

| RAMPS AND RAMP JUNCTIONS WORKSHEET  |                |   |         |            |  |                       |  |  |            |
|---|----------------|---|---------|------------|--|-----------------------|--|--|------------|
| General Information   |                |   |         |            | Site Information   |                       |  |  |            |
| Analyst   | JRE            |   |         |            | Freeway/Dir of Travel  | I-80 Eastbound        |  |  |            |
| Agency or Company   | AECOM          |   |         |            | Junction   | Int. 303 to Route 611 |  |  |            |
| Date Performed  | 9/11/2014      |   |         |            | Jurisdiction   |                       |  |  |            |
| Analysis Time Period  | A.M. Peak Hour |   |         |            | Analysis Year  | Alt D1 Ph II 2045     |  |  |            |
| Project Description Interstate 80 Reconstruction  |                |   |         |            |  |                       |  |  |            |
| Inputs  |                |   |         |            |  |                       |  |  |            |
| Upstream Adj Ramp<br><input type="checkbox"/> Yes <input type="checkbox"/> On<br><input checked="" type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>up</sub> = ft<br>V <sub>u</sub> = veh/h  |                | Number of Lanes, N<br>Acceleration Lane Length, L <sub>A</sub><br>Deceleration Lane Length L <sub>D</sub><br>Freeway Volume, V <sub>F</sub><br>Ramp Volume, V <sub>R</sub><br>Freeway Free-Flow Speed, S <sub>FF</sub><br>Ramp Free-Flow Speed, S <sub>FR</sub> |         |            | 3<br><br>750<br>2689<br>243<br>70.0<br>35.0  |                       | Downstream Adj Ramp<br><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On<br><input type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>down</sub> = 1500 ft<br>V <sub>D</sub> = 170 veh/h |  |            |
| Conversion to pc/h Under Base Conditions  |                |   |         |            |  |                       |  |  |            |
| (pc/h)  | V (Veh/hr)     | PHF   | Terrain | %Truck     | %Rv  | f <sub>HV</sub>       | f <sub>p</sub>   | v = V/PHF x f <sub>HV</sub> x f <sub>p</sub> |            |
| Freeway   | 2689           | 0.94  | Rolling | 10         | 1  | 0.862                 | 0.95   | 3493   |            |
| Ramp  | 243            | 0.72  | Rolling | 1          | 0  | 0.985                 | 0.95   | 361  |            |
| UpStream  |                |   |         |            |  |                       |  |  |            |
| DownStream  | 170            | 0.72  | Rolling | 1          | 0  | 0.985                 | 0.95   | 252  |            |
| Merge Areas   |                |   |         |            | Diverge Areas  |                       |  |  |            |
| Estimation of v <sub>12</sub>   |                |   |         |            | Estimation of v <sub>12</sub>  |                       |  |  |            |
| $V_{12} = V_F (P_{FM})$<br>L <sub>EQ</sub> = (Equation 13-6 or 13-7)<br>P <sub>FM</sub> = using Equation (Exhibit 13-6)<br>V <sub>12</sub> = pc/h<br>V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                |   |         |            | $V_{12} = V_R + (V_F - V_R)P_{FD}$<br>L <sub>EQ</sub> = (Equation 13-12 or 13-13)<br>P <sub>FD</sub> = 0.656 using Equation (Exhibit 13-7)<br>V <sub>12</sub> = 2416 pc/h<br>V <sub>3</sub> or V <sub>av34</sub> 1077 pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                       |  |  |            |
| Capacity Checks   |                |   |         |            | Capacity Checks  |                       |  |  |            |
|   | Actual         | Capacity  |         | LOS F?     |  | Actual                | Capacity   |  | LOS F?     |
| V <sub>FO</sub>   |                | Exhibit 13-8  |         |            | V <sub>F</sub>   | 3493                  | Exhibit 13-8   | 7200   | No         |
|   |                |   |         |            | V <sub>FO</sub> = V <sub>F</sub> - V <sub>R</sub>  | 3132                  | Exhibit 13-8   | 7200   | No         |
|   |                |   |         |            | V <sub>R</sub>   | 361                   | Exhibit 13-10  | 2000   | No         |
| Flow Entering Merge Influence Area  |                |   |         |            | Flow Entering Diverge Influence Area   |                       |  |  |            |
|   | Actual         | Max Desirable   |         | Violation? |  | Actual                | Max Desirable  |  | Violation? |
| V <sub>R12</sub>  |                | Exhibit 13-8  |         |            | V <sub>12</sub>  | 2416                  | Exhibit 13-8   | 4400:All                                     | No         |
| Level of Service Determination (if not F)   |                |   |         |            | Level of Service Determination (if not F)  |                       |  |  |            |
| $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$<br>D <sub>R</sub> = (pc/mi/ln)<br>LOS = (Exhibit 13-2)  |                |   |         |            | $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$<br>D <sub>R</sub> = 18.3 (pc/mi/ln)<br>LOS = B (Exhibit 13-2)  |                       |  |  |            |
| Speed Determination   |                |   |         |            | Speed Determination  |                       |  |  |            |
| M <sub>S</sub> = (Exhibit 13-11)<br>S <sub>R</sub> = mph (Exhibit 13-11)<br>S <sub>0</sub> = mph (Exhibit 13-11)<br>S = mph (Exhibit 13-13)   |                |   |         |            | D <sub>s</sub> = 0.460 (Exhibit 13-12)<br>S <sub>R</sub> = 57.1 mph (Exhibit 13-12)<br>S <sub>0</sub> = 76.5 mph (Exhibit 13-12)<br>S = 61.9 mph (Exhibit 13-13)   |                       |  |  |            |

| RAMPS AND RAMP JUNCTIONS WORKSHEET  |                |  |                       |                       |  |                 |                |  |            |
|---|----------------|--|-----------------------|-----------------------|--|-----------------|----------------|--|------------|
| <b>General Information</b>  |                |  |                       |                       | <b>Site Information</b>  |                 |                |  |            |
| Analyst   | JRE            |  | Freeway/Dir of Travel | I-80 Eastbound        |  |                 |                |  |            |
| Agency or Company   | AECOM          |  | Junction              | Int. 303 to Route 611 |  |                 |                |  |            |
| Date Performed  | 9/11/2014      |  | Jurisdiction          |                       |  |                 |                |  |            |
| Analysis Time Period  | P.M. Peak Hour |  | Analysis Year         | Alt D1 Ph II 2045     |  |                 |                |  |            |
| Project Description Interstate 80 Reconstruction  |                |  |                       |                       |  |                 |                |  |            |
| <b>Inputs</b>   |                |  |                       |                       |  |                 |                |  |            |
| Upstream Adj Ramp<br><input type="checkbox"/> Yes <input type="checkbox"/> On<br><input checked="" type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>up</sub> = ft<br>V <sub>u</sub> = veh/h  |                | Number of Lanes, N 3<br>Acceleration Lane Length, L <sub>A</sub><br>Deceleration Lane Length L <sub>D</sub> 750<br>Freeway Volume, V <sub>F</sub> 3390<br>Ramp Volume, V <sub>R</sub> 324<br>Freeway Free-Flow Speed, S <sub>FF</sub> 70.0<br>Ramp Free-Flow Speed, S <sub>FR</sub> 35.0 |                       |                       | Downstream Adj Ramp<br><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On<br><input type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>down</sub> = 1500 ft<br>V <sub>D</sub> = 239 veh/h   |                 |                |  |            |
| <b>Conversion to pc/h Under Base Conditions</b>   |                |  |                       |                       |  |                 |                |  |            |
| (pc/h)  | V (Veh/hr)     | PHF  | Terrain               | %Truck                | %Rv  | f <sub>HV</sub> | f <sub>p</sub> | v = V/PHF x f <sub>HV</sub> x f <sub>p</sub> |            |
| Freeway   | 3390           | 0.94   | Rolling               | 12                    | 1  | 0.840           | 0.95           | 4517   |            |
| Ramp  | 324            | 0.97   | Rolling               | 1                     | 0  | 0.985           | 0.95           | 357  |            |
| UpStream  |                |  |                       |                       |  |                 |                |  |            |
| DownStream  | 239            | 0.97   | Rolling               | 1                     | 0  | 0.985           | 0.95           | 263  |            |
| Merge Areas   |                |  |                       |                       | Diverge Areas  |                 |                |  |            |
| <b>Estimation of v<sub>12</sub></b>   |                |  |                       |                       | <b>Estimation of v<sub>12</sub></b>  |                 |                |  |            |
| $V_{12} = V_F (P_{FM})$<br>L <sub>EQ</sub> = (Equation 13-6 or 13-7)<br>P <sub>FM</sub> = using Equation (Exhibit 13-6)<br>V <sub>12</sub> = pc/h<br>V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                |  |                       |                       | $V_{12} = V_R + (V_F - V_R)P_{FD}$<br>L <sub>EQ</sub> = (Equation 13-12 or 13-13)<br>P <sub>FD</sub> = 0.631 using Equation (Exhibit 13-7)<br>V <sub>12</sub> = 2981 pc/h<br>V <sub>3</sub> or V <sub>av34</sub> 1536 pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                 |                |  |            |
| <b>Capacity Checks</b>  |                |  |                       |                       | <b>Capacity Checks</b>   |                 |                |  |            |
|   | Actual         | Capacity   |                       | LOS F?                |  | Actual          | Capacity       |  | LOS F?     |
| V <sub>FO</sub>   |                | Exhibit 13-8   |                       |                       | V <sub>F</sub>   | 4517            | Exhibit 13-8   | 7200   | No         |
|   |                |  |                       |                       | V <sub>FO</sub> = V <sub>F</sub> - V <sub>R</sub>  | 4160            | Exhibit 13-8   | 7200   | No         |
|   |                |  |                       |                       | V <sub>R</sub>   | 357             | Exhibit 13-10  | 2000   | No         |
| <b>Flow Entering Merge Influence Area</b>   |                |  |                       |                       | <b>Flow Entering Diverge Influence Area</b>  |                 |                |  |            |
|   | Actual         | Max Desirable  |                       | Violation?            |  | Actual          | Max Desirable  |  | Violation? |
| V <sub>R12</sub>  |                | Exhibit 13-8   |                       |                       | V <sub>12</sub>  | 2981            | Exhibit 13-8   | 4400:All                                     | No         |
| <b>Level of Service Determination (if not F)</b>  |                |  |                       |                       | <b>Level of Service Determination (if not F)</b>   |                 |                |  |            |
| $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$<br>D <sub>R</sub> = (pc/mi/ln)<br>LOS = (Exhibit 13-2)  |                |  |                       |                       | $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$<br>D <sub>R</sub> = 23.1 (pc/mi/ln)<br>LOS = C (Exhibit 13-2)  |                 |                |  |            |
| <b>Speed Determination</b>  |                |  |                       |                       | <b>Speed Determination</b>   |                 |                |  |            |
| M <sub>S</sub> = (Exhibit 13-11)<br>S <sub>R</sub> = mph (Exhibit 13-11)<br>S <sub>0</sub> = mph (Exhibit 13-11)<br>S = mph (Exhibit 13-13)   |                |  |                       |                       | D <sub>S</sub> = 0.460 (Exhibit 13-12)<br>S <sub>R</sub> = 57.1 mph (Exhibit 13-12)<br>S <sub>0</sub> = 74.7 mph (Exhibit 13-12)<br>S = 62.1 mph (Exhibit 13-13)   |                 |                |  |            |

| RAMPS AND RAMP JUNCTIONS WORKSHEET  |                |   |                    |            |  |                 |  |  |            |
|---|----------------|---|--------------------|------------|--|-----------------|--|--|------------|
| General Information   |                |   |                    |            | Site Information   |                 |  |  |            |
| Analyst   | JRE            | Freeway/Dir of Travel   | I-80 Westbound     |            |  |                 |  |  |            |
| Agency or Company   | AECOM          | Junction  | Int. 304 to Rt 209 |            |  |                 |  |  |            |
| Date Performed  | 9/11/2014      | Jurisdiction  |                    |            |  |                 |  |  |            |
| Analysis Time Period  | A.M. Peak Hour | Analysis Year   | Alt D1 Ph II 2045  |            |  |                 |  |  |            |
| Project Description Interstate 80 Reconstruction  |                |   |                    |            |  |                 |  |  |            |
| Inputs  |                |   |                    |            |  |                 |  |  |            |
| Upstream Adj Ramp<br><input type="checkbox"/> Yes <input type="checkbox"/> On<br><input checked="" type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>up</sub> = ft<br>V <sub>u</sub> = veh/h  |                | Number of Lanes, N 4<br>Acceleration Lane Length, L <sub>A</sub><br>Deceleration Lane Length L <sub>D</sub> 250<br>Freeway Volume, V <sub>F</sub> 3206<br>Ramp Volume, V <sub>R</sub> 1023<br>Freeway Free-Flow Speed, S <sub>FF</sub> 70.0<br>Ramp Free-Flow Speed, S <sub>FR</sub> 35.0 |                    |            |  |                 | Downstream Adj Ramp<br><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On<br><input type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>down</sub> = 3000 ft<br>V <sub>D</sub> = 196 veh/h |  |            |
| Conversion to pc/h Under Base Conditions  |                |   |                    |            |  |                 |  |  |            |
| (pc/h)  | V (Veh/hr)     | PHF   | Terrain            | %Truck     | %Rv  | f <sub>HV</sub> | f <sub>p</sub>   | v = V/PHF x f <sub>HV</sub> x f <sub>p</sub> |            |
| Freeway   | 3206           | 0.93  | Rolling            | 12         | 1  | 0.840           | 0.95   | 4318   |            |
| Ramp  | 1023           | 0.84  | Rolling            | 1          | 0  | 0.985           | 0.95   | 1301   |            |
| UpStream  |                |   |                    |            |  |                 |  |  |            |
| DownStream  | 196            | 0.84  | Rolling            | 1          | 0  | 0.985           | 0.95   | 249  |            |
| Merge Areas   |                |   |                    |            | Diverge Areas  |                 |  |  |            |
| Estimation of v <sub>12</sub>   |                |   |                    |            | Estimation of v <sub>12</sub>  |                 |  |  |            |
| $V_{12} = V_F (P_{FM})$<br>L <sub>EQ</sub> = (Equation 13-6 or 13-7)<br>P <sub>FM</sub> = using Equation (Exhibit 13-6)<br>V <sub>12</sub> = pc/h<br>V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                |   |                    |            | $V_{12} = V_R + (V_F - V_R)P_{FD}$<br>L <sub>EQ</sub> = (Equation 13-12 or 13-13)<br>P <sub>FD</sub> = 0.260 using Equation (Exhibit 13-7)<br>V <sub>12</sub> = 2085 pc/h<br>V <sub>3</sub> or V <sub>av34</sub> 1116 pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                 |  |  |            |
| Capacity Checks   |                |   |                    |            | Capacity Checks  |                 |  |  |            |
|   | Actual         | Capacity  |                    | LOS F?     |  | Actual          | Capacity   |  | LOS F?     |
| V <sub>FO</sub>   |                | Exhibit 13-8  |                    |            | V <sub>F</sub>   | 4318            | Exhibit 13-8   | 9600   | No         |
|   |                |   |                    |            | V <sub>FO</sub> = V <sub>F</sub> - V <sub>R</sub>  | 3017            | Exhibit 13-8   | 9600   | No         |
|   |                |   |                    |            | V <sub>R</sub>   | 1301            | Exhibit 13-10  | 4000   | No         |
| Flow Entering Merge Influence Area  |                |   |                    |            | Flow Entering Diverge Influence Area   |                 |  |  |            |
|   | Actual         | Max Desirable   |                    | Violation? |  | Actual          | Max Desirable  |  | Violation? |
| V <sub>R12</sub>  |                | Exhibit 13-8  |                    |            | V <sub>12</sub>  | 2085            | Exhibit 13-8   | 4400:All                                     | No         |
| Level of Service Determination (if not F)   |                |   |                    |            | Level of Service Determination (if not F)  |                 |  |  |            |
| $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$<br>D <sub>R</sub> = (pc/mi/ln)<br>LOS = (Exhibit 13-2)  |                |   |                    |            | $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$<br>D <sub>R</sub> = 4.2 (pc/mi/ln)<br>LOS = A (Exhibit 13-2)   |                 |  |  |            |
| Speed Determination   |                |   |                    |            | Speed Determination  |                 |  |  |            |
| M <sub>S</sub> = (Exhibit 13-11)<br>S <sub>R</sub> = mph (Exhibit 13-11)<br>S <sub>0</sub> = mph (Exhibit 13-11)<br>S = mph (Exhibit 13-13)   |                |   |                    |            | D <sub>s</sub> = 0.545 (Exhibit 13-12)<br>S <sub>R</sub> = 54.7 mph (Exhibit 13-12)<br>S <sub>0</sub> = 76.3 mph (Exhibit 13-12)<br>S = 64.1 mph (Exhibit 13-13)   |                 |  |  |            |

| RAMPS AND RAMP JUNCTIONS WORKSHEET   |                |   |                    |            |   |                 |  |  |            |
|--|----------------|---|--------------------|------------|---|-----------------|--|--|------------|
| General Information  |                |   |                    |            | Site Information  |                 |  |  |            |
| Analyst  | JRE            | Freeway/Dir of Travel   | I-80 Westbound     |            |   |                 |  |  |            |
| Agency or Company  | AECOM          | Junction  | Int. 304 to Rt 209 |            |   |                 |  |  |            |
| Date Performed   | 9/11/2014      | Jurisdiction  |                    |            |   |                 |  |  |            |
| Analysis Time Period   | P.M. Peak Hour | Analysis Year   | Alt D1 Ph II 2045  |            |   |                 |  |  |            |
| Project Description Interstate 80 Reconstruction   |                |   |                    |            |   |                 |  |  |            |
| Inputs   |                |   |                    |            |   |                 |  |  |            |
| Upstream Adj Ramp<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> On<br><input type="checkbox"/> No <input checked="" type="checkbox"/> Off<br>L <sub>up</sub> = 3000 ft<br>V <sub>u</sub> = 377 veh/h   |                | Number of Lanes, N 4<br>Acceleration Lane Length, L <sub>A</sub><br>Deceleration Lane Length L <sub>D</sub> 250<br>Freeway Volume, V <sub>F</sub> 6672<br>Ramp Volume, V <sub>R</sub> 2001<br>Freeway Free-Flow Speed, S <sub>FF</sub> 70.0<br>Ramp Free-Flow Speed, S <sub>FR</sub> 35.0 |                    |            |   |                 | Downstream Adj Ramp<br><input type="checkbox"/> Yes <input type="checkbox"/> On<br><input checked="" type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>down</sub> = ft<br>V <sub>D</sub> = veh/h |  |            |
| Conversion to pc/h Under Base Conditions   |                |   |                    |            |   |                 |  |  |            |
| (pc/h)   | V (Veh/hr)     | PHF   | Terrain            | %Truck     | %Rv   | f <sub>HV</sub> | f <sub>p</sub>   | v = V/PHF x f <sub>HV</sub> x f <sub>p</sub> |            |
| Freeway  | 6672           | 0.96  | Rolling            | 13         | 1   | 0.830           | 0.95   | 8816   |            |
| Ramp   | 2001           | 0.90  | Rolling            | 1          | 0   | 0.985           | 0.95   | 2375   |            |
| UpStream   | 377            | 0.90  | Rolling            | 1          | 0   | 0.985           | 0.95   | 448  |            |
| DownStream   |                |   |                    |            |   |                 |  |  |            |
| Merge Areas  |                |   |                    |            | Diverge Areas   |                 |  |  |            |
| Estimation of v <sub>12</sub>  |                |   |                    |            | Estimation of v <sub>12</sub>   |                 |  |  |            |
| $V_{12} = V_F (P_{FM})$<br>(Equation 13-6 or 13-7)<br>L <sub>EQ</sub> =<br>P <sub>FM</sub> = using Equation (Exhibit 13-6)<br>V <sub>12</sub> = pc/h<br>V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                |   |                    |            | $V_{12} = V_R + (V_F - V_R)P_{FD}$<br>(Equation 13-12 or 13-13)<br>L <sub>EQ</sub> =<br>P <sub>FD</sub> = 0.260 using Equation (Exhibit 13-7)<br>V <sub>12</sub> = 4050 pc/h<br>V <sub>3</sub> or V <sub>av34</sub> 2383 pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                 |  |  |            |
| Capacity Checks  |                |   |                    |            | Capacity Checks   |                 |  |  |            |
|  | Actual         | Capacity  |                    | LOS F?     |   | Actual          | Capacity   |  | LOS F?     |
| V <sub>FO</sub>  |                | Exhibit 13-8  |                    |            | V <sub>F</sub>  | 8816            | Exhibit 13-8   | 9600   | No         |
|  |                |   |                    |            | V <sub>FO</sub> = V <sub>F</sub> - V <sub>R</sub>   | 6441            | Exhibit 13-8   | 9600   | No         |
|  |                |   |                    |            | V <sub>R</sub>  | 2375            | Exhibit 13-10  | 4000   | No         |
| Flow Entering Merge Influence Area   |                |   |                    |            | Flow Entering Diverge Influence Area  |                 |  |  |            |
|  | Actual         | Max Desirable   |                    | Violation? |   | Actual          | Max Desirable  |  | Violation? |
| V <sub>R12</sub>   |                | Exhibit 13-8  |                    |            | V <sub>12</sub>   | 4050            | Exhibit 13-8   | 4400:All                                     | No         |
| Level of Service Determination (if not F)  |                |   |                    |            | Level of Service Determination (if not F)   |                 |  |  |            |
| $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$<br>D <sub>R</sub> = (pc/mi/ln)<br>LOS = (Exhibit 13-2)   |                |   |                    |            | $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$<br>D <sub>R</sub> = 21.1 (pc/mi/ln)<br>LOS = C (Exhibit 13-2)   |                 |  |  |            |
| Speed Determination  |                |   |                    |            | Speed Determination   |                 |  |  |            |
| M <sub>S</sub> = (Exhibit 13-11)<br>S <sub>R</sub> = mph (Exhibit 13-11)<br>S <sub>0</sub> = mph (Exhibit 13-11)<br>S = mph (Exhibit 13-13)  |                |   |                    |            | D <sub>s</sub> = 0.642 (Exhibit 13-12)<br>S <sub>R</sub> = 52.0 mph (Exhibit 13-12)<br>S <sub>0</sub> = 71.4 mph (Exhibit 13-12)<br>S = 61.0 mph (Exhibit 13-13)  |                 |  |  |            |

| RAMPS AND RAMP JUNCTIONS WORKSHEET  |                |  |                       |                     |  |  |                |  |            |
|---|----------------|--|-----------------------|---------------------|--|--|----------------|--|------------|
| <b>General Information</b>  |                |  |                       |                     | <b>Site Information</b>  |  |                |  |            |
| Analyst   | JRE            |  | Freeway/Dir of Travel | I-80 Westbound      |  |  |                |  |            |
| Agency or Company   | AECOM          |  | Junction              | Int. 305 to Main St |  |  |                |  |            |
| Date Performed  | 9/11/14        |  | Jurisdiction          |                     |  |  |                |  |            |
| Analysis Time Period  | A.M. Peak Hour |  | Analysis Year         | Alt D1 Ph II 2045   |  |  |                |  |            |
| Project Description Interstate 80 Reconstruction  |                |  |                       |                     |  |  |                |  |            |
| <b>Inputs</b>   |                |  |                       |                     |  |  |                |  |            |
| Upstream Adj Ramp<br><input type="checkbox"/> Yes <input type="checkbox"/> On<br><input checked="" type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>up</sub> = ft<br>V <sub>u</sub> = veh/h  |                | Number of Lanes, N 4<br>Acceleration Lane Length, L <sub>A</sub><br>Deceleration Lane Length L <sub>D</sub> 750<br>Freeway Volume, V <sub>F</sub> 3206<br>Ramp Volume, V <sub>R</sub> 279<br>Freeway Free-Flow Speed, S <sub>FF</sub> 70.0<br>Ramp Free-Flow Speed, S <sub>FR</sub> 35.0 |                       |                     |  | Downstream Adj Ramp<br><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On<br><input type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>down</sub> = 3000 ft<br>V <sub>D</sub> = 196 veh/h |                |  |            |
| <b>Conversion to pc/h Under Base Conditions</b>   |                |  |                       |                     |  |  |                |  |            |
| (pc/h)  | V (Veh/hr)     | PHF  | Terrain               | %Truck              | %Rv  | f <sub>HV</sub>  | f <sub>p</sub> | v = V/PHF x f <sub>HV</sub> x f <sub>p</sub> |            |
| Freeway   | 3206           | 0.93   | Rolling               | 12                  | 1  | 0.840  | 0.95           | 4318   |            |
| Ramp  | 279            | 0.84   | Rolling               | 1                   | 0  | 0.985  | 0.95           | 355  |            |
| UpStream  |                |  |                       |                     |  |  |                |  |            |
| DownStream  | 196            | 0.84   | Rolling               | 1                   | 0  | 0.985  | 0.95           | 249  |            |
| Merge Areas   |                |  |                       |                     | Diverge Areas  |  |                |  |            |
| <b>Estimation of v<sub>12</sub></b>   |                |  |                       |                     | <b>Estimation of v<sub>12</sub></b>  |  |                |  |            |
| $V_{12} = V_F (P_{FM})$<br>L <sub>EQ</sub> = (Equation 13-6 or 13-7)<br>P <sub>FM</sub> = using Equation (Exhibit 13-6)<br>V <sub>12</sub> = pc/h<br>V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                |  |                       |                     | $V_{12} = V_R + (V_F - V_R)P_{FD}$<br>L <sub>EQ</sub> = (Equation 13-12 or 13-13)<br>P <sub>FD</sub> = 0.436 using Equation (Exhibit 13-7)<br>V <sub>12</sub> = 2083 pc/h<br>V <sub>3</sub> or V <sub>av34</sub> 1117 pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |  |                |  |            |
| <b>Capacity Checks</b>  |                |  |                       |                     | <b>Capacity Checks</b>   |  |                |  |            |
|   | Actual         | Capacity   |                       | LOS F?              |  | Actual   | Capacity       |  | LOS F?     |
| V <sub>FO</sub>   |                | Exhibit 13-8   |                       |                     | V <sub>F</sub>   | 4318   | Exhibit 13-8   | 9600   | No         |
|   |                |  |                       |                     | V <sub>FO</sub> = V <sub>F</sub> - V <sub>R</sub>  | 3963   | Exhibit 13-8   | 9600   | No         |
|   |                |  |                       |                     | V <sub>R</sub>   | 355  | Exhibit 13-10  | 2000   | No         |
| <b>Flow Entering Merge Influence Area</b>   |                |  |                       |                     | <b>Flow Entering Diverge Influence Area</b>  |  |                |  |            |
|   | Actual         | Max Desirable  |                       | Violation?          |  | Actual   | Max Desirable  |  | Violation? |
| V <sub>R12</sub>  |                | Exhibit 13-8   |                       |                     | V <sub>12</sub>  | 2083   | Exhibit 13-8   | 4400:All                                     | No         |
| <b>Level of Service Determination (if not F)</b>  |                |  |                       |                     | <b>Level of Service Determination (if not F)</b>   |  |                |  |            |
| $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$<br>D <sub>R</sub> = (pc/mi/ln)<br>LOS = (Exhibit 13-2)  |                |  |                       |                     | $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$<br>D <sub>R</sub> = 15.4 (pc/mi/ln)<br>LOS = B (Exhibit 13-2)  |  |                |  |            |
| <b>Speed Determination</b>  |                |  |                       |                     | <b>Speed Determination</b>   |  |                |  |            |
| M <sub>S</sub> = (Exhibit 13-11)<br>S <sub>R</sub> = mph (Exhibit 13-11)<br>S <sub>0</sub> = mph (Exhibit 13-11)<br>S = mph (Exhibit 13-13)   |                |  |                       |                     | D <sub>s</sub> = 0.460 (Exhibit 13-12)<br>S <sub>R</sub> = 57.1 mph (Exhibit 13-12)<br>S <sub>0</sub> = 76.3 mph (Exhibit 13-12)<br>S = 65.7 mph (Exhibit 13-13)   |  |                |  |            |

| RAMPS AND RAMP JUNCTIONS WORKSHEET  |                |  |                       |                     |  |  |                |  |            |
|---|----------------|--|-----------------------|---------------------|--|--|----------------|--|------------|
| <b>General Information</b>  |                |  |                       |                     | <b>Site Information</b>  |  |                |  |            |
| Analyst   | JRE            |  | Freeway/Dir of Travel | I-80 Westbound      |  |  |                |  |            |
| Agency or Company   | AECOM          |  | Junction              | Int. 305 to Main St |  |  |                |  |            |
| Date Performed  | 9/11/2014      |  | Jurisdiction          |                     |  |  |                |  |            |
| Analysis Time Period  | P.M. Peak Hour |  | Analysis Year         | Alt D1 Ph II 2045   |  |  |                |  |            |
| Project Description Interstate 80 Reconstruction  |                |  |                       |                     |  |  |                |  |            |
| <b>Inputs</b>   |                |  |                       |                     |  |  |                |  |            |
| Upstream Adj Ramp<br><input type="checkbox"/> Yes <input type="checkbox"/> On<br><input checked="" type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>up</sub> = ft<br>V <sub>u</sub> = veh/h  |                | Number of Lanes, N 4<br>Acceleration Lane Length, L <sub>A</sub><br>Deceleration Lane Length L <sub>D</sub> 750<br>Freeway Volume, V <sub>F</sub> 6672<br>Ramp Volume, V <sub>R</sub> 602<br>Freeway Free-Flow Speed, S <sub>FF</sub> 70.0<br>Ramp Free-Flow Speed, S <sub>FR</sub> 35.0 |                       |                     |  | Downstream Adj Ramp<br><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On<br><input type="checkbox"/> No <input type="checkbox"/> Off<br>L <sub>down</sub> = 3000 ft<br>V <sub>D</sub> = 360 veh/h |                |  |            |
| <b>Conversion to pc/h Under Base Conditions</b>   |                |  |                       |                     |  |  |                |  |            |
| (pc/h)  | V (Veh/hr)     | PHF  | Terrain               | %Truck              | %Rv  | f <sub>HV</sub>  | f <sub>p</sub> | v = V/PHF x f <sub>HV</sub> x f <sub>p</sub> |            |
| Freeway   | 6672           | 0.96   | Rolling               | 13                  | 1  | 0.830  | 0.95           | 8816   |            |
| Ramp  | 602            | 0.90   | Rolling               | 1                   | 0  | 0.985  | 0.95           | 715  |            |
| UpStream  |                |  |                       |                     |  |  |                |  |            |
| DownStream  | 360            | 0.90   | Rolling               | 1                   | 0  | 0.985  | 0.95           | 427  |            |
| Merge Areas   |                |  |                       |                     | Diverge Areas  |  |                |  |            |
| <b>Estimation of v<sub>12</sub></b>   |                |  |                       |                     | <b>Estimation of v<sub>12</sub></b>  |  |                |  |            |
| $V_{12} = V_F (P_{FM})$<br>L <sub>EQ</sub> = (Equation 13-6 or 13-7)<br>P <sub>FM</sub> = using Equation (Exhibit 13-6)<br>V <sub>12</sub> = pc/h<br>V <sub>3</sub> or V <sub>av34</sub> pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |                |  |                       |                     | $V_{12} = V_R + (V_F - V_R)P_{FD}$<br>L <sub>EQ</sub> = (Equation 13-12 or 13-13)<br>P <sub>FD</sub> = 0.436 using Equation (Exhibit 13-7)<br>V <sub>12</sub> = 4247 pc/h<br>V <sub>3</sub> or V <sub>av34</sub> 2284 pc/h (Equation 13-14 or 13-17)<br>Is V <sub>3</sub> or V <sub>av34</sub> > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Is V <sub>3</sub> or V <sub>av34</sub> > 1.5 * V <sub>12</sub> /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>If Yes, V <sub>12a</sub> = pc/h (Equation 13-16, 13-18, or 13-19) |  |                |  |            |
| <b>Capacity Checks</b>  |                |  |                       |                     | <b>Capacity Checks</b>   |  |                |  |            |
|   | Actual         | Capacity   |                       | LOS F?              |  | Actual   | Capacity       |  | LOS F?     |
| V <sub>FO</sub>   |                | Exhibit 13-8   |                       |                     | V <sub>F</sub>   | 8816   | Exhibit 13-8   | 9600   | No         |
|   |                |  |                       |                     | V <sub>FO</sub> = V <sub>F</sub> - V <sub>R</sub>  | 8101   | Exhibit 13-8   | 9600   | No         |
|   |                |  |                       |                     | V <sub>R</sub>   | 715  | Exhibit 13-10  | 2000   | No         |
| <b>Flow Entering Merge Influence Area</b>   |                |  |                       |                     | <b>Flow Entering Diverge Influence Area</b>  |  |                |  |            |
|   | Actual         | Max Desirable  |                       | Violation?          |  | Actual   | Max Desirable  |  | Violation? |
| V <sub>R12</sub>  |                | Exhibit 13-8   |                       |                     | V <sub>12</sub>  | 4247   | Exhibit 13-8   | 4400:All                                     | No         |
| <b>Level of Service Determination (if not F)</b>  |                |  |                       |                     | <b>Level of Service Determination (if not F)</b>   |  |                |  |            |
| $D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$<br>D <sub>R</sub> = (pc/mi/ln)<br>LOS = (Exhibit 13-2)  |                |  |                       |                     | $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$<br>D <sub>R</sub> = 34.0 (pc/mi/ln)<br>LOS = D (Exhibit 13-2)  |  |                |  |            |
| <b>Speed Determination</b>  |                |  |                       |                     | <b>Speed Determination</b>   |  |                |  |            |
| M <sub>S</sub> = (Exibit 13-11)<br>S <sub>R</sub> = mph (Exhibit 13-11)<br>S <sub>0</sub> = mph (Exhibit 13-11)<br>S = mph (Exhibit 13-13)  |                |  |                       |                     | D <sub>s</sub> = 0.492 (Exhibit 13-12)<br>S <sub>R</sub> = 56.2 mph (Exhibit 13-12)<br>S <sub>0</sub> = 71.8 mph (Exhibit 13-12)<br>S = 63.3 mph (Exhibit 13-13)   |  |                |  |            |