its *Use Permit Application*, 2011. The County's Winery Traffic Information/Trip Generation Sheet includes guidance on converting daily trip generation into peak hour trip generation. This guidance includes quite conservative assumptions that 38 percent of visitor trips would occur during the weekday afternoon peak hour and 57 percent would occur during the weekend midday peak hour. Experience gained through preparing numerous traffic analyses for winery projects throughout the North Bay region indicates that visitor traffic is typically spread out over the course of the day, with a smaller percentage of traffic occurring doing peak periods than assumed by the County.

To quantify winery tasting room travel patterns, W-Trans collected data at a large tasting facility in Sonoma County for one week every month over the course of a year. These data were used to determine visitor trip variation both by time of time as well as seasonally. It was found that the majority of visits to a winery tasting room occur mid-day, with fewer visitors at the site near the opening or closing times of the tasting room. Based on the extensive data collected it was determined that, on average, 10 percent of daily visitor trips occur during the p.m. peak hour and 12 percent of visitor trips occur during the weekend midday peak hour. The winery tasting facility where this data was collected is similar to the Domaine Carneros facility in that they are both large tasting facilities that draw visitors regionally. For the purpose of this analysis, these peak hour percentages were applied to visitor trips only, with employee trips projected using assumptions published by the County of Napa. However, it is noted that the proposed use permit modification would not alter employment levels; so, regardless of assumptions applied to the employee trip generation, it would not affect the project-related incremental increase in traffic.

It is furthermore noted that visitors to a winery tasting room are usually visiting multiple facilities in a single trip. Therefore, not all trips generated on the regional network by a winery tasting room are "new" but instead represent one of numerous destinations. However, for the sake of providing a conservative analysis, it is typically assumed that all traffic generated by a winery tasting room would be "new" trips on the network.

Applying the peak hour visitor percentages derived from data collected by W-Trans, it was determined that the proposed project would generate seven additional trips during the weekday p.m. peak period and 51 additional trips during the weekend midday peak hour. Since the County of Napa's Winery Traffic Information/Trip Generation Sheet does not include guidance on inbound versus outbound trips, it was assumed that about 75 percent of trips at the winery would be outbound during the weekday p.m. peak hour since most of the trips would be associated with employees and customers leaving at closure of the business. For the weekend midday peak hour, it was assumed that inbound and outbound trips would be evenly split. These results are summarized in Table 1 and the Trip Generation Sheets are enclosed for reference.

Table 1
Trip Generation Summary

Scenario	**Weekday**	**Weekday PM Peak Hour**			**Weekend Midday Peak Hour**		
	Trips	**Trips**	**In**	**Out**	**Trips**	**In**	**Out**
Existing Typical Operations	406	66	17	49	69	34	35
Proposed Typical Operations	483	73	19	54	120	60	60
Net Increase	**77**	**7**	**2**	**5**	**51**	**26**	**25**

The peak hour trip generation projections that would be calculated using the County's guidance are shown on the enclosed Trip Generation Sheets. For reference, the County's methodology indicates that the proposed project would be expected to generate 29 additional vehicle trips during the weekday p.m. peak hour and 245 additional trips during the weekend midday peak hour.

Access to the site would continue to be taken from Duhig Road, and it is expected that the vast majority of visitors would travel to the site via SR 12-121. Average annual daily traffic (AADT) volume data from 2012 for SR 12-121 was obtained from the California Department of Transportation (Caltrans) Traffic Data Branch through its online database and hourly traffic data was provided by Caltrans staff. Based on existing traffic volumes, it is expected that drivers traveling to/from the site would be traveling to/from the east and west evenly.

As summarized in Table 2 it was determined that the proposed project would increase daily and weekday p.m. peak hour traffic on SR 12-121 less than two-tenths of one percent. During the weekend midday peak, the proposed project would increase traffic by about one percent. These relatively small increases in traffic would be expected to result in an imperceptible impact on traffic operations on a typical weekday. In fact, typical daily and seasonal shifts in traffic volumes are much greater and result in a substantially larger change in traffic on SR 12-121 than implementation of the proposed project.

Table 2
SR 12-121 Added Traffic

Scenario	**West of Duhig Rd**			**East of Duhig Rd**		
	Daily	**PM Peak Hour**	**Weekend Midday Peak Hour**	**Daily**	**PM Peak Hour**	**Weekend Midday Peak Hour**
Exiting Traffic Volumes	24,800	2,700	2,460	31,000	2,800	2,460
Project Added Traffic Volumes	39	4	26	38	3	25
Percentage Increase	**0.16%**	**0.15%**	**1.06%**	**0.12%**	**0.11%**	**1.02%**

Note: Existing traffic volumes were obtained from the Caltrans Traffic Data Branch

Special Events

The use permit modification would allow for the following special events:

- 2 events per year with a maximum attendance of 300 guests
- 2 events per month with a maximum attendance of 50 guests
- 8 events per month with a maximum attendance of 25 guests

Since special events would be infrequent, they would not represent typical daily operations, which is the focus of this analysis. However, the potential impact of events was analyzed from a qualitative point of view for informational purposes. The monthly events of 25 to 50 guests would represent a small increase in daily visitation and would therefore result in a relatively small potential for impacts on the adjacent segment of SR 12-121. The two annual events with a maximum attendance of 300 guests would represent a large portion of daily visitation. However, the site is currently allowed to host events of up to 300 guests, so this would be no change over existing conditions. To minimize the possibility of impacts on SR 12-121, it may be beneficial to employ some or all of the following strategies during these large events:

- Begin and end the event outside of the peak hour
- Hold the event outside of normal tasting room operating hours
- Close the tasting room to the general public during the event

Additionally, it may be necessary to implement a parking management plan during the 300-person events.

Operational Analysis

Despite the relatively low amount of traffic that the project would add to SR 12-121, an operational analysis of the route was completed to quantify any impacts. The County of Napa, in its General Plan Policy CIR-16, establishes the following standards of significance for roadways within Napa County:

> *The County shall seek to maintain an adequate level of service on roads and at intersections as follows. The desired level of service shall be measured at peak hours on weekdays.*
>
> *The County shall seek to maintain an arterial Level of Service D or better on all county roadways, except where maintaining this desired level of service would require the installation of more travel lanes than shown on the Circulation Map.*

SR 12-121 is classified as a "Rural Throughway (2 Lanes)" on the County's Circulation Map. Therefore, County policy limits widening of the road for the sake of increasing capacity.

If a facility operates deficiently at LOS E or F, the County has not established a threshold of significance for determining a project's impact. Therefore, the significance criteria applied in the in the *Napa Pipe EIR* (Napa County 2009) was used for this analysis. In this certified EIR, it was established that a project's impact would be considered less than significant unless it added more than 50 peak hour trips to a facility operating at these deficient levels of service.

Furthermore, since the study facility is a State Route, the Caltrans operational standards were also considered:

> *The level of service (LOS) for operating State highway facilities is based upon measures of effectiveness (MOEs)...Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than the appropriate target LOS, the existing MOE should be maintained.*

Currently SR 12-121 operates at Level of Service (LOS) E during the p.m. peak hour, which is below the desired thresholds established by both the County and Caltrans. With the addition of project-generated traffic the route would continue to operate at LOS E. These results are summarized in Table 3 and calculations are attached for reference. Since the proposed project would add fewer than 50 peak hour vehicle trips to SR 12-121, the project's impact is less than significant. For reference purposes, if the County's peak hour trip generation rates were applied to this analysis, the project would still generate fewer than 50 new vehicle trips on SR 12-121 during the peak hour and would therefore still have a less than significant impact on the facility.

Table 3
SR 12-121 PM Peak Hour Roadway Operations

Scenario Direction	West of Duhig Rd			East of Duhig Rd		
	LOS	v/c	PTSF	LOS	v/c	PTSF
Exiting Traffic Volumes						
Westbound	E	0.84	93.7	E	0.87	94.3
Eastbound	E	0.84	93.7	E	0.87	94.3
Existing plus Project Traffic Volumes						
Westbound	E	0.84	93.8	E	0.87	94.5
Eastbound	E	0.84	93.7	E	0.87	94.5

Note: LOS = Level of Service; v/c = vehicle to capacity ratio; PTSF = Percent Time Spent Following

It was found that the calculated volume to capacity (v/c) ratio would not change with the addition of project-generated traffic; however, there would be a slight increase in the Percent Time Spent Following (PTSF). The v/c ratio and PTSF are the measures of effectiveness used by the County and Caltrans, respectively, when analyzing a two-lane road. While there would be a slight increase in the PTSF, the increase would be very small and drivers would not be expected to experience a perceptible difference in operations of SR 12-121. It is noted that considering the nature of SR 12-121, it would be necessary to widen the route in order to achieve LOS D or better operations. As previously stated, the County, in General Plan Policy CIR-16, has established that a roadway is exempt from the LOS D standard if attainment of this level of service would require widening of the roadway beyond what is shown in the County's Circulation Map. On this map, SR 12-121 has been identified a "Rural Throughway (2 Lanes)" in the vicinity of the project site.

Although weekend midday peak hour trip generation data is provided for informational purposes, since the County's standards of significance only apply to the weekday peak hour, no operational analysis was completed for the weekend peak hour.

Future Conditions

The County, in its General Plan, projects that SR 12-121 would continue to operate at a similar level of service under conditions projected for the 2030 horizon year. Therefore, it is expected that the project's impact to the route would remain negligible under future conditions. Furthermore, application of the 50-trip threshold as a standard of significance for analysis of future cumulative conditions indicates that since the project would generate fewer than 50 new vehicle trips during the p.m. peak hour, the project's impact under cumulative conditions would be less than significant.

Intersection Operations

The project site would continue to be accessed via driveways on Duhig Road, just south of SR 12-121, with the vast majority of Domaine Carneros employees and visitors traveling through the intersection of SR 12-121/Duhig Road to reach the site. This intersection is uncontrolled on the SR 12-121 approaches and is stop-controlled on the Duhig Road approach.

Caltrans has recently completed improvements to the intersection of SR 12-121/Duhig Road to provide a westbound left-turn lane on SR 12-121 to turn onto Duhig Road. Additionally, a westbound acceleration lane is provided on SR 12-121 to allow drivers turning left onto SR 12-121 from Duhig Road to do so in two stages. These improvements are beneficial to those traveling to and from the Domaine Carneros site as well as adjacent businesses and residences.

It is expected that the proposed use permit modification would result in approximately seven more vehicle trips at the SR 121-121/Duhig Road intersection and four more vehicle trips at the SR 12-121/Old Sonoma Road intersection during the p.m. peak hour. These small increases in traffic can reasonably be expected to result in an imperceptible change in operations at the intersections. Furthermore, the traffic that would be added to these intersections is less than the 50-trip threshold used as a standard of significance. Therefore, the project's impact to these intersections would be less than significant.

Conclusions

Based on the analysis performed, it is anticipated that the minor increase in traffic associated with the proposed change in the Use Permit will result in no perceptible change to operation of SR 12-121, and an overall less-than-significant impact on adjacent transportation facilities. This is consistent with the findings presented in the Initial Study.

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

Sincerely,

Tony Henderson

Tony Henderson, PE, PTOE
Traffic Engineer

Dalene J Whitlock

Dalene J. Whitlock, PE, PTOE
Principal

Dalene J. Whitlock
TR001552
Exp. 9/30/14

DJW/tdh/NAX073.L1

Enclosure: Trip Generation Forms
Peak Hour Trip Generation Calculations
Level of Service Calculations

Winery Traffic Information / Trip Generation Sheet

Traffic during a Typical Weekday

Number of FT employees: 30 x 3.05 one-way trips per employee = 92 daily trips.

Number of PT employees: 15 x 1.90 one-way trips per employee = 29 daily trips.

Average number of weekday visitors: 360 / 2.6 visitors per vehicle x 2 one-way trips = 277 daily trips.

Gallons of production: 432,000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 8 daily trips.

Total = 406 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 143 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 30 x 3.05 one-way trips per employee = 92 daily trips.

Number of PT employees (on Saturdays): 15 x 1.90 one-way trips per employee = 29 daily trips.

Average number of Saturday visitors: 360 / 2. 8 visitors per vehicle x 2 one-way trips = 257 daily trips.

Total = 378 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 184 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 30 x 3.05 one-way trips per employee = 92 daily trips.

Number of PT employees (during crush): 15 x 1.90 one-way trips per employee = 29 daily trips.

Average number of Saturday visitors: 360 / 2. 8 visitors per vehicle x 2 one-way trips = 257 daily trips.

Gallons of production: 432000 / 1,000 x .009 truck trips daily x 2 one-way trips = 8 daily trips.

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

Total = 386 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 40 x 2 one-way trips per staff person = 80 trips.

Number of visitors (largest event): 300 / 2.8 visitors per vehicle x 2 one-way trips = 214 trips.

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

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[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).

Winery Traffic Information / Trip Generation Sheet

Traffic during a Typical Weekday

Number of FT employees: 30 x 3.05 one-way trips per employee = 92 daily trips.

Number of PT employees: 15 x 1.90 one-way trips per employee = 29 daily trips.

Average number of weekday visitors: 460 / 2.6 visitors per vehicle x 2 one-way trips = 354 daily trips.

Gallons of production: 432,000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 8 daily trips.

Total = 483 daily trips.

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 172 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 30 x 3.05 one-way trips per employee = 92 daily trips.

Number of PT employees (on Saturdays): 15 x 1.90 one-way trips per employee = 29 daily trips.

Average number of Saturday visitors: 960 / 2. 8 visitors per vehicle x 2 one-way trips = 686 daily trips.

Total = 807 daily trips.

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 429 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 40 x 3.05 one-way trips per employee = 122 daily trips.

Number of PT employees (during crush): 25 x 1.90 one-way trips per employee = 48 daily trips.

Average number of Saturday visitors: 960 / 2. 8 visitors per vehicle x 2 one-way trips = 686 daily trips.

Gallons of production: 432000 / 1,000 x .009 truck trips daily x 2 one-way trips = 8 daily trips.

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

Total = 864 daily trips.

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 40 x 2 one-way trips per staff person = 80 trips.

Number of visitors (largest event): 300 / 2.8 visitors per vehicle x 2 one-way trips = 214 trips.

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

Focused Traffic Impact Study for Domaine Carneros Winery
Peak Hour Trip Generation
Existing Conditions

Weekday

	Num of Empl/ Visitor	Trips			
		Daily	PM Peak		
			Total	In	Out
Full Time Employees - 1 trip per employee	30	92	30	8	22
Part Time Employees - 0.5 trip per employee	15	29	8	2	6
Visitors - 10% of daily visitor trips	360	277	28	7	21
Production	--	8	0	0	0
Total		406	66	17	49

Weekend

	Num of Empl/ Visitor	Trips			
		Daily	Midday Peak Hour		
			Total	In	Out
Full Time Employees - 1 trip per employee	30	92	30	15	15
Part Time Employees - 0.5 trip per employee	15	29	8	4	4
Visitors - 12% of daily visitor trips	360	257	31	15	16
Total		378	69	34	35

Data Sources:

Daily trip generation: Napa County Winery Traffic Information/Trip Generation Sheet

Employee peak hour trip generation: Napa County Winery Traffic Information/Trip Generation Sheet
Visitor peak hour trip generation: Data collected by W-Trans at a similar Sonoma County winery tasting room

Focused Traffic Impact Study for Domaine Carneros Winery
Peak Hour Trip Generation
Existing plus Project Conditions

Weekday

	Num of Empl/ Visitor	Trips			
		Daily	PM Peak		
			Total	In	Out
Full Time Employees - 1 trip per employee	30	92	30	8	22
Part Time Employees - 0.5 trip per employee	15	29	8	2	6
Visitors - 10% of daily visitor trips	460	354	35	9	26
Production	--	8	0	0	0
Total		483	73	19	54
Increase over existing		77	7	2	5

Weekend

	Num of Empl/ Visitor	Trips			
		Daily	Midday Peak Hour		
			Total	In	Out
Full Time Employees - 1 trip per employee	30	92	30	15	15
Part Time Employees - 0.5 trip per employee	15	29	8	4	4
Visitors - 12% of daily visitor trips	960	686	82	41	41
Total		807	120	60	60
Increase over existing		429	51	26	25

Data Sources:

Daily trip generation: Napa County Winery Traffic Information/Trip Generation Sheet

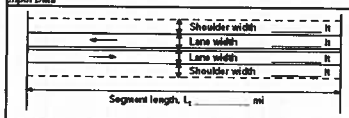
Employee peak hour trip generation: Napa County Winery Traffic Information/Trip Generation Sheet
Visitor peak hour trip generation: Data collected by W-Trans at a similar Sonoma County winery tasting room

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*TDH*	Highway / Direction of Travel	*SR 121-12 Eastbound*
Agency or Company	*W-Trans*	From/To	*East of Duhig Road*
Date Performed	*1/2/2014*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Conditions*

Project Description: *Domaine Carneros Winery*

Input Data



Analysis direction vol., V_d *1400veh/h*
Opposing direction vol., V_o *1400veh/h*
Shoulder width ft *6.0*
Lane Width ft *12.0*
Segment Length mi *1.0*

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.95*
No-passing zone *100%*
% Trucks and Buses , P_T *6 %*
% Recreational vehicles, P_R *4%*
Access points *mi* *5/mi*

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* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1474*	*1474*

Free-Flow Speed from Field Measurement

Mean speed of sample[3], S_{FM}
Total demand flow rate, both directions, v
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) *0.8 mi/h*

Estimated Free-Flow Speed

Base free-flow speed[4], BFFS	*55.0 mi/h*
Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.8 mi/h*
Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*30.1 mi/h*
Percent free flow speed, PFFS	*56.0 %*

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*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1474*	*1474*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*90.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*7.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*94.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, v/c	*0.87*
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)	*56.0*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1473.7*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.18*
Bicycle level of service (Exhibit 15-4)	*D*

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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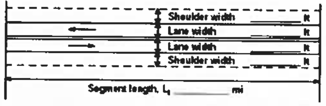
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*TDH*	Highway / Direction of Travel	*SR 121-12 Westbound*
Agency or Company	*W-Trans*	From/To	*East of Duhig Road*
Date Performed	*1/2/2014*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Conditions*

Project Description: *Domaine Carneros Winery*

Input Data



Analysis direction vol., V_d *1400veh/h*
Opposing direction vol., V_o *1400veh/h*
Shoulder width ft *6.0*
Lane Width ft *12.0*
Segment Length mi *1.0*

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.95*
No-passing zone *100%*
% Trucks and Buses , P_T *6 %*
% Recreational vehicles, P_R *4%*
Access points *mi* *5/mi*

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* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1474*	*1474*

Free-Flow Speed from Field Measurement

Mean speed of sample[3], S_{FM}
Total demand flow rate, both directions, v
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) *0.8 mi/h*

Estimated Free-Flow Speed

Base free-flow speed[4], BFFS	*55.0 mi/h*
Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.8 mi/h*
Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*30.1 mi/h*
Percent free flow speed, PFFS	*56.0 %*

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*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1474*	*1474*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*90.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*7.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*94.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, v/c	*0.87*
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)	*56.0*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1473.7*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.18*
Bicycle level of service (Exhibit 15-4)	*D*

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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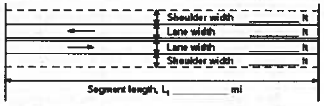
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*TDH*	Highway / Direction of Travel	*SR 121-12 Eastbound*
Agency or Company	*W-Trans*	From/To	*West of Duhig Road*
Date Performed	*1/2/2014*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Conditions*

Project Description: *Domaine Carneros Winery*

Input Data



Show North Arrow

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

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1350veh/h*
Opposing direction vol., V_o	*1350veh/h*
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*1.0*
Grade Length mi Up/down	
Peak-hour factor, PHF	*0.95*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*5/mi*

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* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1421*	*1421*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*30.8 mi/h*
		Percent free flow speed, PFFS	*57.4 %*

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*$f_{HV,PTSF}$ * $f_{g,PTSF}$)	*1421*	*1421*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*89.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*8.6*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+f $_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*93.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.84*
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)	*57.4*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1421.1*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.17*
Bicycle level of service (Exhibit 15-4)	*D*

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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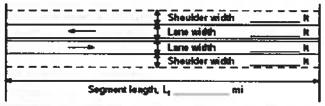
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*TDH*	Highway / Direction of Travel	*SR 121-12 Westbound*
Agency or Company	*W-Trans*	From/To	*West of Duhig Road*
Date Performed	*1/2/2014*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Conditions*

Project Description: *Domaine Carneros Winery*

Input Data



Show North Arrow

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

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1350veh/h*
Opposing direction vol., V_o	*1350veh/h*
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*1.0*
Grade Length mi Up/down	
Peak-hour factor, PHF	*0.95*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*5/mi*

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* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1421*	*1421*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*60.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*58.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*35.8 mi/h*
		Percent free flow speed, PFFS	*61.0 %*

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*$f_{HV,PTSF}$ * $f_{g,PTSF}$)	*1421*	*1421*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*89.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*8.6*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+f $_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*93.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.84*
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)	*61.0*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1421.1*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.17*
Bicycle level of service (Exhibit 15-4)	*D*

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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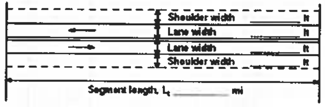
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*TDH*	Highway / Direction of Travel	*SR 121-12 Eastbound*
Agency or Company	*W-Trans*	From/To	*East of Duhig Road*
Date Performed	*1/2/2014*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing plus Proj Conditions*

Project Description: *Domaine Carneros Winery*

Input Data



Analysis direction vol., V_d *1402veh/h*
Opposing direction vol., V_o *1401veh/h*
Shoulder width ft *6.0*
Lane Width ft *12.0*
Segment Length mi *1.0*

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.95*
No-passing zone *100%*
% Trucks and Buses , P_T *6 %*
% Recreational vehicles, P_R *4%*
Access points *mi* *5/mi*

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) $v_i=V_i/(PHF^* f_{g,ATS}{}^* f_{HV,ATS})$	*1476*	*1475*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Total demand flow rate, both directions, v		Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*53.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*30.1 mi/h*
		Percent free flow speed, PFFS	*55.9 %*

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) $v_i=V_i/(PHF^* f_{HV,PTSF}{}^* f_{g,PTSF})$	*1476*	*1475*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*90.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*7.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*94.5*	

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, v/c	*0.87*
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)	*55.9*

Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1475.8*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.18*
Bicycle level of service (Exhibit 15-4)	*D*

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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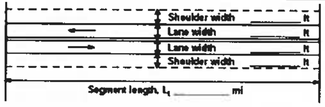
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*TDH*	Highway / Direction of Travel	*SR 121-12 Westbound*
Agency or Company	*W-Trans*	From/To	*East of Duhig Road*
Date Performed	*1/2/2014*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Conditions*

Project Description: *Domaine Carneros Winery*

Input Data



Analysis direction vol., V_d *1401veh/h*
Opposing direction vol., V_o *1402veh/h*
Shoulder width ft *6.0*
Lane Width ft *12.0*
Segment Length mi *1.0*

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.95*
No-passing zone *100%*
% Trucks and Buses , P_T *6 %*
% Recreational vehicles, P_R *4%*
Access points *mi* *5/mi*

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) $v_i=V_i/(PHF^* f_{g,ATS}{}^* f_{HV,ATS})$	*1475*	*1476*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Total demand flow rate, both directions, v		Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*53.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*30.1 mi/h*
		Percent free flow speed, PFFS	*55.9 %*

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) $v_i=V_i/(PHF^* f_{HV,PTSF}{}^* f_{g,PTSF})$	*1475*	*1476*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*90.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*7.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*94.5*	

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, v/c	*0.87*
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)	*55.9*

Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1474.7*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.18*
Bicycle level of service (Exhibit 15-4)	*D*

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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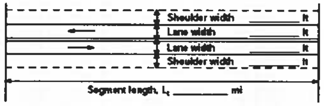
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TDH	Highway / Direction of Travel	SR 121-12 Eastbound
Agency or Company	W-Trans	From/To	West of Duhig Road
Date Performed	1/2/2014	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing plus Proj Conditions

Project Description: *Domaine Carneros Winery*

Input Data



Analysis direction vol., V_d 1351veh/h
Opposing direction vol., V_o 1353veh/h
Shoulder width ft 6.0
Lane Width ft 12.0
Segment Length mi 1.0

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 0.95
No-passing zone 100%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points *mi* 5/mi

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* $f_{g,ATS}$ * $f_{HV,ATS}$)	1422	1424

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)	1.3 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	0.8 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	53.8 mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	30.8 mi/h
		Percent free flow speed, PFFS	57.3 %

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*$f_{HV,PTSF}$* $f_{g,PTSF}$)	1422	1424
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	89.4	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	8.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	93.7	

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.84
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)	57.3
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1422.1
Effective width, Wv (Eq. 15-29) ft	24.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	4.17
Bicycle level of service (Exhibit 15-4)	D

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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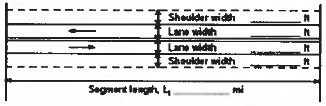
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TDH	Highway / Direction of Travel	SR 121-12 Westbound
Agency or Company	W-Trans	From/To	West of Duhig Road
Date Performed	1/2/2014	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing plus Proj Conditions

Project Description: *Domaine Carneros Winery*

Input Data



Analysis direction vol., V_d 1353veh/h
Opposing direction vol., V_o 1351veh/h
Shoulder width ft 6.0
Lane Width ft 12.0
Segment Length mi 1.0

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF 0.95
No-passing zone 100%
% Trucks and Buses , P_T 6 %
% Recreational vehicles, P_R 4%
Access points *mi* 5/mi

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* $f_{g,ATS}$ * $f_{HV,ATS}$)	1424	1422

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	60.0 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)	1.3 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	0.9 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	58.8 mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	35.8 mi/h
		Percent free flow speed, PFFS	60.9 %

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*$f_{HV,PTSF}$* $f_{g,PTSF}$)	1424	1422
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	89.5	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	8.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	93.8	

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 15-3)	E
Volume to capacity ratio, v/c	0.84
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)	60.9
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1424.2
Effective width, Wv (Eq. 15-29) ft	24.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	4.17
Bicycle level of service (Exhibit 15-4)	D

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.
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