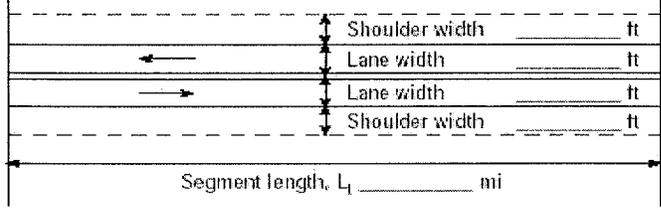


## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

 <p style="text-align: center;">Segment length, <math>L_1</math> _____ mi</p>	<table style="width: 100%;"> <tr> <td><input checked="" type="checkbox"/> Class I highway</td> <td><input type="checkbox"/> Class II highway</td> </tr> <tr> <td>Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling</td> <td></td> </tr> <tr> <td>Grade Length 1.20 mi</td> <td>Up/down 3.0</td> </tr> <tr> <td>Peak-hour factor, PHF 0.85</td> <td></td> </tr> <tr> <td>No-passing zone 17%</td> <td></td> </tr> <tr> <td>% Trucks and Buses, <math>P_T</math> 2%</td> <td></td> </tr> <tr> <td>% Recreational vehicles, <math>P_R</math> 2%</td> <td></td> </tr> <tr> <td>Access points/ mi 3</td> <td></td> </tr> </table>	<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway	Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling		Grade Length 1.20 mi	Up/down 3.0	Peak-hour factor, PHF 0.85		No-passing zone 17%		% Trucks and Buses, $P_T$ 2%		% Recreational vehicles, $P_R$ 2%		Access points/ mi 3	
<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway																
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling																	
Grade Length 1.20 mi	Up/down 3.0																
Peak-hour factor, PHF 0.85																	
No-passing zone 17%																	
% Trucks and Buses, $P_T$ 2%																	
% Recreational vehicles, $P_R$ 2%																	
Access points/ mi 3																	
Analysis direction vol., $V_d$ 551veh/h																	
Opposing direction vol., $V_o$ 432veh/h																	

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	3.7	1.2
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.948	0.996
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	684	510
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ mi/h	Base free-flow speed <sup>3</sup> , $BFFS_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d = FFS_{FM} + 0.00776(V_f^3 / f_{HV})$ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 0.8 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 1.2 mi/h	Free-flow speed, $FFS_d$ ( $FSS=BFFS \cdot f_{LS} \cdot f_A$ ) 59.3 mi/h	
	Average travel speed, $ATS=FFS \cdot 0.00776 v_p \cdot f_{np}$ 48.8 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.998
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	0.93	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h)= $V_i/(PHF \cdot f_{HV} \cdot f_G)$	694	509
Base percent time-spent-following <sup>4</sup> , $BPTSF(\%)=100(1-e^{-v_d^b})$	62.2	
Adj. for no-passing zone, $f_{np}$ (Exhibit. 20-20)	21.2	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	74.4	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_p/1,700$	0.40
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh} \cdot \text{mi})=0.25L_1(V/PHF)$	194
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh} \cdot \text{mi})=V \cdot L_1$	661
Peak 15-min total travel time, $TT_{15}(\text{veh} \cdot \text{h})=VMT_{15}/ATS$	4.0

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G=1.0$ .
2. If  $v_i(V_d \text{ or } v_o) \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

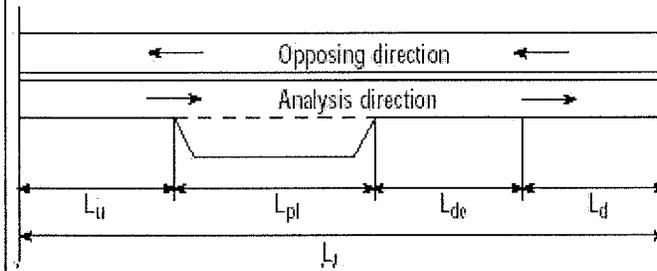
## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway



Total length of analysis segment, $L_t$ (mi)	1.2
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	0.1
Length of passing lane including tapers, $L_{pl}$ (mi)	1.0
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	48.8
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	74.4
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	D

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.60
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.11
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	53.6

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	5.75
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-5.65
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	48.5

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	B
Peak 15-min total travel time, $TT_{15}$ (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	3.6

### Notes

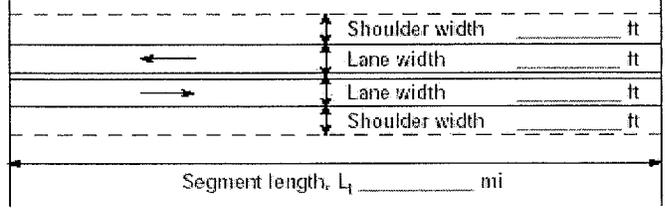
1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	12/28/06	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

 <p style="margin-left: 20px;">Shoulder width _____ ft</p> <p style="margin-left: 20px;">Lane width _____ ft</p> <p style="margin-left: 20px;">Lane width _____ ft</p> <p style="margin-left: 20px;">Shoulder width _____ ft</p> <p style="margin-left: 20px;">Segment length, <math>L_1</math> _____ mi</p>	<div style="display: flex; align-items: center;"> <div> <p><input checked="" type="checkbox"/> Class I highway    <input type="checkbox"/> Class II highway</p> <p>Terrain    <input type="checkbox"/> Level    <input type="checkbox"/> Rolling</p> <p>Grade Length 1.20 mi    Up/down -3.0</p> <p>Peak-hour factor, PHF 0.88</p> <p>No-passing zone 100%</p> <p>% Trucks and Buses, <math>P_T</math> 4%</p> <p>% Recreational vehicles, <math>P_R</math> 2%</p> <p>Access points/ mi 4</p> </div> </div>
<p>Analysis direction vol., <math>V_d</math> 432veh/h</p> <p>Opposing direction vol., <math>V_o</math> 551veh/h</p>	

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	1.2	3.7
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.992	0.901
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	495	695
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ mi/h	Base free-flow speed <sup>3</sup> , $BFFS_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d = FFS = S_{FM} + 0.00776(V_f / f_{HV})$ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 1.0 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 1.7 mi/h	Free-flow speed, $FFS_d$ ( $FSS=BFFS \cdot f_{LS} \cdot f_A$ ) 59.0 mi/h	
	Average travel speed, $ATS=FFS-0.00776v_p \cdot f_{np}$ 48.1 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.996	1.000
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	1.00	0.93
Directional flow rate <sup>2</sup> , $v_i$ (pc/h) $=V_i/(PHF \cdot f_{HV} \cdot f_G)$	493	670
Base percent time-spent-following <sup>4</sup> , $BPTSF(\%)=100(1-e^{-a \cdot v_d^b})$		53.0
Adj. for no-passing zone, $f_{np}$ (Exhibit. 20-20)		32.8
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$		67.0

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_f/1,700$	0.29
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh} \cdot \text{mi})=0.25L_i(V/PHF)$	147
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh} \cdot \text{mi})=V \cdot L_i$	518
Peak 15-min total travel time, $TT_{15}(\text{veh} \cdot \text{h})=VMT_{15}/ATS$	3.1

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G=1.0$ .
2. If  $v_i(v_d \text{ or } v_o) \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

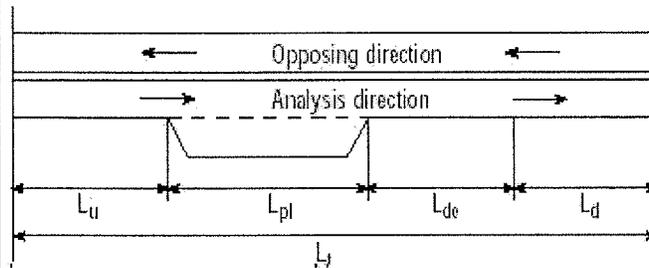
## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	12/28/06	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway



Total length of analysis segment, $L_t$ (mi)	1.2
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	1.2
Length of passing lane including tapers, $L_{pl}$ (mi)	0.0
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	48.1
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	67.0
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	D

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.70
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.10
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	7.36
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-7.36
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	67.0

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	
Peak 15-min total travel time, $TT_{15}$ (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	

### Notes

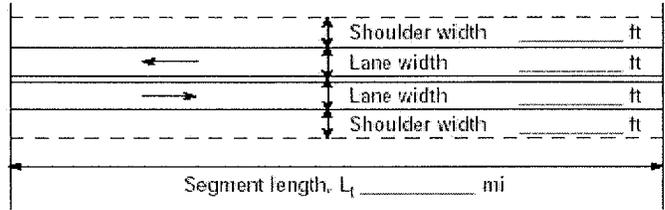
1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

 <p style="text-align: center;">Segment length, <math>L_1</math> _____ mi</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> Class I highway</td> <td style="text-align: center;"><input type="checkbox"/> Class II highway</td> </tr> <tr> <td>Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling</td> <td></td> </tr> <tr> <td>Grade Length 4.00 mi</td> <td>Up/down 3.0</td> </tr> <tr> <td>Peak-hour factor, PHF 0.88</td> <td></td> </tr> <tr> <td>No-passing zone 30%</td> <td></td> </tr> <tr> <td>% Trucks and Buses, <math>P_T</math> 6%</td> <td></td> </tr> <tr> <td>% Recreational vehicles, <math>P_R</math> 2%</td> <td></td> </tr> <tr> <td>Access points/ mi 2</td> <td></td> </tr> </table> <div style="text-align: center; margin-top: 10px;">  <p>Show North Arrow</p> </div>	<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway	Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling		Grade Length 4.00 mi	Up/down 3.0	Peak-hour factor, PHF 0.88		No-passing zone 30%		% Trucks and Buses, $P_T$ 6%		% Recreational vehicles, $P_R$ 2%		Access points/ mi 2	
<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway																
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling																	
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No-passing zone 30%																	
% Trucks and Buses, $P_T$ 6%																	
% Recreational vehicles, $P_R$ 2%																	
Access points/ mi 2																	

Analysis direction vol.,  $V_d$  347veh/h  
 Opposing direction vol.,  $V_o$  993veh/h

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	7.5	1.1
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV} = 1 / (1 + P_T(E_T - 1) + P_R(E_R - 1))$	0.719	0.994
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	0.94	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h) $v_i = V_i / (PHF * f_{HV} * f_G)$	583	1135
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ mi/h	Base free-flow speed <sup>3</sup> , $BFFS_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d = S_{FM} + 0.00776(V_f / f_{HV})$ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 0.6 mi/h	Free-flow speed, $FFS_d$ ( $FSS = BFFS - f_{LS} - f_A$ ) 59.5 mi/h	
	Average travel speed, $ATS = FFS - 0.00776V_p - f_{np}$ 45.5 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	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 <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h) $v_i = V_i / (PHF * f_{HV} * f_G)$	394	1128
Base percent time-spent-following <sup>4</sup> , $BPTSF(\%) = 100(1 - e^{-av_d^b})$	51.8	
Adj. for no-passing zone, $f_{np}$ (Exhibit. 20-20)	19.3	
Percent time-spent-following, $PTSF(\%) = BPTSF + f_{np}$	66.8	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, $v/c = V_p / 1,700$	0.34
Peak 15-min veh-miles of travel, $VMT_{15} (\text{veh} \cdot \text{mi}) = 0.25L_1(V/PHF)$	1065
Peak-hour vehicle-miles of travel, $VMT_{60} (\text{veh} \cdot \text{mi}) = V * L_1$	3748
Peak 15-min total travel time, $TT_{15} (\text{veh} \cdot \text{h}) = VMT_{15} / ATS$	23.4

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G = 1.0$ .
2. If  $v_i (V_d \text{ or } V_o) \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

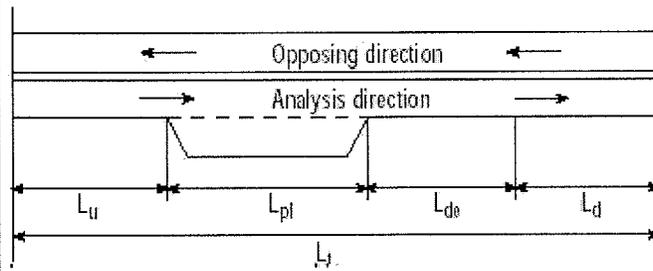
## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway



Total length of analysis segment, $L_t$ (mi)	10.8
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	1.5
Length of passing lane including tapers, $L_{pl}$ (mi)	7.6
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	45.5
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	56.8
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	C

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	0.00
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.10
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	49.0

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	8.25
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-6.55
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	38.1

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, $TT_{15}(\text{veh-h})$ $TT_{15} = VMT_{15}/ATS_{pl}$	21.7

### Notes

1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.



## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

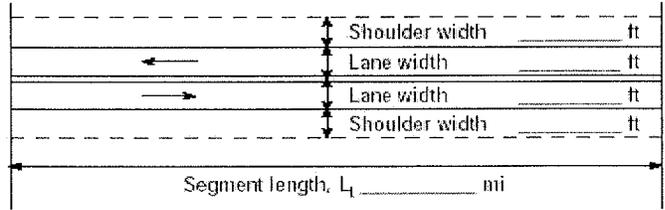
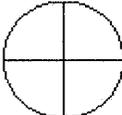
General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch
Project Description: Foresthill Divide Community Plan			
Input Data			
<input checked="" type="checkbox"/> Class I highway <input type="checkbox"/> Class II highway			
Total length of analysis segment, $L_t$ (mi)		10.8	
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)		1.6	
Length of passing lane including tapers, $L_{pl}$ (mi)		7.6	
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)		45.5	
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)		86.5	
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)		E	
Average Travel Speed			
Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)		1.70	
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$		-0.10	
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)		1.11	
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$		49.4	
Percent Time-Spent-Following			
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)		3.60	
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$		-2.00	
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)		0.62	
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$		59.6	
Level of Service and Other Performance Measures <sup>4</sup>			
Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)		C	
Peak 15-min total travel time, $TT_{15}(\text{veh-h})$ $TT_{15} = VMT_{15}/ATS_{pl}$		61.7	
Notes			
1. If $LOS_d = F$ , passing lane analysis cannot be performed. 2. If $L_d < 0$ , use alternative Equation 20-22. 3. If $L_d < 0$ , use alternative Equation 20-20. 4. v/c, $VMT_{15}$ and $VMT_{60}$ are calculated on Directional Two-Lane Highway Segment Worksheet.			

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

 <p style="text-align: center;">Segment length, <math>L_1</math> _____ mi</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td><input checked="" type="checkbox"/> Class I highway</td> <td><input type="checkbox"/> Class II highway</td> </tr> <tr> <td>Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling</td> <td></td> </tr> <tr> <td>Grade Length 1.70 mi</td> <td>Up/down -3.4</td> </tr> <tr> <td>Peak-hour factor, PHF 0.88</td> <td></td> </tr> <tr> <td>No-passing zone 50%</td> <td></td> </tr> <tr> <td>% Trucks and Buses, <math>P_T</math> 2%</td> <td></td> </tr> <tr> <td>% Recreational vehicles, <math>P_R</math> 2%</td> <td></td> </tr> <tr> <td>Access points/ mi 5</td> <td></td> </tr> </table> <div style="text-align: center; margin-top: 10px;">  <p>Show North Arrow</p> </div>	<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway	Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling		Grade Length 1.70 mi	Up/down -3.4	Peak-hour factor, PHF 0.88		No-passing zone 50%		% Trucks and Buses, $P_T$ 2%		% Recreational vehicles, $P_R$ 2%		Access points/ mi 5	
<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway																
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling																	
Grade Length 1.70 mi	Up/down -3.4																
Peak-hour factor, PHF 0.88																	
No-passing zone 50%																	
% Trucks and Buses, $P_T$ 2%																	
% Recreational vehicles, $P_R$ 2%																	
Access points/ mi 5																	

Analysis direction vol., $V_d$	684veh/h
Opposing direction vol., $V_o$	405veh/h

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	1.1	5.7
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998	0.915
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	1.00	0.98
Directional flow rate <sup>2</sup> , $v_i(\text{pc/h}) = V_i / (\text{PHF} * f_{HV} * f_G)$	779	512
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ _____ mi/h	Base free-flow speed <sup>3</sup> , $BFFS_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ _____ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d = S_{FM} + 0.00776(V_f * f_{HV})$ _____ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 1.3 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 1.8 mi/h	Free-flow speed, $FFS_d (FSS = BFFS - f_{LS} - f_A)$ 58.8 mi/h	
	Average travel speed, $ATS = FFS - 0.00776 v_p - f_{np}$ 47.0 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	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 <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate <sup>2</sup> , $v_i(\text{pc/h}) = V_i / (\text{PHF} * f_{HV} * f_G)$	777	488
Base percent time-spent-following <sup>4</sup> , $BPTSF(\%) = 100(1 - e^{-v_d})$	65.7	
Adj. for no-passing zone, $f_{np}$ (Exhibit. 20-20)	26.0	
Percent time-spent-following, $PTSF(\%) = BPTSF + f_{np}$	81.7	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio, $v/c = V_p / 1,700$	0.46
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh-mi}) = 0.25L_1(V/PHF)$	330
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh-mi}) = V * L_1$	1163
Peak 15-min total travel time, $TT_{15}(\text{veh-h}) = VMT_{15}/ATS$	7.0

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G=1.0$ .
2. If  $v_i(v_d$  or  $v_o) \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

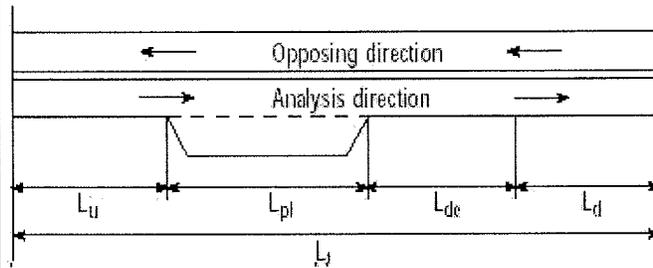
## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway



Total length of analysis segment, $L_t$ (mi)	1.7
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	0.5
Length of passing lane including tapers, $L_{pl}$ (mi)	0.8
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	47.0
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	81.7
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	E

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.30
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.11
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	50.4

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	5.16
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-4.76
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	60.1

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, $TT_{15}$ (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	6.6

### Notes

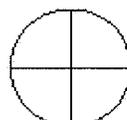
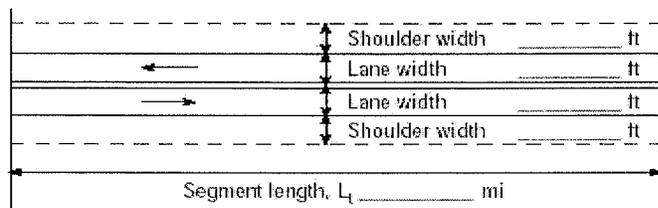
1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling	
Grade Length 1.20 mi	Up/down -3.0
Peak-hour factor, PHF 0.79	
No-passing zone 50%	
% Trucks and Buses, P <sub>T</sub> 2%	
% Recreational vehicles, P <sub>R</sub> 2%	
Access points/ mi 4	

Analysis direction vol., V<sub>d</sub> 549veh/h  
 Opposing direction vol., V<sub>o</sub> 431veh/h

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 20-9 or 20-15)	1.1	5.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 20-9 or 20-17)	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))	0.998	0.927
Grade adjustment factor <sup>1</sup> , f <sub>G</sub> (Exhibit 20-7 or 20-13)	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*f <sub>HV</sub> *f <sub>G</sub> )	696	591
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , S <sub>FM</sub> mi/h	Base free-flow speed <sup>3</sup> , BFFS <sub>FM</sub> 60.0 mi/h	
Observed volume <sup>3</sup> , V <sub>f</sub> veh/h	Adj. for lane width and shoulder width <sup>3</sup> , f <sub>LS</sub> (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS <sub>d</sub> FFS=S <sub>FM</sub> +0.00776(V <sub>f</sub> /f <sub>HV</sub> ) mi/h	Adj. for access points <sup>3</sup> , f <sub>A</sub> (Exhibit 20-5) 1.0 mi/h	
Adjustment for no-passing zones, f <sub>np</sub> (Exhibit 20-19) 1.5 mi/h	Free-flow speed, FFS <sub>d</sub> (FSS=BFFS-f <sub>LS</sub> -f <sub>A</sub> ) 59.0 mi/h	
	Average travel speed, ATS=FFS-0.00776v <sub>p</sub> -f <sub>np</sub> 47.5 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E <sub>T</sub> (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E <sub>R</sub> (Exhibit 20-10 or 20-16)	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</sub> (Exhibit 20-8 or 20-14)	1.00	0.93
Directional flow rate <sup>2</sup> , v <sub>i</sub> (pc/h)=V <sub>i</sub> /(PHF*f <sub>HV</sub> *f <sub>G</sub> )	695	584
Base percent time-spent-following <sup>4</sup> , BPTSF(%)=100(1-e <sup>-av<sub>d</sub></sup> )	62.5	
Adj. for no-passing zone, f <sub>np</sub> (Exhibit 20-20)	27.6	
Percent time-spent-following, PTSF(%)=BPTSF+f <sub>np</sub>	77.5	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V <sub>p</sub> /1,700	0.41
Peak 15-min veh-miles of travel, VMT <sub>15</sub> (veh- mi)=0.25L <sub>t</sub> (V/PHF)	208
Peak-hour vehicle-miles of travel, VMT <sub>60</sub> (veh- mi)=V*L <sub>t</sub>	659
Peak 15-min total travel time, TT <sub>15</sub> (veh-h)=VMT <sub>15</sub> /ATS	4.4

### Notes

1. If the highway is extended segment (level) or rolling terrain, f<sub>G</sub>=1.0 .
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.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway

Show North Arrow

Total length of analysis segment, $L_t$ (mi)	1.2
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	0.3
Length of passing lane including tapers, $L_{pl}$ (mi)	0.6
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	47.5
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	77.5
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	D

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.40
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.11
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	51.3

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	5.74
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-5.44
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	55.6

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, $TT_{15}$ (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	4.1

### Notes

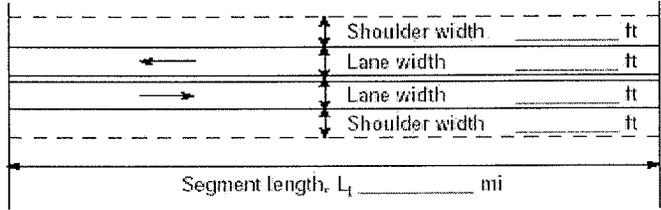
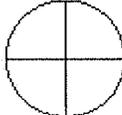
1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: *Foresthill Divide Community Plan*

### Input Data

 <p style="margin-left: 20px;">Shoulder width _____ ft</p> <p style="margin-left: 20px;">Lane width _____ ft</p> <p style="margin-left: 20px;">Lane width _____ ft</p> <p style="margin-left: 20px;">Shoulder width _____ ft</p> <p style="margin-left: 20px;">Segment length, <math>L_1</math> _____ mi</p>	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">  <p>Show North Arrow</p> </div> <div> <input checked="" type="checkbox"/> Class I highway    <input type="checkbox"/> Class II highway                  Terrain    <input type="checkbox"/> Level    <input type="checkbox"/> Rolling                  Grade Length 4.00 mi    Up/down 3.0                  Peak-hour factor, PHF 0.88                  No-passing zone 30%                  % Trucks and Buses, <math>P_T</math> 1%                  % Recreational vehicles, <math>P_R</math> 2%                  Access points/ mi 2             </div> </div>
Analysis direction vol., $V_d$ 1009veh/h Opposing direction vol., $V_o$ 405veh/h	

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	5.7	1.2
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.955	0.998
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	0.95	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1264	461
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ mi/h	Base free-flow speed <sup>3</sup> , $BFFS_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d$ $FFS=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 1.5 mi/h	Free-flow speed, $FFS_d$ ( $FSS=BFFS-f_{LS}-f_A$ ) 59.5 mi/h	
	Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$ 44.6 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.999
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	0.97	1.00
Directional flow rate <sup>2</sup> , $v_i$ (pc/h)= $V_i/(PHF*f_{HV}*f_G)$	1182	461
Base percent time-spent-following <sup>4</sup> , $BPTSF(\%)=100(1-e^{-av_d^b})$	78.8	
Adj. for no-passing zone, $f_{np}$ (Exhibit 20-20)	14.3	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	89.1	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio, $v/c=V_p/1,700$	0.74
Peak 15-min veh-miles of travel, $VMT_{15}$ (veh- mi)= $0.25L_1(V/PHF)$	3096
Peak-hour vehicle-miles of travel, $VMT_{60}$ (veh- mi)= $V*L_1$	10897
Peak 15-min total travel time, $TT_{15}$ (veh-h)= $VMT_{15}/ATS$	69.4

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G=1.0$ .
2. If  $v_i(v_d$  or  $v_o) \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch
Project Description: Foresthill Divide Community Plan			
Input Data			
<input checked="" type="checkbox"/> Class I highway <input type="checkbox"/> Class II highway			
Total length of analysis segment, $L_t$ (mi)		10.8	
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)		1.5	
Length of passing lane including tapers, $L_{pl}$ (mi)		7.6	
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)		44.6	
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)		89.1	
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)		E	
Average Travel Speed			
Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)		1.70	
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$		0.00	
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)		1.11	
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$		48.3	
Percent Time-Spent-Following			
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)		3.60	
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$		-1.90	
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)		0.62	
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$		61.2	
Level of Service and Other Performance Measures <sup>4</sup>			
Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)		C	
Peak 15-min total travel time, $TT_{15}(\text{veh-h})$ $TT_{15} = VMT_{15}/ATS_{pl}$		64.0	
Notes			
1. If $LOS_d = F$ , passing lane analysis cannot be performed. 2. If $L_d < 0$ , use alternative Equation 20-22. 3. If $L_d < 0$ , use alternative Equation 20-20. 4. v/c, $VMT_{15}$ and $VMT_{60}$ are calculated on Directional Two-Lane Highway Segment Worksheet.			

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information	Site Information
Analyst: <i>MKL</i>	Highway / Direction of Travel: <i>Foresthill Road - WB - Mitig.</i>
Agency or Company: <i>MRO Engineers, Inc.</i>	From/To: <i>Bridge to Spring Garden Road</i>
Date Performed: <i>2/27/07</i>	Jurisdiction: <i>Placer County</i>
Analysis Time Period: <i>PM Peak Hour</i>	Analysis Year: <i>Year 2030 With Forest Ranch</i>

Project Description: *Foresthill Divide Community Plan*

### Input Data

Shoulder width \_\_\_\_\_ ft  
Lane width \_\_\_\_\_ ft  
Lane width \_\_\_\_\_ ft  
Shoulder width \_\_\_\_\_ ft

Segment length,  $L_1$  \_\_\_\_\_ mi

Show North Arrow

Class I highway     Class II highway  
 Terrain     Level     Rolling  
 Grade Length 4.00 mi    Up/down -3.0  
 Peak-hour factor, PHF 0.76  
 No-passing zone 30%  
 % Trucks and Buses,  $P_T$  4 %  
 % Recreational vehicles,  $P_R$  2 %  
 Access points/ mi 2

Analysis direction vol.,  $V_d$  405veh/h

Opposing direction vol.,  $V_o$  1009veh/h

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	1.2	5.7
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.992	0.842
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	1.00	0.95
Directional flow rate <sup>2</sup> , $v_i(\text{pc/h})$ $v_i=V_i/(\text{PHF} \cdot f_{HV} \cdot f_G)$	537	1660
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ mi/h	Base free-flow speed <sup>3</sup> , $\text{BFFS}_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $\text{FFS}_d$ $\text{FFS}=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 0.5 mi/h	Free-flow speed, $\text{FFS}_d$ ( $\text{FFS}=\text{BFFS}-f_{LS}-f_A$ ) 59.5 mi/h	
	Average travel speed, $\text{ATS}=\text{FFS}-0.00776V_p \cdot f_{np}$ 41.9 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.996	1.000
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	1.00	0.97
Directional flow rate <sup>2</sup> , $v_i(\text{pc/h})=V_i/(\text{PHF} \cdot f_{HV} \cdot f_G)$	535	1369
Base percent time-spent-following <sup>4</sup> , $\text{BPTSF}(\%)=100(1-e^{-av_d^b})$	63.2	
Adj. for no-passing zone, $f_{np}$ (Exhibit. 20-20)	15.5	
Percent time-spent-following, $\text{PTSF}(\%)=\text{BPTSF}+f_{np}$	67.6	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_p/1,700$	0.32
Peak 15-min veh-miles of travel, $\text{VMT}_{15}(\text{veh-mi})=0.25L_t(V/\text{PHF})$	1439
Peak-hour vehicle-miles of travel, $\text{VMT}_{60}(\text{veh-mi})=V \cdot L_t$	4374
Peak 15-min total travel time, $\text{TT}_{15}(\text{veh-h})=\text{VMT}_{15}/\text{ATS}$	34.3

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G=1.0$ .
2. If  $v_i(v_d \text{ or } v_o) \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway

Show North Arrow

Total length of analysis segment, $L_t$ (mi)	10.8
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	1.6
Length of passing lane including tapers, $L_{pl}$ (mi)	7.6
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	41.9
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	67.6
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	D

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-0.10
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.10
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	45.1

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	7.02
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-5.42
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	45.6

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, $TT_{15}$ (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	31.9

### Notes

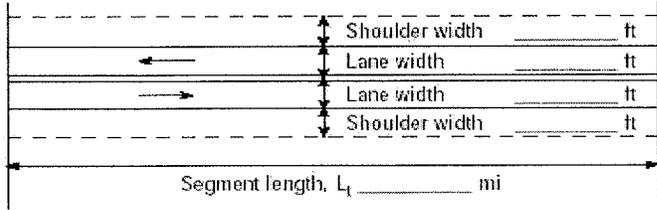
1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.

## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: *Foresthill Divide Community Plan*

### Input Data

 <p style="margin-left: 20px;">Shoulder width _____ ft</p> <p style="margin-left: 20px;">Lane width _____ ft</p> <p style="margin-left: 20px;">Lane width _____ ft</p> <p style="margin-left: 20px;">Shoulder width _____ ft</p> <p style="margin-left: 20px;">Segment length, <math>L_1</math> _____ mi</p>	<div style="display: flex; align-items: center;"> <div> <p><input checked="" type="checkbox"/> Class I highway    <input type="checkbox"/> Class II highway</p> <p>Terrain    <input type="checkbox"/> Level    <input type="checkbox"/> Rolling</p> <p>Grade Length 1.70 mi    Up/down -3.4</p> <p>Peak-hour factor, PHF 0.88</p> <p>No-passing zone 50%</p> <p>% Trucks and Buses, <math>P_T</math> 3%</p> <p>% Recreational vehicles, <math>P_R</math> 2%</p> <p>Access points/ mi 5</p> </div> </div>
Analysis direction vol., $V_d$ 455veh/h	
Opposing direction vol., $V_o$ 676veh/h	

### Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-9 or 20-15)	1.2	4.3
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.994	0.909
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate <sup>2</sup> , $v_i(\text{pc/h}) = V_i / (PHF * f_{HV} * f_G)$	520	845
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed <sup>3</sup> , $S_{FM}$ mi/h	Base free-flow speed <sup>3</sup> , $BFFS_{FM}$ 60.0 mi/h	
Observed volume <sup>3</sup> , $V_f$ veh/h	Adj. for lane width and shoulder width <sup>3</sup> , $f_{LS}$ (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d = S_{FM} + 0.00776(V_f / f_{HV})$ mi/h	Adj. for access points <sup>3</sup> , $f_A$ (Exhibit 20-5) 1.3 mi/h	
Adjustment for no-passing zones, $f_{np}$ (Exhibit 20-19) 0.9 mi/h	Free-flow speed, $FFS_d = BFFS - f_{LS} - f_A$ 58.8 mi/h	
	Average travel speed, $ATS = FFS - 0.00776v_p - f_{np}$ 47.2 mi/h	

### Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, $E_T$ (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, $E_R$ (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.997	1.000
Grade adjustment factor <sup>1</sup> , $f_G$ (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate <sup>2</sup> , $v_i(\text{pc/h}) = V_i / (PHF * f_{HV} * f_G)$	519	814
Base percent time-spent-following <sup>4</sup> , $BPTSF(\%) = 100(1 - e^{-v_i v_o})$	56.2	
Adj. for no-passing zone, $f_{np}$ (Exhibit. 20-20)	25.1	
Percent time-spent-following, $PTSF(\%) = BPTSF + f_{np}$	66.0	

### Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c = V_p / 1,700$	0.31
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh-m}) = 0.25L_1(V/PHF)$	220
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh-m}) = V * L_1$	774
Peak 15-min total travel time, $TT_{15}(\text{veh-h}) = VMT_{15}/ATS$	4.7

### Notes

1. If the highway is extended segment (level) or rolling terrain,  $f_G=1.0$ .
2. If  $v_i$  or  $v_o \geq 1,700$  pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

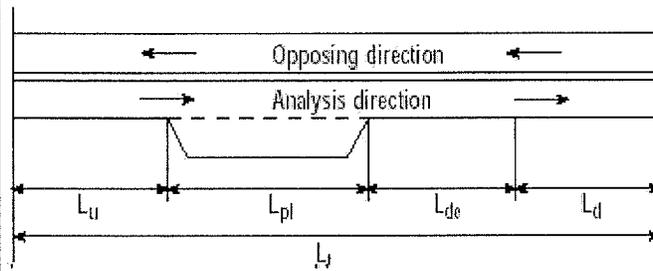
## DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 With Forest Ranch

Project Description: Foresthill Divide Community Plan

### Input Data

Class I highway     Class II highway



Total length of analysis segment, $L_t$ (mi)	1.7
Length of two-lane highway upstream of the passing lane, $L_u$ (mi)	0.5
Length of passing lane including tapers, $L_{pl}$ (mi)	0.8
Average travel speed, $ATS_d$ (from Directional Two-Lane Highway Segment Worksheet)	47.2
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	66.0
Level of service <sup>1</sup> , $LOS_d$ (from Directional Two-Lane Highway Segment Worksheet)	D

### Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, $L_{de}$ (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.30
Adj. factor for the effect of passing lane on average speed, $f_{pl}$ (Exhibit 20-24)	1.10
Average travel speed including passing lane <sup>2</sup> , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	50.3

### Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, $L_{de}$ (mi) (Exhibit 20-23)	7.15
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d$ (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-6.75
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl}$ (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane <sup>3</sup> , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	48.0

### Level of Service and Other Performance Measures<sup>4</sup>

Level of service including passing lane $LOS_{pl}$ (Exhibit 20-3 or 20-4)	B
Peak 15-min total travel time, $TT_{15}(\text{veh-h})$ $TT_{15} = VMT_{15}/ATS_{pl}$	4.4

### Notes

1. If  $LOS_d = F$ , passing lane analysis cannot be performed.
2. If  $L_d < 0$ , use alternative Equation 20-22.
3. If  $L_d < 0$ , use alternative Equation 20-20.
4. v/c,  $VMT_{15}$  and  $VMT_{60}$  are calculated on Directional Two-Lane Highway Segment Worksheet.